AGENDA REPORT

To: Mayor Pat Humphrey and the Clare City Commission
From: Jeremy Howard, City Manager
Date: May 11, 2023
Regarding: Adoption of Clare County Hazard Mitigation Plan

For the Agenda of May 15, 2023

Background. As reflected in the attached letter from Marc Griffis, Isabella County Director of 911 & Emergency Management, the Isabella County Emergency Planning Committee has prepared a hazard mitigation plan for Isabella County. The Plan (*copy att'd*) has been approved by appropriate state and federal agencies as well as Isabella County and enables Isabella County and any local governmental entities within Isabella County that adopt the Plan as theirs to apply for state and federal emergency assistance funds in the event of a qualifying disaster. The City Commission is asked to adopt the Isabella County Hazard Mitigation Plan.

Issues & Questions Specified. Should the City Commission adopt The Isabella County Hazard Mitigation Plan?

Alternatives.

1. Adopt the Plan.
2. Do not adopt the Plan.
3. Set aside decision regarding this matter to a later date.

Financial Impact. The fiscal impact is indeterminable. However, in the event of a qualifying disaster, the City could be eligible to apply for and receive Michigan and FEMA hazard recovery funding to offset costs associated with a disaster. We would likely not be eligible for any available funding if we do not adopt the Plan.

Recommendation. I recommend that the City Commission adopt the Isabella County Hazard Mitigation Plan by approving Resolution 2023-031 (*copy att'd*).

Attachments.

1. Letter from Marc Griffis, Isabella County Director of 911 & Emergency Management.
2. Isabella County Hazard Mitigation Plan.
3. Resolution 2023-031.

To the Isabella Township Boards:

Hello, my name is Kim Fox and I am a volunteer worker for Isabella County Emergency Management Department assisting them in contacting the county's township boards. Attached is a copy of the Hazard Mitigation Plan that has been approved by the county along with the Mitigation Resolution document. Action to be taken by the township boards is:

- Review the Hazard Mitigation plan;
- Place the Hazard Mitigation plan on your next township meeting agenda;
- After any discussion, take a vote to accept the plan;
- Complete the Mitigation Resolution document; and
- Submit the completed Mitigation Resolution document to the Emergency Management Department by July 1, 2023.

There is no cost to the township for adopting the plan. What it does do is enable the township to access FEMA monies in the event the township incurs a qualifying hazard event. If the plan is not signed and/or accepted, the township would have to incur the cost of the event.

If you cannot meet the July 1 deadline for submission or have further questions, please contact Marc Griffis or Julie Adams at the Emergency Management office.

Thank you.

Isabella County
Emergency Management

2008 E. Preston Mt Pleasant, MI 48858 (989) 773-6116 FAX (888) 384-5668

Elected Official,

Isabella County has recently gone through the process of updating the Isabella County Hazard Mitigation Plan. This plan has since been approved by FEMA as well as adopted by the Isabella County Board of Commissioners. It is imperative that each township, village, and city adopt this plan by resolution as well. By adopting the plan your entity will be covered under it, therefore making themselves eligible to seek reimbursements in the event of a disaster. If you choose not to adopt the Isabella County Hazard Mitigation Plan your jurisdiction will not be covered under the current Isabella County Hazard Mitigation Plan, therefore leaving themselves ineligible to request reimbursements in the event of a disaster.

We are asking each jurisdiction take the time to review and adopt the Isabella County Hazard Mitigation Plan and send a copy of the signed resolution to both Isabella County at jjarosiewicz@isabellacounty.org and Isabella County Emergency Management at mgriffis@isabellacounty.org.

If you have any questions or concerns, please feel free to contact Emergency Management/911 Director, McCarther Griffis at 989-621-2726 or via email at mgriffis@isabellacounty.org.

Isabella County Hazard Mitigation Plan

Draft December 2022

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CHAPTER 1: INTRODUCTION

Isabella County is located in the mid-section of the lower peninsula of Michigan. The County is bordered on the north by Clare County, on the west by Mecosta County, on the south by Montcalm and Gratiot Counties, and on the east by Midland County. According to the US Census, the County covers an approximate area of 366,515 acres or about 573 square miles. Using the 2020 US Census population figure of 64,394, the population density of the county is roughly 123 people per square mile. The County consists of sixteen townships, two cities, and three villages. Mt. Pleasant is the largest municipality and the county seat. Approximately 37 percent of the county population resides in the City of Mt. Pleasant.

The county seat, Mt. Pleasant is situated less than fifty miles to the west and north of the cities of Bay City, Saginaw and less than thirty miles west from Midland. Mt. Pleasant is approximately sixty-five miles north of the State Capitol, Lansing. The City of Grand Rapids lies less than 100 miles from the county seat and the cities of Cadillac and Traverse City are less than 100 miles to the northwest.

Isabella County contains over 2,700 acres of water, including lakes, streams, and reservoirs. Most prominent of these features are the Chippewa River, Lake Isabella, Coldwater Lake, Stevenson Lake, and Littlefield Lake. All of the prominent lakes are located in the western section of the County, while the streams meander throughout the entire County. An additional 25 percent of the County are forests and wetlands.

North-south access is provided by US-127 in the east. East-west access is provided by M-20 through the middle of the county.

What is Hazard Mitigation?

Hazard Mitigation is any action taken before, during, or after a disaster to permanently eliminate or reduce the long term risk to human life, and property from natural, societal, and technological hazards. Hazard mitigation, along with preparedness, response, and recovery comprise the four phases of emergency management. There is a cyclical relationship between these four phases of emergency management: a community prepares for disaster, including hazard mitigation activities, and then responds to a disaster when it occurs. Following the response, there is a transition into the recovery process, during which hazard mitigation measures can be evaluated and adopted. This in turn, improves the resilience of the community for the next incident, and so on. When successful, hazard mitigation will lessen future impacts to such a degree that succeeding occurrences will remain incidents and not become disasters.

Hazard mitigation strives to reduce the impact of hazards on people and property through the coordination of resources, programs, and authorities so that, at the very least, communities do not contribute to the increasing severity of the problem. When repairs and reconstruction are completed as quickly as possible to pre-disaster conditions, then pre-disaster conditions may simply result in a cycle of repeated damages. However, post-disaster repairs and reconstruction provide an opportunity to strengthen a community's resilience. Recovery projects can rebuild things in a safer manner, informed by the lessons of past disasters, so that future disasters will not have as much of an impact.

Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced. Through a combination of regulatory, administrative, and engineering approaches, losses can be limited by reducing susceptibility to damage. Hazard mitigation provides the mechanism by which communities and individuals can break the cycle of damage, reconstruction, and damage again.

Recognizing the importance of reducing community vulnerability to natural and technological hazards, Isabella County is actively addressing the issue through the development and subsequent implementation of this plan. The many benefits to be realized from this effort – protection of the public health and safety, preservation of essential services, prevention of property damage, and preservation of the local economic base, to mention just a few – will help ensure that Isabella County remains a vibrant, safe, and enjoyable place in which to live, raise a family, and conduct business.

Under the Disaster Mitigation Act of 2000, state and local governments are required to develop local hazard mitigation plans in order to be eligible for pre- and post-disaster funding from the federal government. The Plan was prepared in accordance with the Federal Emergency Management Agency (FEMA) documents: Local Mitigation Handbook and the Local Mitigation Plan Review Guide, and the Michigan State Police Emergency Management Homeland Security Division (MSP/EMHSD) publication 207: Local Hazard Mitigation Workbook.

The Isabella County Hazard Mitigation Plan (the "Plan") serves as the foundation for hazard mitigation activities within the community. Implementation of the plan's recommendations will assist in the reduction of injuries, loss of life, and destruction of property due to natural and technological hazards. The Plan provides a path toward continuous, proactive reduction of vulnerability to the most frequent hazards that result in repetitive and often severe social, economic and physical damage. The ideal end- state would be the total integration of hazard mitigation activities, programs, capabilities, and actions into normal, day-to-day governmental functions and management practices.

Isabella County Emergency Management Director and the Local Emergency Planning Commission (LEPC) worked with the East Michigan Council of Governments (EMCOG) and the MSP/EMHSD to develop this Plan. The intent of the Plan is to work with those familiar with Isabella County to describe the County, and to create an action plan to protect the health, safety, and economic interests of residents through hazard mitigation, planning, awareness, and implementation.

In the Plan, the hazard analysis section describes the major categories of hazards that affect Isabella County (and provides some additional information about lesser hazards). The analysis of hazards makes use of community profile information that includes a description of community organization and potential resources. The major hazards have been identified as severe weather, geological threats, fires, floods/drought, hazardous materials, infrastructure problems, public health emergencies, transportation incidents, seasonal population shifts, and civil unrest. For each of the major hazards, the following is provided:

Description of the hazard;
Explanation of how it affects the County;
Requirements/Rules affecting the County;
Hazard mitigation Goal(s) that have been identified; and Description and explanation of the Action Item proposed.

This new Plan updates the previous Isabella County Hazard Mitigation Plan that was approved in 2016. This process began in 2022, as recertification of the Hazard Mitigation Plan shall take place at least once every five (5) years. It has been modified so that it is easier to find and use information contained within it. This should be helpful for stakeholders

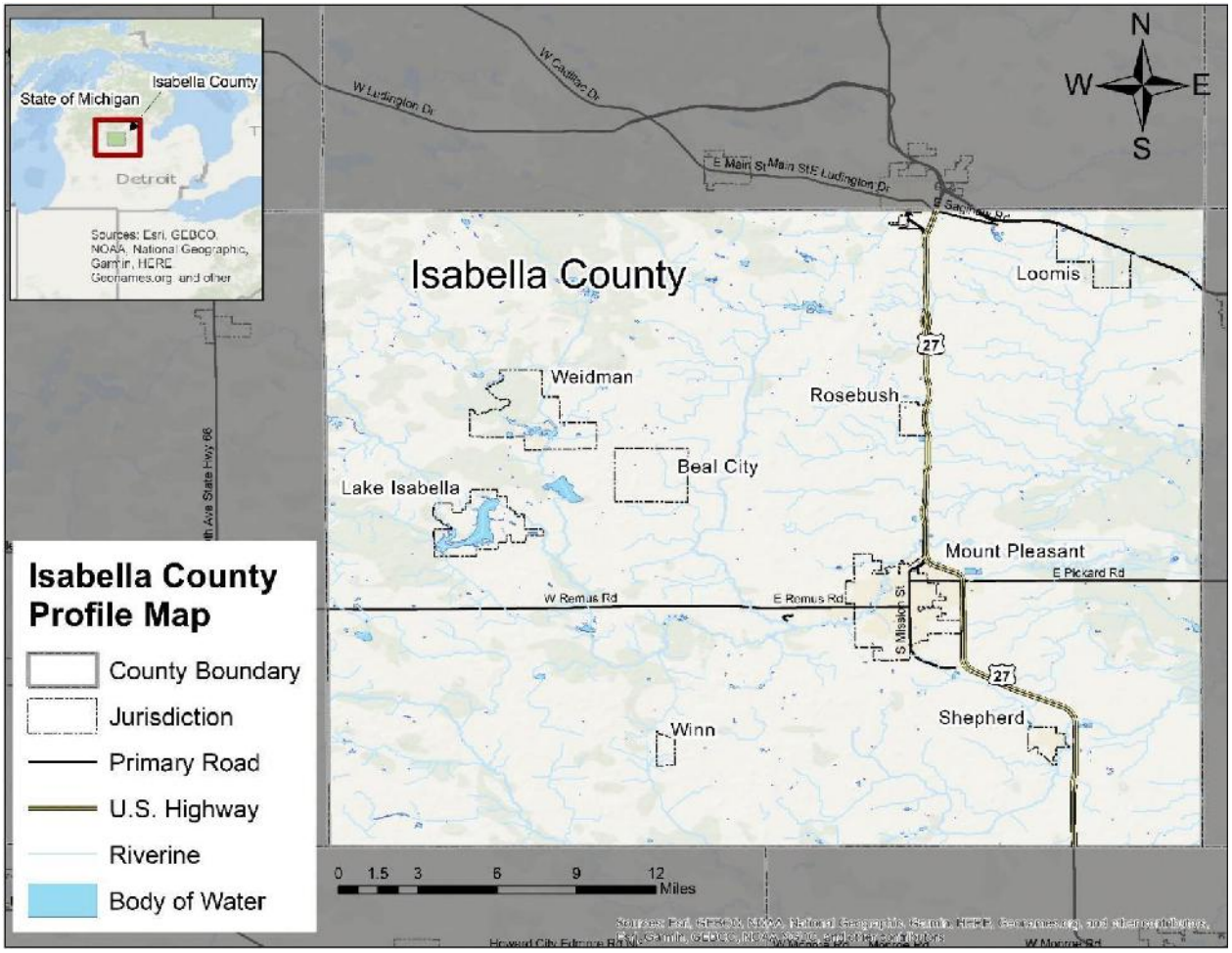
to more easily find and review the information that is most relevant for their jurisdictions and areas of expertise/interest.

Certain information that is considered confidential or too sensitive for widespread public distribution has been kept out of this document, and will only be distributed at the discretion of the Isabella County Office of Emergency Management. This plan is the culmination of our interdisciplinary and interagency planning effort that required the assistance and expertise of numerous agencies, organizations, and individuals. Without their technical assistance and contributions of time and ideas this plan could not have been completed.

A map of Isabella County identifying the local units of government follows.

Isabella County Municipal Map

MAP 1.1



Executive Summary

The Plan was created to protect the health, safety, and economic interests of the Isabella County residents and businesses by reducing the impacts of natural and technological hazards through hazard mitigation planning, awareness, and implementation. The Plan serves as the foundation for hazard mitigation activities and actions within Isabella County. Implementation of recommendations will reduce loss of life, destruction of property, and economic losses due to natural and technological hazards. The Plan provides a path toward continuous, proactive reduction of vulnerability to hazards which result in repetitive and oftentimes severe social, economic, and physical damage. The ideal end state is full integration of hazard mitigation concepts into day-to-day governmental and business functions and management practices.

This Plan employs a broad perspective in examining multi-hazard mitigation activities and opportunities in Isabella County. Emphasis is placed on hazards which have resulted in threats to the public health, safety and welfare, as well as the social, economic and physical fabric of the community. This plan addresses such hazards as severe weather, geological threats, fires, floods/drought, hazardous materials, infrastructure problems, public health emergencies, transportation incidents, seasonal population shifts, and civil unrest. Each hazard is analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigation actions. The plan also describes some of tools to be used for its implementation.

Local Units of Government

While the Hazard Mitigation Plan was performed by Isabella County, it involved the participation of the communities within the County. Isabella County's communities consist of two cities, three villages, sixteen townships, and two CDPs. All participating jurisdictions in the planning process will adopt the plan and continue to participate in the monitoring and evaluation process on both the annual and 5-year planning cycle. All participating jurisdictions will incorporate the identified mitigation strategies within local planning mechanisms where appropriate. This includes considering elements of the mitigation plan while updating local master plans throughout the planning area. The communities are listed below:

City

Mt. Pleasant, Clare

Village

Lake Isabella, Shepherd, Rosebush

Townships

Broomfield, Chippewa, Coe, Coldwater, Deerfield, Denver, Fremont, Gilmore, Isabella, Lincoln, Nottawa, Rolland, Sherman, Union, Vernon, Wise

Isabella Community Information and Participation Status

TABLE 1.1

Community name	2000 pop.	2010 pop.	2020 pop.	Change 2010-2020	Currently a participant in 2022 plan	NFIP Digitalized Map Available	NFIP participant	NFIP map date
Isabella County	63,351	70,311	64,394	-8.4%	YES			
Broomfield Twp.	1,293	1,340	1,857	38.6%	YES	YES	YES	2/5/2014
Chippewa Twp.	4,623	4,654	4,446	-4.5%	YES	YES	YES	2/5/2014
Coe Twp.	1,484	1,564	3,032	93.9%	YES	YES	YES	2/5/2014
Coldwater Twp.	739	777	801	3.1%	YES		YES	2/5/2014
Deerfield Twp.	3,081	3,188	3,257	2.2%	YES	YES	YES	2/5/2014
Denver Twp.	1,144	1,148	1,199	4.4%	YES	YES	YES	2/5/2014
Fremont Twp.	1,358	1,455	1,445	-0.7%	YES	YES	YES	2/5/2014
Gilmore Twp.	1,374	1,459	1,314	-9.9%	YES	YES	YES	2/5/2014
Isabella Twp.	1,766	1,885	2,096	11.2%	YES	YES	YES	2/5/2014
Lincoln Twp.	1,936	2,115	2,069	-2.2%	YES	YES		
Nottawa Twp.	2,278	2,282	2,225	-2.5%	YES	YES	YES	2/5/2014
Rolland Twp.	1,210	1,305	1,406	7.7%	YES	YES	YES	2/5/2014
Sherman Twp.	1,700	1,819	3,127	71.9%	YES	YES	YES	2/5/2014
Union Twp.	7,611	12,927	11,699	-9.5%	YES	YES	YES	2/5/2014
Vernon Twp.	1,328	1,369	1,300	-5.0%	YES	YES	YES	2/5/2014
Wise Twp.	1,301	1,397	1,355	-3.0%	YES	YES	YES	2/5/2014
Clare	47	47	78	66.0%	YES		YES	12/3/2010
Mt Pleasant	25,947	26,016	21,688	-16.6%	YES	YES	YES	2/5/2014
Lake Isabella	1,243	1,681	1,829	8.8%	YES		YES	2/5/2014
Rosebush	379	368	353	-4.1%	YES		YES	2/5/2014
Shepherd	1,509	1,515	1,469	-3.0%	YES		YES	2/5/2014
Saginaw Chippewa Indian Tribe					YES			

CHAPTER 2: THE PLANNING PROCESS

In March 2022, the Isabella County Emergency Management staff began the update process by hosting a virtual plan update kickoff meeting with the East Michigan Council of Governments (EMCOG) staff and the Michigan State Police Emergency Management and Homeland Security Division (EMHSD) Staff. The purpose of the meeting was to advise the public and Isabella County representatives of the need to update the 2017 Isabella County Hazard Mitigation Plan (Plan) and the process that would be utilized.

This update was made possible after the County, was awarded a grant from the Federal Emergency Management Agency (FEMA) through the Michigan State Police to update their hazard mitigation plans.

EMCOG staff worked with the Isabella County Emergency Management staff, which included the director, assistant director, and coordinator, and the Isabella County Local Planning Team (ICLPT) who was designated as the steering committee for the Plan update.

The ICLPT is composed of volunteers and professionals from county municipalities and various agencies located throughout the county/region, including the Michigan State Police, American Red Cross, Michigan Department of Health and Human Services, and the Department of Natural Resources. The ICLPT is led by Emergency Management Director (EMD), Marc Griffis.

To further promote the update and municipal participation, a questionnaire was sent to the municipal governments for their input on the update process. The questionnaire sought information on the hazards, how they impacted the County, and what measures would be most beneficial for each municipality to mitigate the damages resulting from the hazard events. A copy of the questionnaire is included in Appendix B, which also includes a summary of the questionnaire responses.

Through a series of open meetings to the public, the EMD and EMCOG staff directed the ICLPT through an assessment of the Plan in order to determine what changes, if any, would be necessary for the update. The ICLPT and municipal officials were provided meeting agendas and any accompanying memos regarding the Plan update the week before each meeting, at which time the agendas were also posted on the public bulletin board at the Isabella Public Safety Building. The following table (Table 2.1) identifies the meeting dates, locations, and subject matter for the ICLPT meetings. At the end of this chapter are two tables identifying the agencies represented at the meetings (Table 2.2) and the individuals at each meeting (Table 2.3). Appendix A includes the sign-in sheets for all the meetings for this update.

Isabella County Local Planning Team Meeting Schedule/Discussion Topic **Table 2.1**

Meeting Date	**Meeting Location**	**Discussion Topic(s)**
3-2-22	Virtual “Zoom"	Kick-off meeting #1 to inform County officials/ residents of the Plan update

4-6-22	Isabella County Public Safety Building and Virtual "Zoom"	Planning Committee Meeting #2 -Review of community survey results. -Review of previous hazards and determination of hazards in the 2022 HMP update. -Introduction to hazard ranking survey for planning team members.
7-27-22	Isabella County Public Safety Building and Virtual "Zoom"	Planning Committee Meeting #3 (Mitigation Strategy Workshop) -Final review of hazards -Completed Hazard ranking worksheets/surveys for planning team members and participating jurisdiction. -Finalized updated Mitigation Goals -Review Mitigation Strategies -Reviewed existing mitigation actions updated status' -Identified new mitigation action items/projects. -

Through the meetings above, the chapters of the Plan were evaluated and modified accordingly. Below are the results of the chapter reviews for each chapter in the Plan.

Reviewed and update preface and executive summary. Reviewed and updated information on Isabella County, as well as on the process. Information is included in Chapters 1: Introduction and Chapter 2: Planning Process of the update.

Reviewed and updated Chapter 1: Community Profile. Reviewed and updated information on Isabella County. Information is included in Chapter 3: Community Profile of the update.

Reviewed and updated Chapter 2: Hazard Analysis. Reviewed and updated the analyses for the hazards identified in Isabella County. Information is included in Chapter 4: Hazard Identification and Risk Assessment of the update.

Reviewed and updated Chapter 3: Goals and Objectives. Reviewed and updated the goals and objectives for Isabella County. Updated goals and objectives are found in Chapter 6: Action Items.

Reviewed and updated Chapter 4: Mitigation Strategies and Priorities. Reviewed the mitigation strategies and priorities for Isabella County. Status of the mitigation strategies is found in Chapter 5: Evaluation of Alternatives. New actions are found in Chapter 6: Action List Items. Final mitigation strategies are found in Appendix C, preliminary mitigation strategies are found in Appendix D, and all activities are found in Appendix E.

Reviewed and updated Chapter 5: Plan Closure. Reviewed and updated the approval and implementation schedule for Isabella County. The revised implementation process is included in Chapter 7: Plan Maintenance.

This update process included the review of the Isabella County Master Plan, the 2019 Michigan Hazard Mitigation Plan, county maps and studies, municipal master plans, as well as ongoing planning activities. This included the review of informational sources such as: U.S. Census, National Weather Services, master plans, emergency management plans, Michigan Department of Transportation, Michigan Department of Natural Resources, and local health departments. Census data was updated to reflect the latest changes provided via the 2020 Census. Hazard data provided in the Michigan Hazard Analysis from the 2019 state HMP were utilized in updated hazard histories throughout the Hazard Identification and Risk Analysis of this plan update. The other plans and studies noted, were cross referenced to ensure all applicable hazards were reviewed and accounted for during the update process.

CHAPTER 3: COMMUNITY PROFILE

NATURAL FEATURES OF ISABELLA COUNTY

Isabella County is located near the geographic center of the Lower Peninsula of the State of Michigan. The counties surrounding Isabella County are: Clare to the north, Midland to the east, Gratiot to the South, Mecosta and Montcalm to the west,

Isabella County is a generally rural county located in the geographic center of Michigan's Lower Peninsula. The county seat of Mt. Pleasant is situated less than fifty miles to the west and north of the cities of Bay City, Saginaw and less than thirty miles west from Midland. Mt. Pleasant is approximately sixty-five miles north of the State Capitol, Lansing. The City of Grand Rapids lies less than 100 miles from the county seat and the cities of Cadillac and Traverse City are less than 100 miles to the northwest. The County is located approximately 85 miles from Lake Michigan and 45 miles from the southern end of Saginaw Bay.

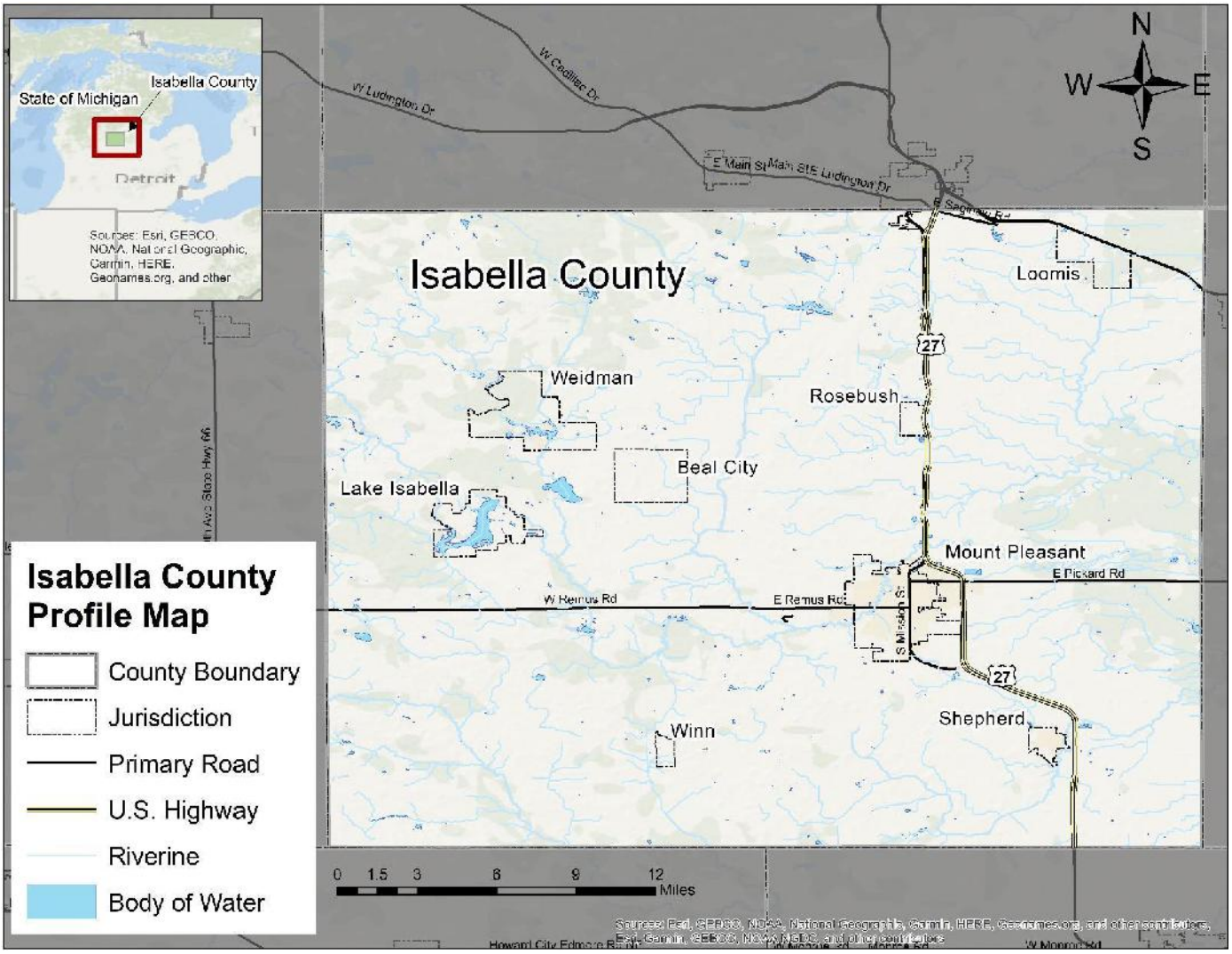
Isabella County is composed of 572.7 square miles of land. The primary land use in Isabella County is agriculture. Over half of the County's total land area is in agriculture with eleven of the 16 townships containing more than 10,000 acres of agricultural land each. Approximately 3% of the county's land is urban.

Isabella County contains twenty one (21) local units of government, including 16 townships, two (2) cities and three (3) villages. The City of Mt. Pleasant is the County seat. Approximately 37% of the entire County's population resides in the City of Mt. Pleasant. These communities are represented by a seven (7)-member Isabella County Board of Commissioners which cover as many districts. The following table lists all 21 of the local units of government with their population data and trends from the United States decennial census. The 2020 census of the County was 64, 394.

Isabella County is covered by District 6 of the Emergency Management & Homeland Security Division of the Michigan State Police.

Isabella County Municipal Map

MAP 3.1



Isabella County Population

TABLE 3.1

P – Participating
NP – Non-Participating

Minor Civil Division	2020 population	2010 population	2000 population	Change in population 2010-2020	Change in population 2000-2010	Participating in the Plan Update	NFIP Status
Broomfield Township	1,857	1,340	1,293	38.6%	4%	P	P
Chippewa Township	4,446	4,654	4,623	-4.5%	1%	P	P
Coe Township	3,032	1,564	1,484	93.9%	5%	P	P
Coldwater Township	801	777	739	3.1%	5%	P	P
Deerfield	3,257	3,188	3,081	2.2%	3%	P	
Denver	1,199	1,148	1,144	4.4%	0%	P	P
Fremont	1,445	1,455	1,358	-0.7%	7%	P	
Gilmore	1,314	1,459	1,374	-9.9%	6%	P	P
Isabella	2,096	1,885	1,766	11.2%	7%	P	P
Lincoln	2,069	2,115	1,936	-2.2%	9%	P	P
Nottawa	2,225	2,282	2,278	-2.5%	0%	P	P
Rolland	1,406	1,305	1,210	7.7%	8%	P	
Sherman	3,127	1,819	1,700	71.9%	7%	P	P
Union Township	11,699	12,927	7,611	-9.5%	70%	P	
Vernon	1,300	1,369	1,328	-5.0%	3%	P	P
Wise Township	1,355	1,397	1,301	-3.0%	7%	P	P
City of Clare	78	47	47	66.0%	0%	P	P
City of Mount Pleasant	21,688	26,016	25,947	-16.6%	0%	P	
Village of Lake Isabella	1,829	1,681	1,243	8.8%	35%	P	
Village of	353	368	379	-4.1%	-3%	P	P
Village of	1,469	1,515	1,509	-3.0%	0%	P	P
Total	68,045	70,311	63,351	-3%	11%		

Isabella County Top Employers

TABLE 3.2

PRINCIPAL EMPLOYERS IN ISABELLA COUNTY			
COMPANY NAME	**LOCATION**	**EMPLOYEES**	**PRODUCT DESCRIPTION**
Saginaw Chippewa Indian Tribe	Chippewa Township	4,000	Resort and Services
Central Michigan University	Mount Pleasant	2,388	Education
McLaren Central Michigan	Mount Pleasant	512	Health Care and General Medical & Surgical Hospital
Delfield Co.	Union Township	650	Manufactures Restaurant Equipment
McBride Quality Care Services	Mount Pleasant	500	Health Care
Meijer Inc.	Mount Pleasant	-	Department store
Morbark Inc.	Fremont Township	413	Manufactures Forestry and Wood Harvesting Equipment, Brush & Whole Tree Chippers
Bandit Industries, Inc.	Broomfield Town-ship	400	Manufactures Forestry and Wood Harvesting Equipment, Brush & Whole Tree Chippers
Wal-Mart Stores, Inc.	Union Township	-	Department Store
Unified Brands	Broomfield Town-ship	174	Manufactures Restaurant Equipment
American Mitsuba	Mount Pleasant	365	Auto Supplier
Isabella Bank	Mount Pleasant	340	Bank
Mt. Pleasant Public Schools	Mount Pleasant	-	Education
J. Rank Electric	Mount Pleasant	100	Construction

Source: Middle Michigan Development Corporation - January 2022 Dun & Bradstreet

– January 2022

LAND USE

Unique Residential Conditions & Considerations

Special considerations for Isabella County include two primary examples, which are the campus of Central Michigan University and the Saginaw Chippewa Resort and Casino. The county also maintains parks, campgrounds, retirement communities and other more traditional features characterized as special residential conditions or considerations.

Central Michigan University has many large occupied buildings, including dormitories, on its campus. The seasonal fluctuation of students is highest during the fall and spring semesters, substantially lower during summer one and two sessions, and nearly nonexistent during August, Christmas Holiday and for one week during early spring. A majority of the faculty presence is similar to that of student fluctuations experienced throughout the year. Most administrators and other staff remain on campus throughout the year except for a one to two week shutdown during the Christmas – New Year Holiday.

Daily fluctuations during the school year are also common on the campus of CMU. Most of the course instruction on campus is conducted between eight and five in one of the many academic buildings, which means that fewer students, will be inside dormitories as compared to the evening hours. Daily fluctuations from living quarters often include sporting events, lectures, performances and other university sponsored events. The university also hosts a variety of camps that draw students from high schools across the state during the months of June and July. These students are housed in dormitories throughout campus for the duration of their stay and create an influx of temporary residents.

The Saginaw Chippewa's Soaring Eagle Resort and Casino (SERC) is the second primary example of a special population consideration for Isabella County. SERC is a destination that provides a variety of entertainment options, including hotel, casino, cultural center and various forms of entertainers (boxing, comedy, concerts etc.). The hotel has 512 rooms and the casino experiences an average of 12,000 visitors per day

Consideration should be noted regarding entertainment functions and routine traffic through the casino. Many resort visitors travel back to their home, however, on any given night a substantial number of temporary visitors reside in motels/hotels in the Mt. Pleasant community.

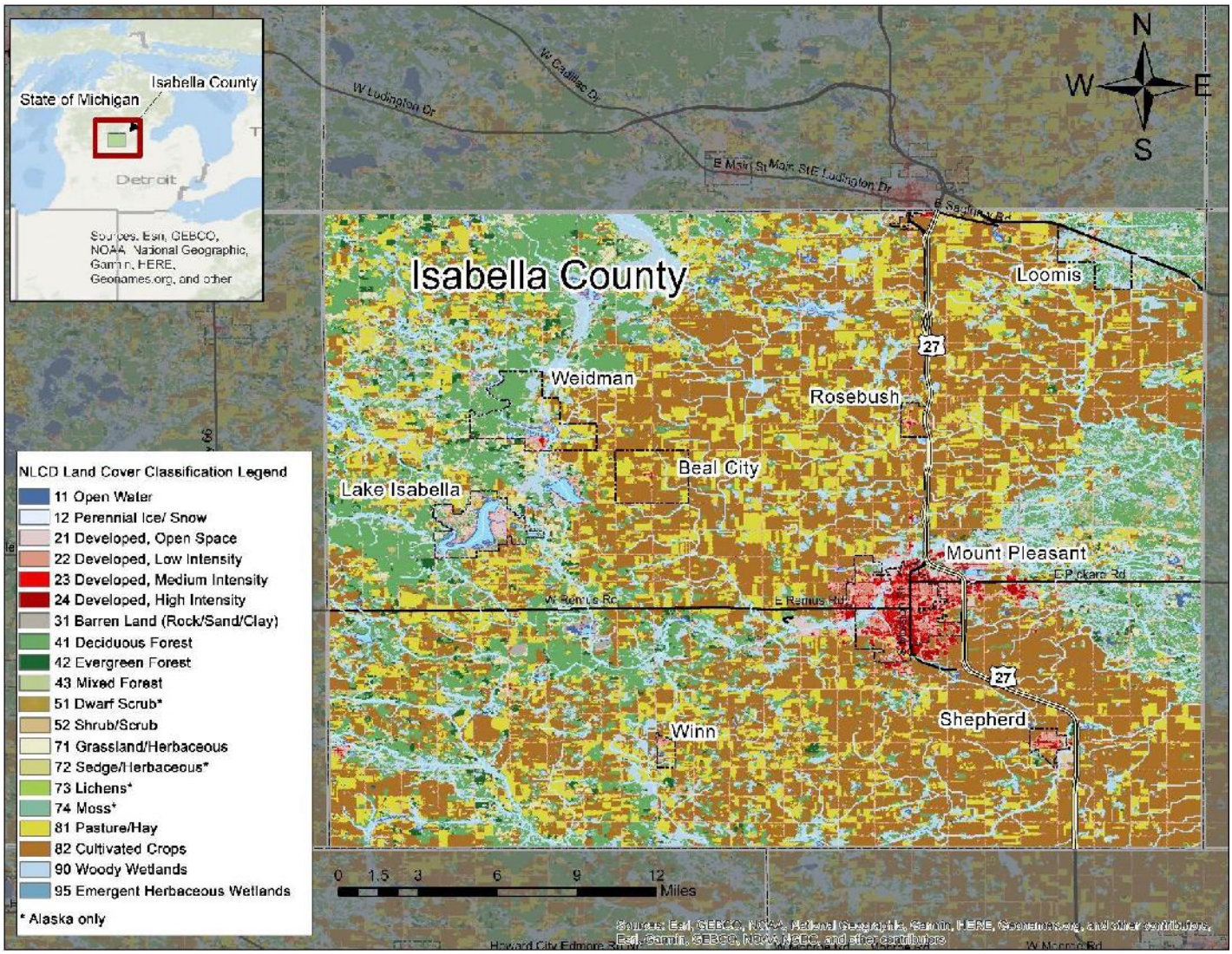
Senior living environments exist in many forms and locations in the county; however, population density is greatest in three high-rise structures located in the City of Mt. Pleasant. The high-rises are designed for independent living and not registered nursing homes. The newest of these high-rise units is Dover Court. The state has forty licensed adult care facilities registered in Isabella County. These facilities range from small group to large group accommodations. Although the majority of these facilities are located in Mt. Pleasant, there are locations in Shepherd and outlying rural areas.

Isabella County Parks and Recreation maintain camping facilities at Deerfield Nature Park, Coldwater Lake Family Park and Herrick Recreation Area. There are ten rustic campsites available at Deerfield Park, which is located approximately eight miles west of Mt. Pleasant on M-20 (Remus Rd.). Coldwater Park is located on the eastern shore of Coldwater Lake and approximately five miles north of M-20 on Littlefield Road. Coldwater Park offers 95 campsites and five cabins. Herrick Park offers 73 campsites and five rustic cabins

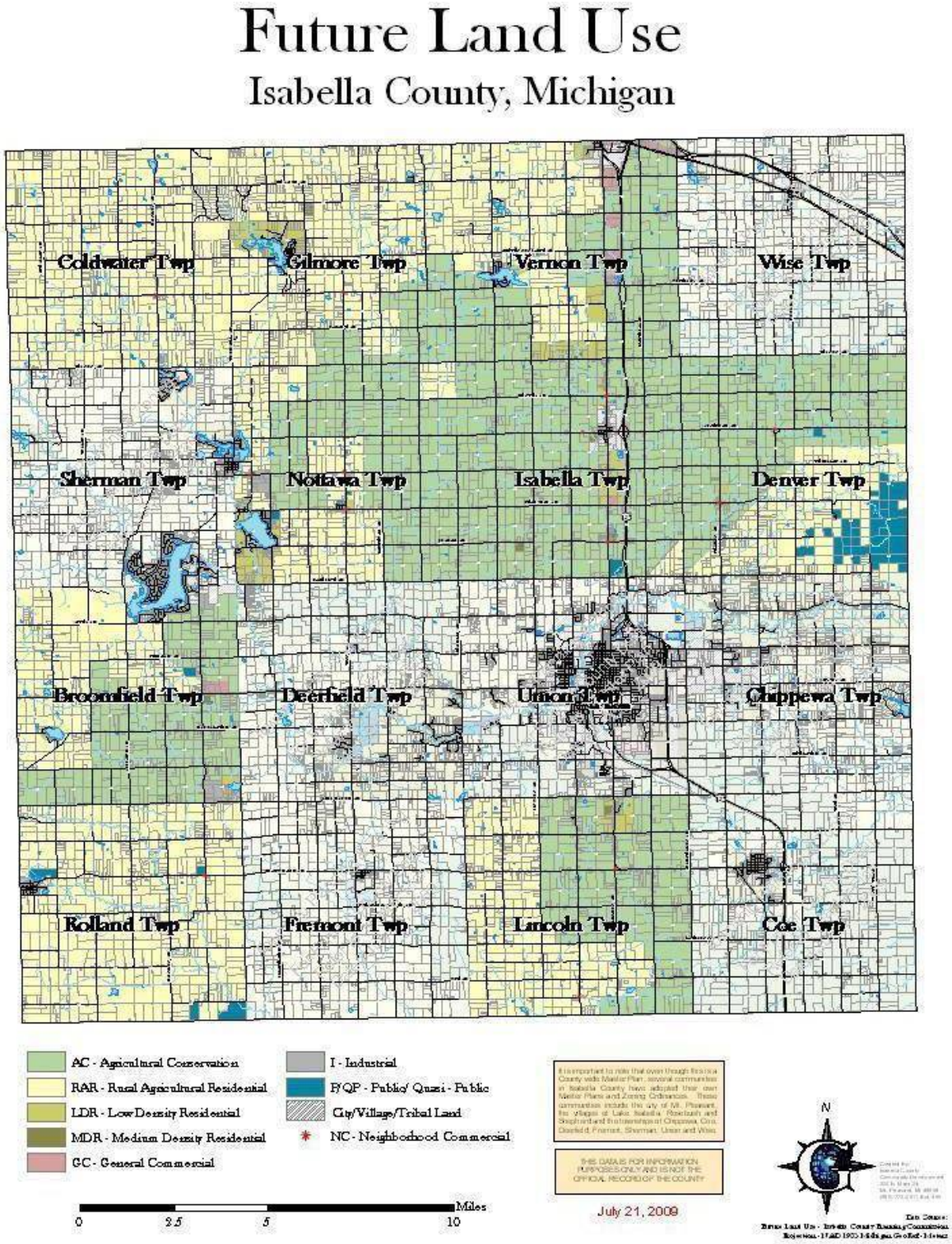
and is located approximately two miles southeast of the City of Clare on Herrick Road. Maps for each park are located on the Isabella County Parks and Recreation website (http://isabellacounty.org/Dept/Parks/index.htm).

Isabella County Land Cover Map

MAP 3.2



Isabella County Future Land Use Map
MAP 3.3



NATURAL FEATURES - TOPOGRAPHY

Topographically, the eastern and southern sectors of the County are generally flat to gently rolling, while the northern and western areas are moderately rolling to hilly. There is considerable variation in relief with elevations ranging from 700 feet above sea level in the County's southeast corner to over 1,200 feet in the northwest corner.

Three distinctive topographic divisions occur in a general north/south direction. The eastern part of the County is in the wide Lake Plain which joins Saginaw Bay to the east. The southeastern corner, including much of Coe Township, is part of the old Saginaw Lake bed, where the land is nearly level with increases in elevation occurring in steps rather than slopes. The numerous depressions in this general land formation have become intermittent ponds, receiving and holding water during periods of heavy rainfall and runoff. Most of the Lake Plain area is broadly undulating and, at its western edge, it rises very gently toward the uplands with no definitive transition from one area to another. Elevations throughout this area vary only modestly.

Within the County's mid-area uplands, the terrain is gently rolling with elevations gradually rising to the west. Drainage is generally very good with most land draining to the streams.

Along the western belt, topography varies greatly. Much of the land is fairly level but is punctuated by several high, isolated hills. The highest of these, Bundy Hill in the west central part of the County, is 1,270 feet high. In some parts of the area slopes vary from gentle to rugged. Most of the area is well drained, but frequent depressions in the northwest also collect and store excesswaters.

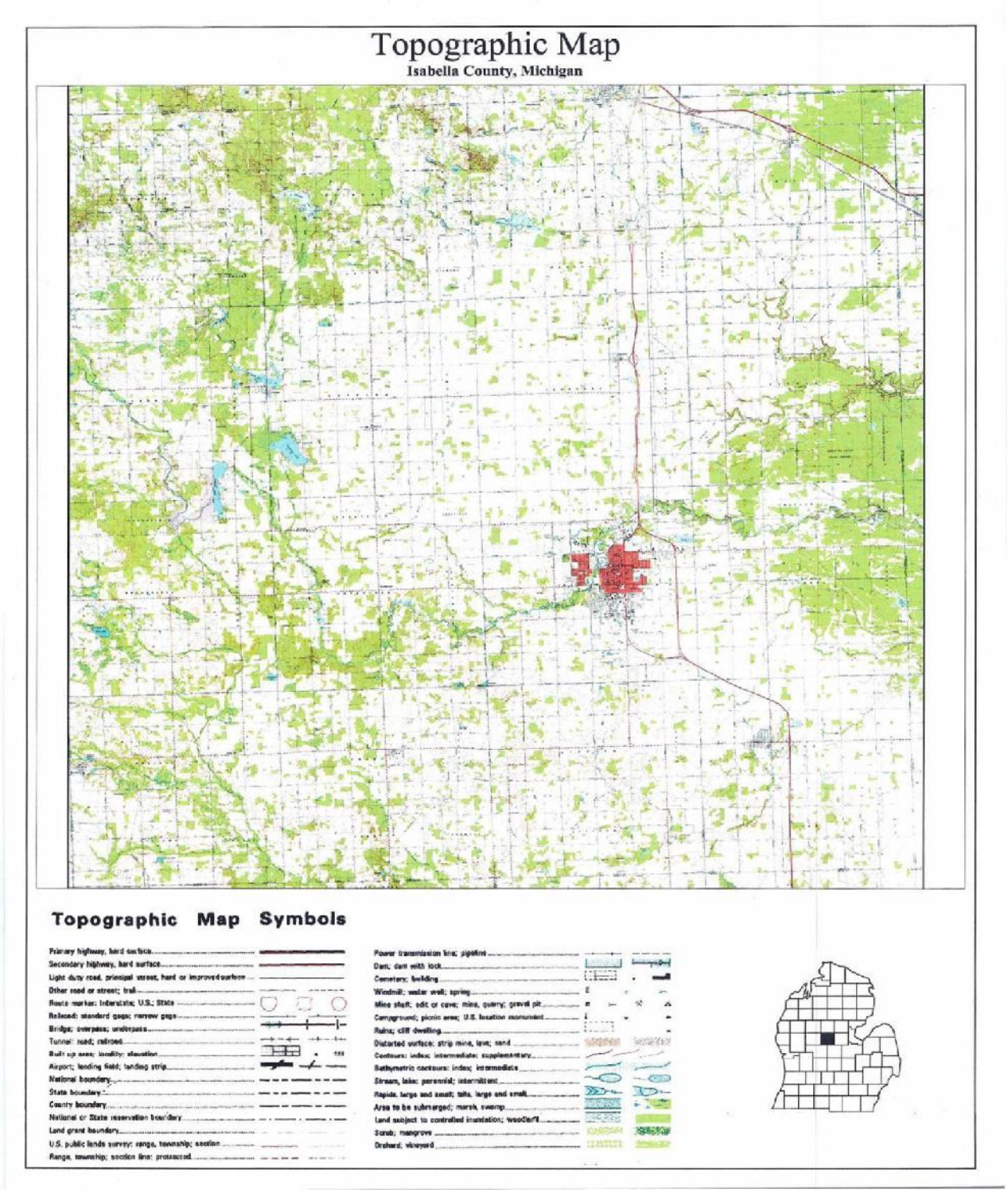
Two significant valley features are also found in the County. These include the valley of the Chippewa River, flowing eastward from the County line to Mt. Pleasant and two separate valleys running north/south which converge south of Weidman to form a broad plain.

The Pine River drains the southwestern areas of Isabella County. The Pine enters the county in Blanchard and flows southeast until it enters Gratiot County from Fremont Township. Primary tributaries include Skunk and Pony Creek.

The North and South Branches of the Salt River dissect the northeastern part of Isabella County. The North Branch begins in Wise Township and flows east into Midland County from Denver Township. Denver Township is also where the South Branch and the North Branch converge. The southeastern areas of the county are drained by the Little Salt River, which originates in Lincoln Township and flows east until leaving the county from Coe Township.

Isabella County Topographic Map

MAP 3.4



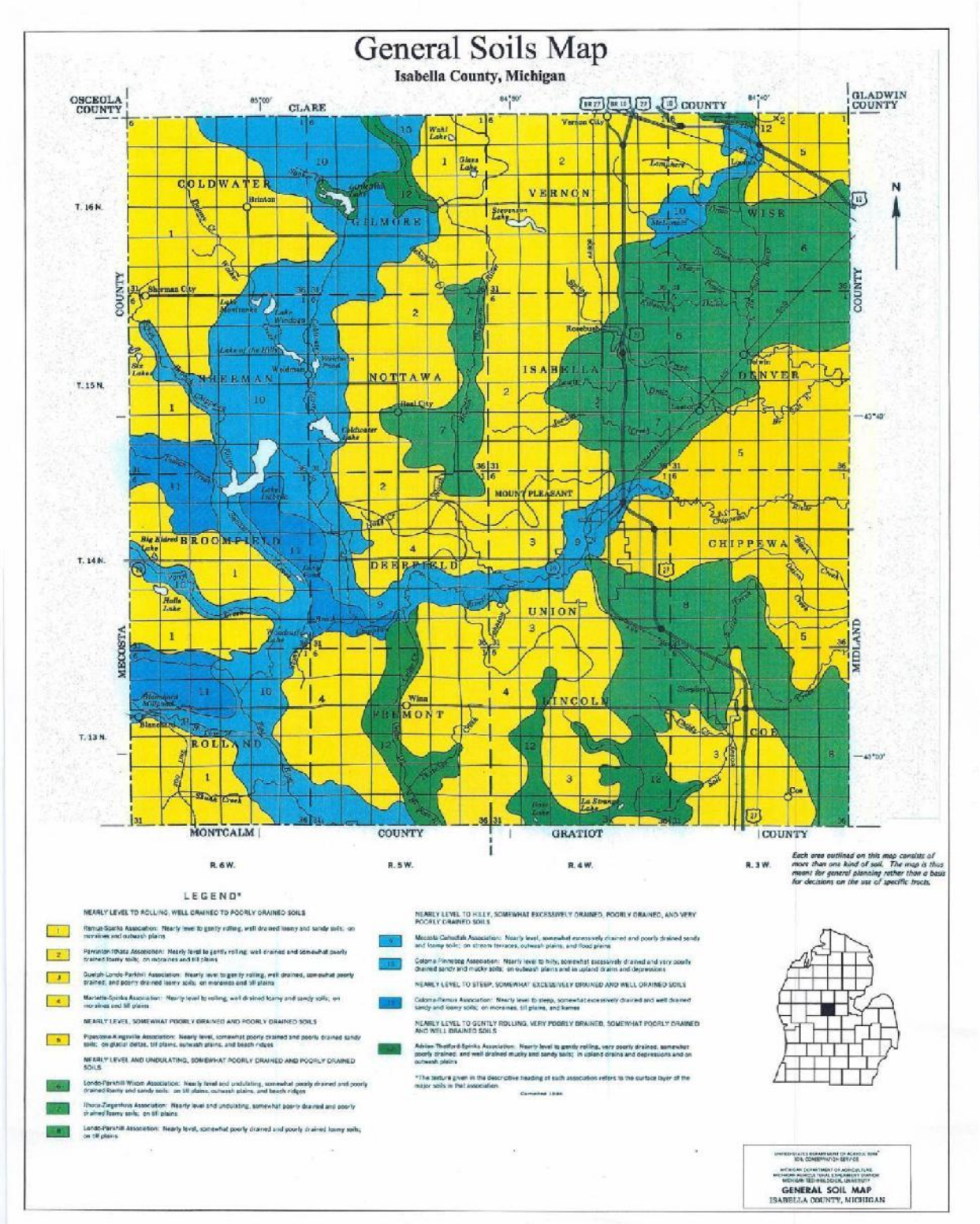
SOILS

Soils throughout the County vary from rich, well drained loams to poorly drained muck. These soil characteristics greatly influence, if not determine, the suitability of land for agricultural purposes, development, and the use of on-site septic systems. The major determinants of soil suitability for land use include the composition of the soil, permeability, steepness of slope, drainage characteristics, susceptibility to erosion, and depth to bedrock.

A critical factor to Isabella County's economy is the presence of "prime" agricultural soils. These are the soils determined by the U.S. Department of Agriculture to be the most productive, richest farming soils. While several townships throughout the County contain scattered patches of "prime" soils, the greatest concentrations of such soils are found in Coe, Denver, Deerfield, Isabella, Lincoln, Nottawa, Union, Vernon and Wise Townships. It is important to note, however, that while not considered "prime" many areas of sandy soil have proven extremely valuable in the production of specialty crops such as potatoes.

Isabella County Soils Map

MAP 3.5



CLIMATE

The continental type climate of Isabella County means that the area typically experiences larger temperature ranges than in locations of similar latitude near the Great Lakes, which moderates temperatures locally. The area seldom experiences prolonged periods of either extreme cold in the winter or extreme heat and humidity during the summer. Isabella County has moderately warm summers with an average of eleven days annually reaching or exceeding 90°F. There have been occasions with temperatures exceeding 100°F, but this is a rare event in mid-Michigan. The record for temperature maximum occurred in 1936 with a temperature of 106°F. Winter weather in the county can bring extreme cold, but the Great Lakes typically modify the coldest arctic air masses. The area averages eleven days annually when the minimum temperature reaches zero or below. There is an average of fifty-seven days where the temperature does not rise above the freezing mark (32°F).

In table below is a breakdown of the average mean temperatures for each month (daily average), along with the monthly average precipitation. The first column in each category is from 1917-2000 and the second column is for the period from 2001-2022. Even though the average temperatures show a moderate increase in the past 21 years, according to National Weather Service staff, the increase is too small, and over too short of a period of time, to project any temperature pattern changes. (The National Weather Service uses 30 year periods for their sample sizes to determine weather pattern changes. This helps eliminate skewed data with one abnormal year.) However, the average precipitation has nearly a 20 percent increase during this time period, which is a much greater change from the previous 80+ years. This could reflect a change in the precipitation pattern, however, a longer test sample would be required to determine if the precipitation is indeed increasing. (It should be noted that the precipitation increase for several of the surrounding counties, while increasing moderately, did not have nearly the change that was experienced by Isabella County.)

Climate in Isabella County

TABLE: 3.3

MONTH	AVERAGE TEMPERATURES	
	1917 to 2000	2001 to 2022
January	21.4	22.35
February	22.7	23.01
March	30.8	33.2
April	44.8	45.04
May	56.8	56.57
June	66.5	66.43
July	71.0	70.73
August	68.9	69.14
September	61.3	61.70
October	50.2	49.48

November	37.5	38.19
December	26.6	28.07
Year	46.5	47.0

Source: National Weather Service
It should be noted that average snowfall for this period was not available due to faulty locations.

In the table below is a breakdown of the average mean temperatures for each month (daily average) along with the monthly average precipitation based on data between 1950 - 2013.

TABLE: 3.4

	Average Daily Maximum	Average Daily Minimum	Total Precipitation (in.)
January	28.9	13.3	1.77
February	31.8	14.2	1.35
March	41.8	22.4	2.01
April	56.4	33.7	3.1
May	69	44.2	3.1
June	78.4	54	3.35
July	82.7	58.2	3.01
August	80.4	56.4	3.57
September	72.3	48.6	3.23
October	60.1	38.7	2.83
November	45.5	29.4	2.64
December	33.3	19.4	1.98
The averages are base on monthly data for years 1950 - 2013 https://crt-climate-explorer.nemac.org/climate_graphs/?city=Isabella+County%2C+MI&county=Isabella+County&area-id=26073&fips=26073&zoom=7&lat=43.6&lon=-84.86&id=pcpn&mode=daily_vs_climate			

Water

Isabella County contains four minor drainage basins which contribute to the Tittabawassee River Basin. Isabella County is part of the Saginaw Bay Watershed. The County contains over 2,700 acres of water bodies including lakes, streams, and reservoirs. Most prominent of these are the Chippewa River, Lake Isabella, Coldwater Lake, and Littlefield Lake. All of the prominent lakes are located in the western half of the County, while streams meander throughout the entire County.

Seven of the 16 townships contain over 200 acres of water, accounting for a total of approximately 2,300 acres (85 % of the County's water resources). Sherman Township has the largest area devoted to water (515 acres) and Broomfield Township closely follows (507 acres). Both of these townships are situated along the west border of the County.

Wetlands

Isabella County contains approximately 13,000 acres of wetlands (± 3.5% of the County's land area). Most of these are of the forested or shrub/scrub types and are generally found along the west edge of the County.

Coldwater Township contains over 3,000 acres of wetlands, the most of any community in the County.

Five other townships (Broomfield, Fremont, Sherman, Wise, and Rolland) have 1,000 or more acres of wetlands within their boundaries. Collectively, these townships, along with Coldwater, account for nearly 10,000 acres of wetlands (± 76 % of the County total).

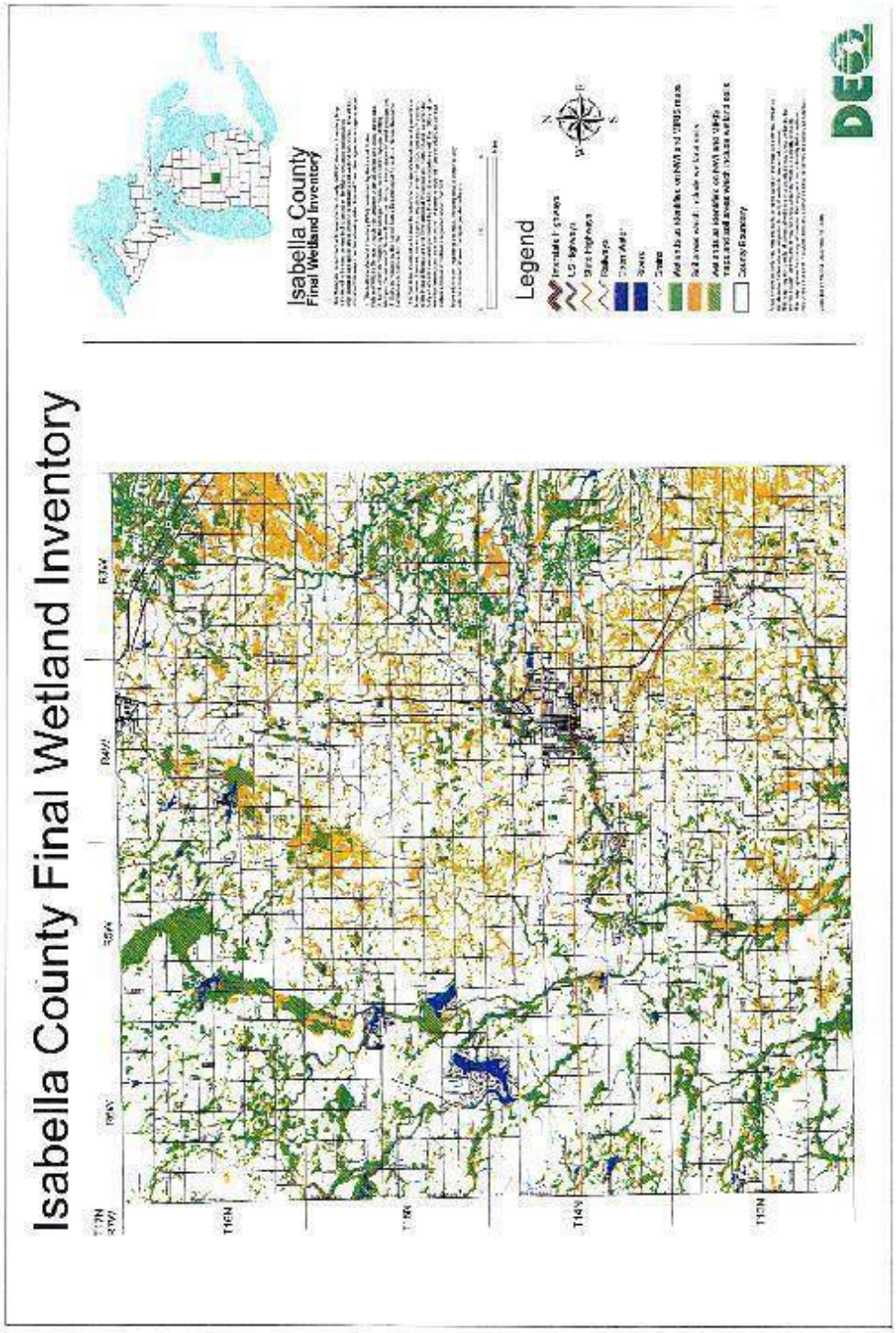
Forests

The County contains substantial forest resources comprised of upland hardwoods, lowland hardwoods, upland and lowland conifers, and Christmas tree plantations. Over 86,000 acres of forest lands (23% of the County's land) are found throughout the County. Nine townships contain 5,000 or more acres of forest, with the largest amount found in Gilmore Township (10,065 acres). Other townships with significant forests are: Denver (9,915 acres.), Sherman (8, 371 acres), and Chippewa (8, 268 acres).

Most of the forests in Isabella County are composed of transitional forest varieties, such as aspen and birch. Red pine, cedar, oak and maple stands grow in the county as well.

Isabella County Final Wetland Inventory

MAP 3.6



COMMUNITY ORGANIZATION AND RESOURCES FOR HAZARD MITIGATION including County and Local Community Agencies, Departments and organizations potentially relevant for Hazard Mitigation.

Emergency Services

Emergency services are very important for the Hazard Mitigation Process. These services help serve the public in times of natural disasters and other emergency situations. It is crucial for the public to know a) that these services exist b) where they are located and c) how to reach them in times of need.

Isabella County Emergency Management

2008 E. Preston St
Mt. Pleasant, MI 48858
989-779-8720 (fax) 989-773-6116
mgriffis@isabellacounty.org

Isabella County provides emergency operations services on a countywide basis through the Emergency Operations Center (EOC). The EOC office is co-located with the Isabella County E 911 Central Dispatch, which also provides countywide 911 dispatch services. Other county based services include planning and zoning for nine townships that do not provide these services on their own, and health services through the Central Michigan District Health Department.

Public Works exist at the municipal level in the City of Mt. Pleasant, Village of Shepherd, Village of Rosebush, Union Township and the Saginaw Chippewa Tribe. There is also an Isabella County Public Works Commission that oversees public works projects in the Village of Lake Isabella and in areas of the county that are not included in municipal public works service areas.

This office was established under the provisions of the Michigan Emergency Management Act, PA 390 of 1976, as amended, to ensure a coordinated public response in the event of a natural or man-made disaster. The purpose of Emergency Management is to plan and prepare for high impact, low probability events. The Isabella County Emergency management office assesses local capabilities to respond to emergency and disaster situations, and advocates emergency preparedness in both the public and private sectors and works to assure a comprehensive approach is used involving a range of public and private agencies including local police, fire and EMS agencies, the Michigan State Police Emergency Management and Homeland Security Division, the Michigan Department of Environmental Quality, the Homeland Security Board and the National Weather Service. Other agencies coordinating with emergency management include the American Red Cross, local and state health departments, educators and amateur radio operators. This office tends to be central for all major threats and incidents within the county. This office also handles all NOAA Weather alerts, Broadband, and Homeland Security matters. All 211 is handled by Listening Ear through the 211 NE Michigan Call Center.

Warning Sirens or System

The warning systems include seventeen (17) sirens that are located throughout the county. Many locations, however, that have been developed recently are not covered by warning sirens. Key locations not covered by warning sirens include the new development in western Union and Deerfield Townships.

CodeRED

Isabella County is covered by CodeRED mass notification system and is administered by Isabella County Central Dispatch.

Police

Isabella County has five (5) County-specific police departments within the County. In addition, there is also police presence provided by the Michigan State Police Post from Mt. Pleasant, the Central Michigan University Police, the Saginaw Chippewa Tribal Police, the Shepherd Police Department and the City of Clare. There is also a Central Dispatch.

Isabella County Sheriff's Department
207 North Court Street
Mt. Pleasant, MI 48858
989-772-5911
mgriffis@isabellacounty.org 989-774-3081

Isabella County Central Dispatch
2010 E. Preston Street
Mt. Pleasant, MI 48858
989-773-1000

City of Clare Police Department
206 W Fifth St
Clare, MI 48617
989-386-2121

Mt. Pleasant Police
804 E. High Street
Mt. Pleasant, MI 48858
989-779-5100

Central Michigan University Police
Combined Services Building
Mt. Pleasant, MI 48858
989-774-3081
989-828-5045

Shepherd Police
251 Wright Avenue

Shepherd, MI 48883

Saginaw Chippewa Tribal Police
6954 E. Broadway Road
Mt. Pleasant, MI 48858
989-775-4701

Michigan State Police-Mt. Pleasant Post 63
3580 S Isabella Rd
Mt. Pleasant, MI 48858
989-773-5951

Fire

There are eight (8) fire departments located in Isabella County. They are:

Mt. Pleasant Fire Department
804 E. High Street
Mt. Pleasant, MI 48858
989-779-5100
989-773-4020-FAX

Isabella Northeast Fire Department
4215 N. Mission Road
Rosebush, MI 48878
989-433-2152

Saginaw Chippewa Tribal Fire Department
6954 E. Broadway Road
Mt. Pleasant, MI. 48858
989-775-4842 – FAX
millrollfd@power-net.net

Millbrook Rolland Fire Department
8323 W. County Line Rd
Blanchard, MI 49310
989-775-4701

Shepherd Tri-Township Fire Department
410 N. Chippewa Street
Shepherd, MI 48883
989-828-5272
Sttfd48883@yahoo.com

Fremont Township Fire Department
P. O. Box 336
Winn, MI 48896
989-866-2396 – FAX
ftfd@power-net.net

Deerfield Township Fire Department
3032 S. Winn Road
Mt. Pleasant, MI 48858
989-773-0327

Nottawa Sherman Fire Department
6263 W. Weidman
Weidman, MI 48893
989-644-3221

In addition, the following departments are located outside of Isabella County, but do provide contractual service to townships within Isabella County.

Clare Fire Department (Clare County)
202 East 5th Street
Clare, MI 48617
989-386-2151

Wheatland Township Fire Department
201 S. Sheridan
Remus, MI 49340
989-967-8282

Coleman Community Fire Department
(Midland County)
413 E. Railway Street
Coleman, MI 48618
989-465-9351
989-588-6364 FAX

Surrey Township (Clare County)
P. O. Box 306
185 N. Superior St
Farwell, MI 48622
989-588-6914

Ambulance

There is one ambulance service covering Isabella County. Mobile Medical Response – based in Saginaw.
MMR/Mobile Medical Response 8746 S. Clare Ave.
Clare, MI 48617
989-386-0911

Health Care

There are several clinics located throughout the county, but only one hospital that serves county residents. McClaren Central Michigan Hospital (MCM) is a 118-bed acute care hospital located in the City of Mt. Pleasant. MCM is a not-for-profit, locally governed, community-based hospital, offering a full range of health and wellness services from the Hospital campus and off-site locations. With its wide array of services and programs, MCM is recognized as an accessible and dependable source for quality medical care for the residents of Isabella County and central Michigan.

Mid-Michigan Medical Center, located in the City of Clare, provides a range of services that include hospital care, outpatient care, urgent care, home care, nursing home care, and wellness. There are also three urgent care centers, a county health department, and a community mental health department.

Mid-Michigan Medical Center-Clare
104 W Sixth St
Clare, MI 48617
989-802-5000
www.midmichigan.org.

Isabella Health Care Center
4950 East Blue Grass Road
Mt. Pleasant, MI 48858
989-317-0565

McClaren Ready Care
1523 S. Mission
Mt. Pleasant, MI 48858
989-773-1166

Urgent Care Express
1750 E. Bellows
Mt. Pleasant, MI 48858
989-773-9669

There are a number of organizations that operate in Isabella County that provide emergency and/or crisis services. Among these organizations is the Central Michigan Chapter of the American Red Cross, which serves Isabella, Osceola, Mecosta, and Clare Counties. The Red Cross has developed a "Disaster Plan" that provides information relating to the community. The plan can be viewed by contacting the Red Cross in Mt. Pleasant at 989.773.3615. The following is a listing of primary organizations operating in the community that provide emergency and/or crisis services. For a comprehensive listing visit Listening Ear at http://www.listeningear.com/resource.html.

Crisis Service Agencies

TABLE 3.5

Key Organizations Providing Emergency/Crisis Services		
United Way of Isabella County 402 S. University Mt. Pleasant, MI 48858 989.773.9863	Salvation Army Isabella County 1308 Burch Street Mt. Pleasant, MI 48858 989-773-4663	Goodrow Fund St. John's Episcopal Church Mt. Pleasant, MI 48858 989-772-2918
Eight-Cap Community Services Inc. 300 W. Michigan Mt. Pleasant, MI 48858 989-772-0110 800-649-3777 TDD Relay Service	Department of Human Services 1475 S. Bamber Rd. Mt. Pleasant, MI 48858 989-772-8400	Red-Cross/Isabella County 1800 E Grand River Ave Lansing, MI 48912 989-773-3615
Mental Health Services of Isabella County 301 S. Crapo Mt. Pleasant, MI 48858 989-772-5938 989-772-2918 After Hours 989-773-2890 (TDD & Deaf #)	Soup Kitchen Trinity United Methodist 621 South Adams Mt. Pleasant, MI 48858 989-772-7392	Catholic Family Services 118 S. Washington Mt. Pleasant, MI 48858 989-773-9328

Listening Ear P.O. Box 800 Mt. Pleasant, Michigan 48804-0800 Isabella County 989-772-2918	Isabella County Commission on Aging 3480 S. Isabella Mt. Pleasant, MI 48858 989-772-0748	Central Michigan District Health Department 2612 E. Preston Mt. Pleasant, MI 48858 989- 773-5921

Government Facilities

Government facilities may have a large impact on how emergencies are handled. They provide services to the public such as shelter in times of natural disasters. They also serve as a way to distribute information on how to handle emergency circumstances.

Isabella County Municipal Offices and Facilities (Main Locations)

TABLE 3.6

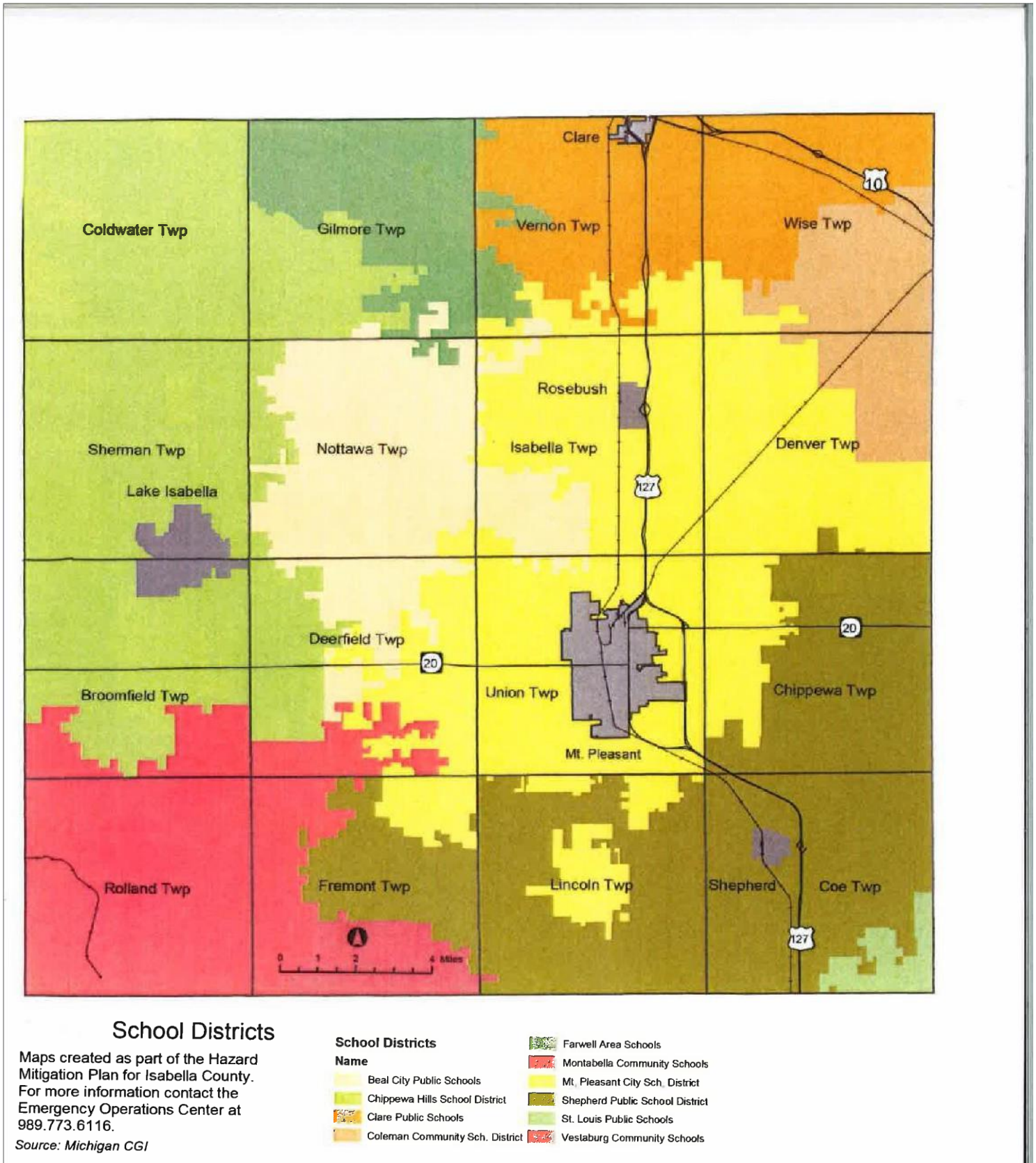
Township Contacts	
Broomfield Township Hall 2889 S. Rolland Road, Remus, MI. Christy Mathewson, Supervisor, 989-561-5391	Chippewa Township Hall 11084 E. Pickard Rd., Mt. Pleasant 48858 Robert Smith, Supervisor, 989-773-1975
Coe Township Hall 309 W. Wright Ave, Shepherd, MI 58883 Mary Kay Maas, Supervisor 989-828-5322	Coldwater Township Hall The corner of Brinton Road and Coleman Road James Dague, Supervisor 989- 289-4111
Deerfield Township Hall 3032 S. Winn Rd., Mt. Pleasant 48858 Tim Murphy, Supervisor, 989-772-2029	Denver Township Hall 8461 E. Rosebush Rd., Mt. Pleasant, MI 48858 John Pedjac, Supervisor, 989-442-5157
Fremont Township Hall Winn Community Bldg., 2583 W. Blanchard Road, Winn, MI 48896 Gerald Himebaugh, Supervisor, 989-513-8587	Gilmore Township Hall 1998 West Stevenson Lake Rd, Farwell, MI 48622 Steve Lasher, Supervisor, 989-588-4062
Isabella Township Hall 3929 E. Rosebush Rd., Rosebush, MI 48878 Rick Ervin, Supervisor, 989-621-9924	Lincoln Township Hall 8500 S. Crawford Rd., Mt. Pleasant, MI 48858 Thomas L. Ramon, Supervisor, 989-828-6519
Nottawa Township Hall 3024 W. Weidman Rd., Weidman, MI 48893 Kory Mindel, Supervisor, 989-644-8480	Rolland Township Hall 324 Main St., Blanchard, MI 49310 Daniel Shaw, Supervisor, 989-561-2224
Sherman Township Hall 3550 N. Rolland Rd, Weidman, MI 48893 Tom Johnson, Supervisor, 989-627-6258	Union Township Hall 2010 N. Lincoln Rd, Mt. Pleasant Bryan Mielke, Supervisor, 989-772-4600 – X226

Vernon Township Hall 4031 E. Stevenson Lake Rd., Clare, MI 48617 Jeffrey Bean, Supervisor, 989-433-2028	Wise Township Hall 10570 Loomis St., Clare, MI 48617 Robert Moore, Supervisor, 989-465-9116

City & Village Contacts	
Mt. Pleasant, City 320 West Broadway, Mt. Pleasant, MI 48858 Mt. Pleasant MI, 48858 Nancy Ridley, City Manager 989-779-5322	Village of Lake Isabella 1010 Clubhouse Drive, Lake Isabella, MI 48893 David Torgersen, President 989-644-8654
Village of Rosebush 4029 N. Mission Rd. Rosebush, MI 48878 Margaret Anderson, President 989-433-8059	Village of Shepherd (Coe Township Hall 309 West Wright Avenue, Shepherd, MI 48883 Lee Coughlin, President 989-828-6712
City of Clare 202 West Fifth Street, Clare, MI 48617 Ken Hibl, City Manager, 989-286-7541, ext. 102	
Isabella County Commissioners	
District 1 Terry Hutchinson 989-772-0911 ext 202	District 2 Frank Engler 989-772-0911 ext 202
District 3 Jerry Jaloszynski 989-772-0911 ext 202	District 4 Jim Horton 989-772-0911 ext 202
District 5 James Moreno 989-772-0911 ext 202	District 6 Steve Swaney 989-772-0911 ext 202
District 7 989-772-0911 ext 202	Mail to: Isabella Board of Commissioners Attn: (name of commissioner) 200 North Main St, Mt. Pleasant, MI 48858

Isabella County Schools District Map

Map 3.7



Schools

There are ten school districts in Isabella and 21 schools. Two private schools are located in the City of Mt. Pleasant and two charter schools operate in the county. The following table lists the name and location of each school along with the district that each school belongs too.

Isabella County Schools

TABLE 3.7

Name	Address	District
Mt. Pleasant Senior High School	1155 S. Elizabeth Mt. Pleasant	Mt. Pleasant Area Public Schools
West Intermediate School	440 S. Bradley Mt. Pleasant	Mt. Pleasant Area Public School
Beal City Public Schools	3117 Elias Rd Mt. Pleasant	Beal City Public Schools
Fancher Elementary School	810 S. Kinney Mt. Pleasant	Mt. Pleasant Area Public Schools
Ganiard Elementary School	101 S. Adams Mt. Pleasant	Mt. Pleasant Area Public Schools
Mary McGuire Elementary	4883 E. Crosslanes Mt. Pleasant	Mt. Pleasant Area Public Schools
Oasis Alternative Education	310 W. Michigan Mt. Pleasant	Mt. Pleasant Area Public Schools
Pullen Elementary School	251 S. Brown, Mt. Pleasant	Mt. Pleasant Area Public Schools
Rosebush Elementary School	3771 N. Mission Rd Mt. Pleasant	Mt. Pleasant Area Public Schools
Vowles Elementary School	1560 Watson St Mt. Pleasant	Mt. Pleasant Area Public School
Renaissance Public School Academy	2797 S. Isabella Mt. Pleasant	Charter Schools
Morey Charter School	418 W. Blanchard Rd Shepherd	Charter School
Weidman Building	3311 N. School Rd Weidman	Chippewa Hills School District
Kinney Elementary	720 N. Kinney Mt. Pleasant	Mt. Pleasant Area Public Schools
Shepherd Main Elementary School	168 E. Maple Shepherd	Shepherd Public Schools
Shepherd Middle and Senior High School	100 Hall Shepherd	Shepherd Public Schools
Beal City Alternative/Adult Education	3032 S. Winn Rd Mt. Pleasant	Beal City Public Schools
Winn Elementary	8190 Church St Winn	Shepherd Public Schools
Sacred Heart Academy	316 E. Michigan Mt. Pleasant	Private
Seventh Day Adventist	1730 E. Pickard Rd. Mt. Pleasant	Private

Higher Learning Institutions

Central Michigan University is the only four-year institution that is located in Isabella County. MidMichigan Community College, a two-year institution, has a branch campus in the City of Mt. Pleasant, but its central location is to the north in Harrison. The branch campus is located at the Doan Center Campus at the southwest corner of Broadway and Summerton Roads.

Central Michigan University (CMU) is located in the City of Mt. Pleasant and has an enrollment of more than 19,000 students on the local campus. Additionally, CMU employs approximately 2,500 faculty and staff. The addition of 19,000 students and 2,400 employees to a community the size of Mt. Pleasant has had a tremendous long-term economic, cultural and public safety/health impact. CMU's campus occupies a large portion of southern and central Mt. Pleasant. CMU will continue to provide benefits to the community in the future, but it also presents new challenges with respect to new potential threats to public safety and welfare.

Service Agencies

Utilities

Information on the utilities provided to communities within the County is essential to distribute information to the public in times of need. Also, certain locations that provide these services may be the source of emergency situations (transformer problems, gas leaks, etc.).

Consumers Energy Company and Tri-County Electric Cooperative provide electric utility service to Isabella County, while MichCon Consolidated Gas Company and Consumers Energy Company provide gas utility service to county residents.

Utility gas is the most common form of heating fuel type for households in the county. Bottled, tank or LP gas, however, also provides a large portion of the heat fuel to houses that are located primarily beyond traditional gas utility lines found in urbanized areas. The following table identifies the dependency of households on the combination of gas utility and/or the use of electric utilities to generate heat source.

Water

There are five Public Works agencies in Isabella County. They are located in the County, the City of Mt. Pleasant, the Village of Shepherd, The Charter Township of Union, and the Village of Rosebush. The Saginaw Chippewa Indian Tribe also maintains a Utility Authority. See list below.

Isabella County Public Works
Drain Commissioner
200 N. Main Street
Mt. Pleasant, MI 48858
989-772-0911 – X 247

City of Mt. Pleasant Public Works
1303 N. Franklin Street
Mt. Pleasant, MI 48858
989-779-5401

Village of Shepherd Public Works
8134 S. Federal Street
Shepherd, MI 48883
989-828-5062

Village of Rosebush Public Works
4029 N. Mission Road
Rosebush, MI 48878

Saginaw Chippewa Indian Tribe Utility Authority
7377 E. Tomah Road Mt. Pleasant,
MI 48858 989-772-8810

Telephone Service

The following Isabella County information was obtained by accessing the Michigan Public Services Commission at (http://www.michigan.gov/mpsc).

Incumbent Telephone Companies:

SBC, Blanchard, Verizon North, Winn

Competitive Telephone Companies:

Access One, Access Point, ACD Telecom, ACN Communications Services, Advanced Integrated Technologies, Airespring, American Broadband and Telecommunications, AT&T Corp., Bandwidth.com, Birch Telecom of the Great Lakes, Blanchard, Broadwing Communications, Budget Phone, Bullseye Telecom, Call Giant, Call One, Castle Wire, Cavalier Telephone, Cbeyond Communications, CenturyTel Acquisition, CenturyTel Solutions, Charter Fiberlink-Michigan, Cincinnati Bell Any Distance, Clear Rate Communications, Comcast Phone of MI dba CIMCO, Crexendo Business Solutions, CynergyComm.net, dPi Teleconnect, Entelegent Solutions, Global Connection Inc. of America, Global Crossing Local Services,, Globalcom dba First Communications of IL, Granite Telecommunications, Grid 4 Communications, IBC Telecom, ITELECOM, Level 3 Communications, Lightyear Network Solutions, Lucre, Lynx Network Group, Mass Communications, Matrix Telecom, McGraw Communications, MClmetro Access Transmissions Services, McLeodUSA, MetTel, Michigan Access, Navigator Telecommunications, Nexus Communications, Norlight, NOS Communications, Onvoy Voice Services, PNG Telecommunications, QuantumShift Communications, Quick Communications, Qwest Communications Company, RACC Enterprises, Sage Telecom, Superior Spectrum Telephone & Data, TC3 Telecom, TelCove Operations, Teleport Communications America, Telnet Worldwide, Three Rivers Telecom, TNCI, TouchTone Communications, tw telecom data services, US Xchange of Michigan dba Earthlink Business, Velocity the Greatest Telephone Company Ever, Westphalia Broadband, Wholesale Carrier Services, Winn Telecom, XO Communications
Services.

Transportation

Roads

Isabella County has three primary highway transportation routes, of which, two intersect in the City of Mt. Pleasant. Michigan State Highway 20 (M-20) runs east and west through the county connecting with Big Rapids to the west and Midland to the east. U.S. 127 runs north and south connecting with Lansing to the south and Clare to the north. U.S. 127 and M-20 intersect in Mt. Pleasant and are the two primary routes used by residents to access points beyond the county and by others to enter the Mt. Pleasant area. The third primary route, U.S. 10, passes through the northeastern corner of the county without any access points.

The highest traffic counts in the Mt. Pleasant area were observed on Business Route 127 (Mission Street) and the M-20 corridor (High Street to Pickard). One corridor in particular experienced traffic counts greater than 20,000 in twenty-four hours is the Mission to Pickard and east to U.S. 127 corridor. Locally, this is the only corridor that experiences light congestion during peak driving times.

Other key roads that enhance the transportation network around Mt. Pleasant are considered part of the “ring road”. These roads include Isabella, Broomfield, Lincoln and Pickard and serve as connectors to the state and federal highways. Future residential, commercial and industrial development will likely continue to envelope these transportation routes, thus increasing traffic volume. All of the roads in the

ring system have been at least partially widened to four lanes, with the exception of Lincoln, to accommodate the anticipated increase in future traffic. The "ring road" system also alleviates heavy truck traffic away from dense residential areas located adjacent to High Street (M-20) in Mt. Pleasant.

The Isabella County Road Commission, located in the Charter Township of Union maintains roads and bridges locally. Generally, roads and bridges in the county are maintained and in good condition. The local road network includes a mixture of paved and gravel surfaces. As is typical in most Midwestern counties with relatively flat terrain, the road network is laid out in a grid system that follows the Public Land Survey System divisions.

Handicap-accessible transportation is available in the county through the Isabella County Transportation Commission (ICTC). ICTC serves residents throughout the county through a dispatch notification system. It is the only community-based mode of transportation in the area.

Three airports, two of which serve only small private planes, exist in Isabella County. One of these is located near the Village of Lake Isabella, while the other is located near the Ojibwa Development Company. The Mt. Pleasant Municipal Airport is city operated and classified as a basic transport airport and featuring a 5,000 foot runway, self-serve 24 hour jet and aviation fueling system and maintenance.

The county is not served by a passenger rail service; however, transport rail does run from north to south through the area. According to the Federal Railroad Administration's Office of Safety Isabella County has experienced one train accident in a period from 1975 through 2003. This number is among the lowest in Michigan.

Isabella County Road Commission
2261 East Remus Road
Mt. Pleasant, MI 48858
989-773-7131
989-773-7756

Michigan Department of Transportation
Mt. Pleasant Transportation Service Center
1212 Corporate Drive
Mt. Pleasant, MI 48858

ISABELLA COUNTY (2020 population: 64,394)

ISABELLA County Drain Commissioner
200 N. Main
Mt. Pleasant, MI 48858 989-772-0911 X 247
drain@isabellacounty.org
The mission of this office is to provide for the health, safety and welfare of Isabella County citizens, the protection of surface waters and the environment, and to promote the long-term environmental sustainability of Isabella County by providing storm water management, flood control, soil erosion controls and education. The office is particularly relevant for hydrological hazards.

Community Mental Health for Central Michigan (serving Clare, Gladwin, Isabella, Mecosta, Midland and Osceola Counties)
301 S. Crapo Street Suite 200
Mt. Pleasant, MI 48858 989-772-
5938

989-775-7701 FAX
www.cmhcm.org
The mission of the Central Michigan District Health Department exists is to promote health and physical well-being by providing preventive health care, education and environmental safety to all members of the community and to become recognized by the public as the local advocate in promoting, assessing and safeguarding public health and the environment. This will be done through coordinated planning, resource development, and service delivery. The human impacts of hazards may require their involvement. Public health emergencies threatening the area would certainly involve thisdepartment.

Michigan State University Extension – Mt. Pleasant Office
200 N. Main, 3rd Floor, Room 340 Mt. Pleasant,
MI 48858
989-772-0911 X-302 Msue37@msu.edu msue.isabella@county.msu.edu
The office is involved in various educational and outreach activities involving agriculture and health. They should be valuable in events concerning such matters, such as droughts, pandemics, etc.

Department of Community Development Isabella County Building
200 N. Main Street
Mt. Pleasant, MI 48858 989-772-0911 – X371
kkennedy@isabella.org
The Isabella County Department of Community Development is responsible for planning and zoning in the County along with the administration of the housing program benefiting low and moderate income families, administration of the State of Michigan Construction codes via inspections and permits, information on who needs Flood insurance along with the criteria for requiring flood plain building inspections, GIS services and Soil erosion.

Isabella County Planning Commission 200 North Main, Mt. Pleasant, MI 48858 989-772-0911 – X283
989-775-6681 - FAX
The mission of the Isabella County Planning Commission is to assist with the creation of a healthy, safe and sustainable community of choice, through leadership, education, partnerships and stewardship of resources and assets. The Planning Commission works closely with the Department of Community Development.

ISABELLA County Road Commission
2261 E. Remus Road, Mt. Pleasant, MI 48858 989-773-7131
www.isabellaroads.com
The Isabella County Road Commission uses their expertise, energy, and funds to provide the safest and most convenient road system possible, and contributes to economic development and the high quality of life throughout the County. Their goal is to maintain a county road system that is safe and convenient for public travel and to manage the roadside environment, with a view towardpreservation.

ISABELLA County Sheriff's Department
207 North Court Street, Mt. Pleasant, MI 48858 989-772-5911
sheriff@isabellacounty.org
The Sheriff's Department provides law enforcement and services to protect the lives and property of Isabella County citizens—enforcing State laws and local ordinances, investigating crimes, and detaining prisoners remanded to the county jail. This is accomplished in a manner that maintains the highest degree of professional excellence, integrity, and courtesy. Sheriff's Department personnel would be involved in protective actions during a serious community emergency.

Isabella County Transportation Commission (I-RIDE)
2100 Transportation Drive
Mt. Pleasant, MI 48858 989-773-2913 www.irideictc.com
The purpose of the Isabella County Transportation Commission is to plan, promote, finance, acquire, improve, enlarge, extend, own, construct, operate, maintain, replace, and contract for public transportation service by means of one or more public transportation systems and public transportation facilities within the jurisdictional boundaries of the County of Isabella. They may have resources useful for the transportation or evacuation of residents during emergency situations.

City of Mt. Pleasant (2010 population: 26,016)
320 West Broadway Mt. Pleasant,
MI 48858 989-779-5323
989-773-4691 – FAX
Founded in the 19th Century, the city provides a diverse mixture of old and new. The city is the County's primary population center, education and transportation hub as well as urban focus within the county. The following city departments are the most relevant to emergency management and hazard mitigation considerations.

City of Mt. Pleasant Department Public Works
1303 N. Franklin Street Mt. Pleasant,
MI 48858 989-779-5401
The department oversees the provision of city services such as waste disposal, fresh water supply, and storm drainage systems. They would have important resources to help deal with disasters or emergencies involving debris, water, and drainage systems.

City of Mt. Pleasant Department of Public Safety
804 E. High St
Mt. Pleasant, MI 48858 989-779-5152
The Department of Public Safety provides law enforcement, fire rescue, and emergency management serving the citizens and visitors of Mt. Pleasant. The Department also provides fire and rescue service to the Chartered Township of Union.

AUTHORITIES, CENTERS, PROGRAMS, ETC. THAT ADDRESS VARIOUS HAZARDS

Sabotage/Terrorism/Weapons of Mass Destruction (WMD)

The federal Office of Homeland Security coordinates the many counter-terrorism functions scattered across numerous federal agencies and organizations, and works closely with state and local police and fire agencies, emergency response teams, and emergency management agencies in formulating and carrying out the National Homeland Security Strategy.

Metropolitan Medical Response System:

One of the key features of the federal response element is the formation of highly skilled and mobile Metropolitan Medical Response Systems (MMRS) to provide medical care in incidents involving nuclear, chemical or biological terrorism. The nearest MMRS facility is in Grand Rapids. In case of an incident that may involve nuclear, chemical or biological weapons, this MMRS would be mobilized to provide initial, on-site response, in addition to providing for patient transportation to hospital emergency rooms. The MMRS are self-contained and capable of providing both medical and mental health care to victims. Should local health care resources be overrun, they will assist in preparing to move victims to other regions. The U.S. Department of Health and Human Services (HHS) coordinates the MMRS program. The West Michigan Metropolitan Medical Response System in Grand Rapids has a goal of coordinating the efforts of local law enforcement, fire, HAZMAT, EMS, hospital, public health and other personnel to improve response capabilities in case of a terrorist attack.

51st WMD Civil Support Team

The Michigan National Guard, 51st WMD/Civil Support Team, provides additional support for the Regional Response Team Network (RRTN). Stationed at Fort Custer (Battle Creek), the 51st WMD/Civil Support Team deploys to a WMD or suspected WMD incident in support of the local incident commander to: assess a suspected nuclear, chemical, biological or radiological event; advise the Incident Commander on appropriate courses of action to protect the local population; assist with appropriate requests for state additional support. They also provide informational briefings, exercises, and cross training activities with state and local first responders.

SNS – The Strategic National Stockpile Program:

Presidential Decision Directive 62, issued by President Clinton in May 1998 ordered federal agencies to take significantly expanded and better-coordinated steps to protect against the consequences of biological and other unconventional attacks, especially potential bio-terrorism directed at civilian populations. One of the major bio-terrorism initiatives of the U.S. Department of Health and Human Services (HHS) in response to this PDD is the development of the Strategic National Stockpile – a national repository of lifesaving pharmaceuticals and medical materials that will be delivered to the site of a major medical emergency in order to reduce morbidity and mortality in civilian populations. The decision to send the SNS is a collaborative effort between local, state, and federal officials in a process whereby local health departments and emergency management officials contact the Michigan State police Emergency Management Division, and state health officials who recommend to the Governor that a formal request for the SNS is made to the CDC.

The stockpile is activated to support a local and or state response to an emergency within the US or its territories. The two major components of the stockpile are the 12 Hour Push Pack and the Vendor Managed Inventory (VMI). Push Packs contain 50 tons of medical materiel that will treat a variety of illnesses. The VMI will re-supply the Push Pack or supplies will be sent immediately to the emergency site if the biological agent is known.

H.B. 4713 – Act 12 of Public Acts of 2014 February 2014:
The bill amends the Fire Prevention Code to modify school drill requirements. The bill also requires the governing body of a school to adopt and implement a school cardiac emergency response plan. The bill takes effect on July 1, 2014. Currently, a school that operates any of grades kindergarten through 12 must hold at least six fire drills and two "lockdown" drills during each school year. The bill requires a K- 12 school to hold a minimum of five fire drills and three lockdown drills, according to a schedule prescribed in the bill. The Code requires a K-12 school to hold at least two tornado safety drills for each school year. Under the bill, at least one tornado safety drill would have to be held in March.

The bill would require the governing body of a K-12 school to ensure that documentation of a completed school safety drill was posted on its website (or on its intermediate school district's website) within 30 days of completing the drill, and maintained for at least three years. By September 15, the chief administrator of a K-12 school would have to give a list of scheduled drill days to the county emergency management coordinator, who would have to provide the information to the local emergency management coordinator, if any, and certain local officials. This information would be exempt from disclosure under the Freedom of Information Act. If a drill were not conducted as scheduled, it would have to be rescheduled and the chief administrator would have to notify the county emergency management coordinator of the rescheduled date. The governing body of a school that operates any of grades kindergarten through 12 would have to adopt and implement a cardiac emergency response plan for the school. The plan would have to address all of the following: use and maintenance of automated external defibrillators (AEDs), if available; activation of a cardiac emergency response team during an identified emergency; effective and efficient communication throughout the school campus; a training plan for the use of an AED and CPR techniques, in a school with grades 9 to 12; integration of the local emergency response system and emergency response agencies with the school's plan; and an annual review and evaluation of the cardiac emergency response plan.

School Safety Information Act: 102 P.A. 1999:
In response to the rash of school shootings that occurred in the late 1990s, the Michigan Legislature passed Act 102 in July 1999 – The Michigan School Safety Information Act – which requires local school districts to meet with law enforcement officials to develop emergency plans to handle violent situations. School superintendents are then required to educate local communities about the plans. The plans spell out, among other things, how to evacuate schools, bring first aid and emergency resources to the scene, and handle parents that want to pick up their children. The law also requires the development and implementation of a statewide school safety information policy, the reporting and compiling of certain school safety information, and the expulsion of pupils for certain assaults.

Michigan Office of Safe Schools:
In 1998 the Michigan Legislature established the Michigan Office of Safe Schools within the Michigan Department of Education. The Office of Safe Schools began operating in October of 1999. Its mission is to collect and distribute information about school safety. The Office of Safe Schools maintains a web site that serves as a one-stop clearinghouse for information on school safety, school bus safety, food safety and current and proposed school safety legislation.

In March 2001, the Michigan Office of Safe Schools established a toll-free School Violence Hotline to provide a means for students to anonymously report specific threats of imminent school violence or other suspicious or criminal conduct. The toll-free hotline is operational 24-hours per day, 365 days a year, at 1-800-815-TIPS.

Michigan State Agencies:
Sabotage/terrorism is being addressed on a variety of other fronts within Michigan State Government. The Michigan Department of State Police oversees and coordinates state agency actions related to homeland security and terrorism response – including the investigation of suspected or potential criminal enterprises and activities that might involve sabotage or terrorism. In addition, the State Police (in conjunction with other state agencies as well as federal and local counterparts) continuously prepares for terrorist incidents through emergency planning, training, information sharing and exercising efforts.

Weather Hazards (General)

National Weather Service Doppler Radar:
The National Weather Service (NWS) has completed a major modernization program designed to improve the quality and reliability of weather forecasting. The keystone of this improvement is Doppler Weather Surveillance Radar, which can more easily detect severe weather events that threaten life and property. The lead-time and specificity of warnings for severe weather have improved significantly. Doppler technology calculates both the speed and the direction of motion of severe storms. By providing data on the wind patterns within developing storms, the new system allows forecasters to better identify the conditions leading to severe weather such as tornadoes, severe straight-line winds, lightning and damaging hail. This means early detection of the precursors to severe storms, as well as information on the direction and speed of storms once they form.

National Weather Service Watches/Warnings:
The National Weather Service issues severe thunderstorm watches for areas when the meteorological conditions are conducive to the development of severe thunderstorms. People in the watch area are instructed to stay tuned to National Oceanic and Atmospheric Administration (NOAA) weather radio and local radio or television stations for weather updates, and watch for developing storms. Once radar or a trained Skywarn spotter detects the existence of a severe thunderstorm, the National Weather Service will issue a severe thunderstorm warning. The warning will identify where the storm is located, the direction in which it is moving and the time frame during which the storm is expected to be in the area. Persons in the warning area are instructed to seek shelter immediately. The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), NOAA weather radio and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet through the Interactive Weather Information Network (IWIN). Residents of Isabella County are also warned of severe weather events through CodeRED's Integration with National Weather Service Warnings.

National Weather Service Education:
The National Weather Service issues severe thunderstorm watches and warnings when there is a threat of severe thunderstorms. However, lightning, by itself, is not sufficient criteria for the issuance of a watch or warning (every storm would require a watch or warning). The National Weather Service has an extensive public information program aimed at educating citizens about the dangers of lightning and ways to prevent lightning-related deaths and injuries.

Severe Weather Awareness Week:
Each spring, the Emergency Management Division, Michigan Department of State Police, in conjunction with the Michigan Committee for Severe Weather Awareness, sponsors Severe Weather Awareness Week. This annual public information and education campaign focuses on such severe weather events as tornadoes, thunderstorms, hail, high winds, flooding and lightning. Informational materials on lightning hazards are disseminated to schools, hospitals, nursing homes, other interested community groups, facilities, and the public.

Tornado National Weather Service Watches/Warnings:
The National Weather Service issues tornado watches for areas when the meteorological conditions are conducive to the development of a tornado. People in the watch area are instructed to stay tuned to NOAA weather radio and local radio or television stations for weather updates, and watch for developing storms. Once a tornado has been sighted and its existence is confirmed and reported, or Doppler Radar shows strong probability of the development or occurrence of a tornado, the National Weather Service will issue a tornado warning. The warning will identify where the tornado was sighted, the direction in which it is moving and the time frame during which the tornado is expected to be in the area. Persons in the warning area are instructed to seek shelter immediately.

The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA) weather radio and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN).). Residents of Isabella County are also warned of severe weather events through CodeRED's Integration with National Weather Service Warnings.

Tornado Warning Systems:
Outdoor warning siren systems warn the public about impending tornadoes and other hazards. Most of these systems were originally purchased to warn residents of a nuclear attack, but that purpose was expanded to include severe weather hazards as well. These systems can be very effective at saving lives in densely populated areas where the siren warning tone is most audible. In more sparsely populated areas where warning sirens are not as effective, communities are turning to NOAA weather alert warning systems to supplement or supplant outdoor warning siren systems. Unfortunately, several of the communities within Isabella County do not have adequate public warning systems in place to warn their residents of severe weather or other hazards. The County is substantially covered with sirens and is provided with access to the CodeRED mass notification system for severe weatherwarnings.

Michigan Office of Fire Safety:
The Michigan Department of Licensing and Regulatory Affairs' Office of Fire Safety is responsible for conducting fire safety and prevention inspections in state-regulated facilities and certain other facilities. Specific services provided include: 1) fire safety inspections of adult foster care, correctional and health care facilities; 2) plan review and construction inspections of the regulated facilities in item (1), as well as schools, colleges, universities, and school dormitories; 3) coordination of fire inspector training programs;
4) coordination of fire alarm and fire suppression system installation in regulated facilities; 5) places of public assemblage; and 6) above and below grade flammable/combustible liquid storage tanks. These activities are important mitigation activities designed to save lives and protect property from structural

fire hazards. The State Fire Safety Board, also housed within the Michigan Department of Licensing and Regulatory Affairs, Bureau of Construction Codes and Fire Safety, promulgates rules covering the construction, operation and maintenance of schools, dormitories, health care facilities, and correctional facilities. These rules are designed to protect life and property at these facilities from fire, smoke, hazardous materials and fire-related panic.

Fire Safety Rules for Michigan Dormitories:
Even before the Seton Hall University dormitory fire in January, 2000, the State Fire Safety Board took action to enhance the fire and life safety protection of Michigan's college and university dormitories. On December 21, 1999 two new sets of rules took effect governing the construction, operation, and maintenance of school, college and university instructional facilities and dormitories. These sets of rules were updated to meet the most current nationally recognized standards from the National Fire Protection Association. The new rules adopted the 1997 edition of NFPA 101, Life Safety Code. NFPA standards provide the minimum requirements necessary to establish a reasonable level of fire and life safety and property protection from hazards created by fire and explosion.

The new rules require, among other things, that fire sprinklers be installed in newly constructed dormitories or those undergoing major renovations. However, existing dormitories don't fall under the new rules and therefore do not have to be retrofitted unless they are being renovated.

Wild Fires
Because the vast majority of wildfires are caused by human activity, the Michigan Department of Natural Resources established, in 1981, the Michigan Interagency Wildfire Prevention Group. It was the first such group in the nation (promoting wildfire prevention and awareness) that had the full involvement of the state's fire agencies. In 1993, the Michigan Interagency Wildfire Prevention Group was expanded to form the Michigan Interagency Wildland Fire Protection Association (MIWFPA). The MIWFPA promotes interagency cooperation in fire prevention, training, fire technology, and firefighting operations. Members of the MIWFPA include the: 1) MDNR Forest Management Division; 2) USDA Forest Service – Huron- Manistee, Hiawatha, and Ottawa National Forests; 3) USDI National Park Service - Pictured Rocks and Sleeping Bear Dunes National Lakeshores; 4) USDI Fish and Wildlife Service – Seney National Wildlife Refuge; 5) USDI Bureau of Indian Affairs; 6) Michigan Department of State Police – fire investigation; 7) Michigan State Firemen's Association; and the 8) Michigan Fire Chief's Association. While the risk of wildfires is low, Isabella County can reduce its vulnerability to wildfires by: 1) participating in multi-state and interagency mitigation efforts.

Scrap Tire Fires
The Scrap Tire Regulatory Program is implemented by the Waste Management Division of the Michigan Department of Environmental Quality, under the authority of Part 169 of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. Policies and regulations established under this law provide the basis for the MDEQ to implement and administer an effective scrap tire management program per the following initiatives: 1) a compliance and enforcement program was implemented; 2) a scrap tire policy recycling hierarchy was established; 3) special uses of scrap tires were approved; and 4) a grant program was established to address abandoned tires.

Riverine and Urban Flooding

National Flood Insurance Program

For many years, the response to reducing flood damages followed a structural approach of building dams, levees and making channel modifications. However, this approach did not slow the rising cost of flood damage, plus individuals could not purchase insurance to protect themselves from flood damage. It became apparent that a different approach was needed. The National Flood Insurance Program (NFIP) was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that: 1) require any new residential construction within the 100-year floodplain to have the lowest floor, including the basement, elevated above the 100-year flood elevation; 2) allow non-residential structures to be elevated or dry flood proofed (the flood proofing must be certified by a registered professional engineer or architect); and 3) require anchoring of manufactured homes in flood prone areas. The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed. In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the purchase of flood insurance as a condition of any federally regulated, supervised or insured loan on any construction or building within the 100-year floodplain.

The following local units of government within Isabella County are recognized by FEMA as participants in the National Flood Insurance Program as of November 2022: the city of City of Mt. Pleasant, the townships of Broomfield, Chippewa Township, Coe Township, Deerfield Township, Denver Township, Fremont Township, Isabella Township, Nottawa Township, Rolland Township, Sherman Township, Union Township, Vernon Township, Coldwater Township, Gilmore Township and Wise Township currently signed into the NFIP program within Isabella County. These communities have all had their floodplain areas officially mapped and are in compliance with the NFIP. The Township of Lincoln is the only remaining jurisdiction not listed as a participant in the NFIP.

Michigan Flood Hazard Regulatory Authorities:

Land Division Act, 591 P.A. 1996, as amended by 87 P.A. 1997:

The Land Division Act governs the subdivision of land in Michigan. The Act requires review at the local, County and state levels to ensure the land being subdivided is suitable for development. From a flood hazards viewpoint, a proposed subdivision is reviewed by the County Drain Commissioner for proper drainage, and for floodplain impacts by the Department of Environmental Quality, Land and Water Management Division.

Provisions of the Act and its Administrative Rules require that the floodplain limits be defined and prescribe minimum standards for developments for residential purposes and occupancy, within or affected by the floodplain. Restrictive deed covenants are filed with the final plat which stipulates that any building used, or capable of being used, for residential purposes and occupancy within or affected by the floodplain shall meet the following conditions:

Be located on a lot having a buildable site of 3,000 square feet of area at its natural grade above the floodplain limit. (Lots with less than 3,000 square feet of buildable area may be filled to achieve that area.)

Be served by streets within the proposed subdivision having surfaces not lower than one foot below the elevation defining the floodplain limits. Have lower floors, excluding basements, not lower than the elevation defining the floodplain limits. Have openings into the basement not lower than the elevation defining the floodplain limits.

Have basement walls and floors below the elevation defining the floodplain limits, watertight and designed to withstand hydrostatic pressures. Be equipped with a positive means of preventing sewer backup from sewer lines and drains serving the building. Be properly anchored to prevent flotation. Floodplain Regulatory Authority, found in Water Resources, Part 31 of the Natural Resources and Environmental Act, 451 P.A. 1994, as amended.

The floodplain regulatory portion of Act 451 restricts residential occupation of high-risk flood hazard areas and ensures that other occupations do not obstruct flood flows. A permit is required from the Department of Environmental Quality for any occupation or alteration of the 100-year floodplain. In general, construction and fill may be permitted in the portions of the floodplain that are not floodway, provided local ordinances and building standards are met. (Floodways are the channel of a river or stream and those portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the 100-year flood. These are areas of moving water during floods.) New residential construction is specifically prohibited in the floodway. Non-residential construction may be permitted in the floodway, although a hydraulic analysis may be required to demonstrate that the proposed construction will not harmfully affect the stage-discharge characteristics of the watercourse. The Act does not apply to watersheds that have a drainage area of less than two square miles. Those small watersheds are considered to be local drainage systems, and do not fall under the Floodplain Regulatory Authority.

Soil Erosion and Sedimentation Control, Part 91 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act seeks to control soil erosion and protect the waters of the state from sedimentation. A permit is required for all earth changes that disturb one or more acres of land, as well as those earth changes that are within 500 feet of a lake or stream. The Act itself does not address flood hazards, per se. However, if sedimentation is not controlled, it can clog streams, block culverts, and result in continual flooding and drain maintenance problems.

Inland Lakes and Streams, Part 301 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act regulates all construction, excavation and commercial marina operations on the State's inland waters. It ensures that proposed actions do not adversely affect inland lakes, streams, connecting waters and the uses of all such waters. Structures are prohibited that interfere with the navigation and/or natural flow of an inland lake or stream. Though reduction of flooding is not a specific goal of this Act, minimizing restrictions on a stream can help to reduce flooding conditions.

Wetlands Protection, Part 303 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act requires a permit from the Department of Environmental Quality for any dredging, filling, draining or alteration of a wetland. This permitting process helps preserve, manages, and protect wetlands and the public functions they provide – including flood and storm water runoff control. The hydrologic absorption and storage capacity of the wetland allows wetlands to serve as natural floodwater and sedimentation storage areas. The Act recognizes that the elimination of wetland areas can result in

increased downstream flood discharges and an increase in flood damage. Permits for wetland alterations are generally not issued unless there is no feasible alternative and the applicant can demonstrate that the proposal would not have a detrimental impact upon the wetland functions.

Natural Rivers Program, Part 305 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

The Natural Rivers Act was originally passed in 1970, and has been incorporated as Part 305 of the Natural Resources and Environmental Protection Act. The purpose of this program is to establish and maintain a system of outstanding rivers in Michigan, and to preserve, protect, and enhance their multi-faceted values. Through the natural rivers designation process, a Natural River District is established (typically 400 feet either side of the riverbank) and a zoning ordinance is adopted. Within the Natural River District, permits are required for building construction, land alteration, platting of lots, cutting of vegetation, and bridge construction. Not all of the zoning ordinances on the natural rivers have the same requirements, but they all have building setback and vegetative strip requirements. Although the purpose is not specifically to reduce flood losses, by requiring building setbacks (in many cases prohibiting construction in the 100-year floodplain), flood hazard mitigation benefits can be realized.

Dam Safety, Part 315 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

The Dam Safety Unit within the Land and Water Management Division, Department of Environmental Quality, has the primary responsibility to ensure dam safety within the state. Following the September, 1986 flood in central Lower Michigan, the current Dam Safety Act was passed to ensure that dams are built and maintained with necessary engineering and inspections for safety of the public and the environment. The Department of Environmental Quality is required to review applications involving construction, reconstruction, enlargement, alteration, abandonment and removal for dams that impound more than five acres of water and have a height of six feet or more.

Manufactured Housing Commission Act, 96 P.A. 1987, as amended:

The Michigan Manufactured Housing Commission Act and its implementing Administrative Rules provide regulation on the placement of manufactured homes and establishes construction criteria. Manufactured homes are prohibited from being placed within a floodway, as determined by the Department of Environmental Quality. In addition, manufactured homes sited within a floodplain must install an approved anchoring system to prevent the home from being moved from the site by floodwaters (or high winds), and be elevated above the 100 year flood elevation.

Local River Management Act, 253 P.A. 1964:

Enacted in 1964, the Local River Management Act provides for the coordination of planning between local units of government in order to carry out a coordinated water management program. Implementation of the water management program occurs via the establishment of watershed councils. These councils conduct studies on watershed problems, water quality and the types of land uses occurring within the watershed. Watershed councils have the authority to develop River Management Districts for the purpose of acquisition, construction, operation and the financing of water storage and other river control facilities necessary for river management. The provision to allow acquisition of land adjacent to the river for the purpose of management aids in regulating development of land prone to flooding.

Floodplain Service Program:
The need to identify a flood hazard area before construction is essential to the goal of flood hazard mitigation. The Department of Environmental Quality regularly provides floodplain information to public and private interests as part of its Floodplain Service Program under the Land and Water Management Division. The goal of the program is to provide 100-year floodplain information to interested parties so that informed purchase or development decisions can be made. In addition to providing floodplain information, the MDEQ will provide information on land and water "interface" permit requirements and on building requirements relating to construction in flood hazard areas.

Dam Failures
Both the MDEQ and the Federal Energy Regulatory Commission (FERC) classify and regulate dams in Michigan. Under state and federal legislation, certain dam owners are required to develop a survey of the downriver area, develop flood-prone area maps and develop emergency action plans (EAPs). Furthermore, the FERC requires the owners of such dams to exercise these plans; the MDEQ has initiated an effort to encourage owners of state-regulated dams to voluntarily perform exercises of their EAPs. In Michigan, well over 100 dams are covered by Emergency Action Plans. Dams in Michigan are regulated by Part 315 of The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Part 315, Dam Safety provides for the inspection of dams. This statute requires the MDEQ to rate each dam as either "high," "significant," or "low" hazard potential, according to the potential downstream impact if the dam were to fail (not according to the physical condition of the dam). The MDEQ has identified and rated over 2,400 dams. Dams over 6 feet in height that create an impoundment with a surface area of 5 acres or more are regulated by this statute. Dam owners are required to maintain an EAP for "high" and "significant" hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Dams regulated by FERC, such as hydroelectric power dams, are generally exempt from this statute. The FERC licenses water power projects (including dams) that are developed by non-federal entities, including individuals, private firms, states and municipalities. Under provisions of the Federal Power Act and federal regulations, the licensee of the project must prepare an EAP. This plan must include a description of actions to be taken by the licensee in case of an emergency. Inundation maps showing approximate expected inundation areas must also be prepared. Licensees must conduct a functional exercise at certain projects, in cooperation with local emergency management officials.

Shoreline Flooding and Erosion
Not Applicable to Isabella - No Great Lakes Boundaries.

Drought

U.S. Geological Survey:
The U.S. Geological Survey (USGS) is the primary federal agency that collects and analyzes stream flow data, another good index of the relative severity of drought. The agency provides a handy "Drought Watch" web site at http://waterwatch.usgs.gov/. The site presents a map that is continually updated through an automated analysis of USGS stream gauging stations. Additional drought-related links can be accessed through the Michigan-specific web page: http://waterwatch.usgs.gov/new/index.php?m=dryw&r=mi) by clicking on the map (or proceeding directly to the specific web page at http://mi.water.usgs.gov/midroughtwatch.php).

Fixed Site Hazardous Material Incidents (including explosions and industrial accidents)

Resource Conservation and Recovery Act - 42 U.S.C. s/s 6901 et seq. (1976)
RCRA (pronounced "rick-rah") gave EPA the authority to control hazardous waste from the "cradle-to- grave". This includes the generation, transportation, treatment, storage and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes. The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. RCRA focuses only on active and future. The Federal Hazardous and Solid Waste Amendments are the 1984 amendments to RCRA that required phasing out land disposal of hazardous waste. Some of the other mandates of this strict law include increased enforcement authority for EPA, more stringent hazardous waste management standards and a comprehensive underground storage tank program.

Within Isabella County, efforts are ongoing to enhance general awareness and specialized training for HAZMAT emergencies.

Hazardous Material Transportation Incidents

Superfund Amendments and Reauthorization Act (SARA), Title III:
As explained earlier, the Bhopal, India tragedy initiated a chain of events aimed at enhancing preparedness activities to minimize the potential for a similar event to occur in the United States. On October 17, 1986 the Superfund Amendments and Reauthorization Act (SARA) was signed into law. A major SARA provision is Title III (the Emergency Planning and Community Right-To-Know Act, also known as SARA Title III), which establishes hazardous material emergency planning, reporting, and training requirements for federal, state and local governments, and private industry. In Michigan, the SARA Title III program is jointly administered and implemented by two state departments- the Michigan State Police and the Michigan Department of Environmental Quality.

Local Emergency Planning Committees (LEPC)
One of the major provisions of SARA Title III is the establishment of Local Emergency Planning Committees (LEPCs) for designated planning districts. The LEPCs are responsible for developing emergency response plans for communities that have facilities in their jurisdiction subject to SARA Title III emergency planning requirements. The LEPC is the primary mechanism through which local SARA Title III planning, training and exercising activities are implemented. Michigan has 88 designated LEPCs – one for each of the 83 counties and 5 in major cities. Nearly 2,800 facilities across the state have been identified as being subject to Title III emergency planning provisions. A facility is subject to SARA Title III provisions if extremely hazardous substances (as determined by the U.S. Environmental Protection Agency) are present at the facility in quantities at or above the minimum threshold quantities established in Section 302 of the Act. The map at the end of this section provides a breakdown of Title III (Section 302) sites by county.

Note: Many of the programs and initiatives designed to mitigate, prepare for, respond to, and recover from fixed- site hazardous material incidents have the dual purpose of also protecting against hazardous material transportation incidents.

Federal Hazardous Material Transportation Regulations:
The transportation, manufacturing, storage and disposal processes for hazardous materials are highly regulated by federal and state agencies in order to reduce risk to the public. At the federal level, the U.S. Department of Transportation, Office of Hazardous Materials Safety (USDOT/OHMS), is the regulating

agency for all modes of hazardous material transportation. In addition to enforcing federal hazardous material transportation regulations, the USDOT/OHMS is also involved in a number of other areas aimed at improving the safety of hazardous material shipping. Those areas include: 1) research and development of improved containment/packaging and other technological aspects of hazardous material shipping; 2) interagency coordination efforts in hazardous material transportation planning and standards setting; 3) management of data information systems pertaining to hazardous material transportation; and
4) development of hazardous material safety training policies and programs.

In Michigan, the Motor Carrier Division, Department of State Police, oversees, coordinates and implements the commercial truck safety aspects of the USDOT regulations. The Michigan Department of Transportation oversees programs aimed at enhancing railroad safety and improving the rail infrastructure (which helps reduce the likelihood of a hazardous material rail transportation accident).

Hazardous Materials Transportation Uniform Safety Act:
The federal Hazardous Materials Transportation Uniform Safety Act (HMTUSA), enacted in 1990, provides funding for the training of emergency responders and the development of emergency response plans for both fixed site facilities and transportation-related incidents. (This funding mechanism under the HMTUSA is referred to as Hazardous Material Emergency Preparedness [HMEP] grants.) In Michigan, the HMTUSA/HMEP program is coordinated and implemented by the Emergency Management Division, Department of State Police. Since the program's inception, over $326,000 in grants have been allocated to 80 Michigan communities for hazardous material planning and training activities.

Federal/State Hazardous Material Response Resources:
There are numerous groups at the federal, state and local levels and in private industry that are trained to deal with hazardous material fixed-site and transportation incidents. These groups include the National Response Team (NRT), Regional Response Teams (RRTs), and state and local hazardous material response teams. The Chemical Manufacturers Association established the Chemical Transportation Emergency Center (CHEMTREC) to provide 24-hour technical advice to emergency responders. The National Response Center (NRC), which operates much like CHEMTREC, was established to provide technical advice and coordinate federal response to a hazardous material incident.

In Michigan, a 24-hour statewide notification system called the Pollution Emergency Alerting System (PEAS) was established for reporting chemical spills to the Department of Environmental Quality. As a companion to the PEAS, the Michigan Department of Agriculture (MDA) has established a 24-hour Agriculture Pollution Emergency Hotline for use by agrichemical users to report fertilizer and pesticide spills. Callers to the MDA hotline gain immediate access to appropriate technical assistance, regulatory guidance for remediation, and common sense approaches for addressing the problem.

Oil and Natural Gas Well Accidents Local

Emergency Capability:
Communities that may be affected by oil or natural gas well accidents should have adequate procedures
in their Emergency Operations Plans to address the unique types of problems associated with this hazard, including rescue and evacuation. Affected communities must work closely with company officials and surrounding jurisdictions to ensure compatibility of procedures for a fast, coordinated response. Mitigation possibilities include the use of community zoning regulations to provide suitable open, unoccupied "buffer" areas around refineries and compressor stations. Michigan Department of

Environmental Quality regulations provide for buffer zones around wells and treatment and storage facilities.

Pipeline Accidents (Petroleum and Natural Gas) MPSC

Pipeline Safety Inspections:
Safety engineers from the MPSC are certified by the USDOT/OPS to conduct inspections on natural gas pipelines to ensure structural and operational integrity of the systems. If violations are found, the pipeline company can be ordered to take corrective actions; in addition, the pipeline operator may be fined. The MPSC safety engineers also respond to accidents involving natural gas pipelines (to ensure compliance with federal and state law and to offer technical assistance to emergencyresponders).

Protection of Underground Facilities Act / MISS DIG Program:
Michigan's first line of defense against pipeline and other utility line breaks from construction excavation is The "MISS DIG" Program established with the passage of Act 53 in 1974 – The Protection of Underground Facilities. MISS DIG System, Inc., is a 24-hour utility communications system that helps contractors comply with the state law (Act 53) which requires notification of utilities at least three working (but not more than 21 calendar) days before commencing excavation, tunneling, demolishing, drilling or boring procedures, or discharging explosives for a project. When properly administered and followed, the MISS DIG safety system does an excellent job of minimizing pipeline and utility line accidents.

Programs and Initiatives:
Pipeline jurisdiction and oversight in Michigan is complex, determined primarily by the type and function of a pipeline and its location. Agencies involved include 1) the MPSC Gas Safety Office; 2) the USDOT/OPS in Kansas City, Missouri; and 3) the Michigan Department of Environmental Quality, Geological Survey Division (MDEQ/GSD). The table below is a breakdown of jurisdictional and inspection responsibilities for the various types of pipelines present in Michigan:

Pipeline Safety Regulation in Michigan

TABLE 3.8

Pipeline Type	Jurisdiction	Applicable Code	Inspected by
Inter-state natural gas	USDOT/OPS	49 CFR Part 192	MPSC Gas Safety Intrastate
Inter-state natural gas	State of MI/MPSC	Michigan Gas Safety Standards	MPSC Gas Safety
Liquid Petroleum	USDOT/OPS	49 CFR Parts 193/195	USDOT/OPS
Gathering Lines*	MDEQ/GSD	Oil/Gas Administrative rules under Part 165, 1994 P.A. 451	

*Note: Gathering lines are run from a production facility (i.e., well) to a pre-processing plant (i.e., dehydration facility, separator, compression station). Source: Michigan Public Service Commission, Gas Safety Office

Local Emergency Capability:
Procedures in the Emergency Operations Plans address the unique types of problems associated with this hazard, including specific functions such as rescue and evacuation. Communities work closely with company officials and surrounding jurisdictions to ensure a fast, coordinated response. Mitigation

possibilities include the use of community zoning regulations to provide suitable open, unoccupied "buffer" areas around pipelines, storage fields, refineries and compressor stations.

Nuclear Power Plant Accidents

Mitigation of nuclear power plant hazards on the local County level is primarily limited to the detection of radiation, alerting the public, and providing directions for evacuation and/or housing – the latter three issues are addressed in other sections of this mitigation action item section of the mitigation plan.

Infrastructure Failures

Infrastructure Failures in Isabella County

There have been no significant infrastructure failures in Isabella County. Typically the infrastructure failures occur when there are thunderstorms, ice storms, or wind storms and power lines are downed. In most cases the power is restored in a matter of hours but in some cases power has been out for a week at a time in parts of the County. The overall impact of an infrastructure failure could pose the greatest impact to Mount Pleasant, Rosebush, Shepherd, Lake Isabella, Saginaw Chippewa Tribe and parts of Union, Deerfield and Chippewa Townships, where social and economic interests would be affected the greatest. The most common type of event is power outages that result from severe summer storms or winter storms, which can occur anywhere in the county.

Most of Isabella County's infrastructure failures are secondary hazards caused by other major events such as floods, windstorms, snow and ice storms. The main infrastructure failures are power outages, which are normally restored in a matter of hours. However, if the power were out for a longer period of time, the local chapter of the American Red Cross and other established groups would be called to set up temporary shelters.

Water/Electrical Infrastructure Failure

The Federal Clean Water Act regulates the discharge from community wastewater collection and treatment systems. The regulatory aspects of the Act that pertain to municipalities have been delegated to the MDEQ Surface Water Quality Division for surface water discharge facilities, and the MDEQ Waste Management Division for groundwater discharge facilities. Authority for the oversight of planning, facility design review, and construction permitting of sewerage systems collection, transportation and treatment facilities, is derived from Part 41 of the Michigan Natural Resources and Environmental Protection Act (451 P.A. 1994) and Administrative Rules promulgated under authority of Part 41. The two MDEQ divisions assist communities with the development and maintenance of their wastewater collection and treatment systems. In addition, they monitor and regulate these systems to ensure pollution abatement and health conditions are met. Although the regulatory authority vested in the MDEQ is primarily aimed at preventing pollution of waters of the state, there are requirements in place under 451 P.A. 1994 regarding the design, construction, and operational integrity and reliability of wastewater collection and treatment systems.

Electrical system

Disaster-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. Detroit Edison, Consumers Energy and other major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by wind, snow and ice, and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components,

protecting equipment from lightning strikes, and placing new distribution systems underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages.

Telecommunications System

Like electric utility companies, telecommunications companies are concerned with the issue of protecting facilities and systems from disaster-related damage. Major telecommunications companies have programs to improve system reliability and physically protect facilities and system components from wind, snow and ice, and other hazards, utilizing many of the same techniques as the electric utility companies.

Surface Drainage Systems:

Michigan's first drain laws appeared on the books as Territorial laws – years before Michigan achieved statehood. After attaining statehood in 1837, the State passed its first drain law in 1839. Since that time, there have been 45 separate acts passed regarding drainage, up to the most recent re-codification of drain law in 1956. Since 1956, the present drain code has been amended over 200 times – an indication of how important and dynamic the issue of drainage continues to be in Michigan. The Michigan Drain Code provides for the maintenance and improvement of the vast system of intra-County (County) and inter- County drainage facilities. Each drain has a corresponding special assessment district (watershed), a defined route and course, an established length, and is conferred the status of a public corporation with powers of taxation, condemnation, ability to contract, hold, manage and dispose of property, and to sue and be sued. Drainage districts and drains are established by petition of the affected landowners and/or municipalities. County drains, with a special assessment district entirely within the County, are administered by the locally elected County Drain Commissioner. Inter-County drains, with a special assessment district in more than one county, are administered by a drainage board that consists of the drain commissioners of the affected counties, and is chaired by the Director of the Michigan Department of Agriculture (MDA) or an MDA Deputy Director.

Water Distribution Systems:

Michigan's public water supplies are regulated under the Federal Safe Drinking Water Act. The Michigan Department of Environmental Quality (MDEQ), as a primary agency for the Federal government, provides supervision and control of Michigan's public water supplies (including their operation and physical improvements) under the Michigan Safe Drinking Water Act (399 P.A. 1976).

The MDEQ Drinking Water and Radiological Protection Division regulates, through a permit process, the design, construction and alteration of public water supply systems. Water supply construction must be conducted within the framework of the Michigan Safe Drinking Water Act, as well as the Architecture, Professional Engineering and Land Surveying Act (240 P.A. 1937, which requires professional engineering preparation of construction documents for water works construction costing over $15,000). Most communities in Michigan, including Mt. Pleasant have, in conjunction with the MDEQ, developed water system master plans that conform to the requirements of the Michigan Safe Drinking Water Act. From a hazard mitigation standpoint, that is important because it helps ensure that all new water system construction and alterations to existing systems will conform to the minimum standards set in the Act. While not making water infrastructure "disaster-proof", the standards provide at least a basic level of design, structural and operational integrity to new or renovated portions of a community's water supply system.

Public Health Emergencies

Michigan Department of Community Health:

The Director of the Department of Community Health, and local public health officers, have the authority

(under the Michigan Public Health Code—1978 PA 368, as amended) to take those steps determined necessary and prudent to prevent epidemics and the spread of hazardous communicable diseases, or to effectively mitigate other

conditions or practices that constitute a menace to public health. The Director and local public health officers can issue written orders to implement the required preventive steps and/or responses, and those orders can be enforced through the imposition of civil and criminal penalties for failure to comply. State and local health departments have detailed, written emergency operations plans that address public health emergencies.

U.S. Centers for Disease Control and Prevention:
At the national level, the U.S. Centers for Disease Control and Prevention (CDC), a branch of the Department of Health and Human Services, has the responsibility and authority to investigate public health emergencies to determine their cause, probable extent of impact, and appropriate mitigation measures. The CDC can also assist state and local public health officials in establishing health surveillance and monitoring systems/programs, and in disseminating information on prevention and treatment to the general public. The CDC announced dedicated funding for bioterrorism response, and Michigan has been strengthening its surveillance and intervention infrastructures with these funds. Since 2001, the CDC has also provided dedicated funding for public health emergency preparedness programs. In 2002, the MDCH Office of Public Health Preparedness was established to oversee these cooperative agreements. In the 2009 Influenza A (H1N1) event, CDC coordinated with numerous health departments across the country, tracked influenza cases, and provided information about outbreak trends. Tests were also performed, to verify whether flu cases were indeed of the correct type.

Michigan Pandemic Influenza Plan:
In October 2009, the Michigan Department of Community Health updated the "Michigan Pandemic Influenza Plan," to provide response guidelines for an influenza pandemic affecting Michigan. Although the plan cannot eliminate the disease, it will aid in reducing the impact by enabling state and local agencies to anticipate, prepare for, and respond efficiently and effectively to the disease. The plan, which is divided into pre-pandemic, pandemic, and post-pandemic phases, details necessary activities at the state and local level related to:

command and management,
crisis communications,
surveillance,
laboratory testing,
community containment,
infection control in health care facilities,
vaccines and antivirals/medical management,
data management,
border/travel issues
recovery

The Michigan Pandemic Influenza Plan is available for review and downloading at www.michigan.gov/flu

Michigan Pandemic Influenza Response Plan:
In December 2020, the Michigan Department of Community Health updated the "Michigan Pandemic Influenza Response Plan," prevent, control, and mitigate the effects of influenza viruses that pose high risk to human health. Influenza viruses, of which there are many types, can cause rapid, widespread disease and death." Although the plan cannot eliminate the disease, it will aid in reducing the impact by enabling state and local agencies to anticipate, prepare for, and respond efficiently and effectively to the disease.
The Michigan Pandemic Influenza Plan is available for review and downloading at https://www.michigan.gov/documents/michiganprepares/MDHHS_Pandemic_Plan_December_2020_Final_Draft_710679_7.pdfTransportation Accidents

Air Transportation:

The Michigan Aeronautics Commission of the MDOT administers several programs aimed at improving aviation safety and promoting airport development. The Commission's safety programs include: 1) registering aircraft dealers, aircraft, and engine manufacturers; 2) licensing airports and flight schools; 3) inspecting surfaces and markings on airport runways; and 4) assisting in removal of airspace hazards at airports. The Commission's airport development program includes providing state funds for airport development and airport capital improvements – many of which contribute to overall air transportation safety. The Federal Aviation Administration (FAA) contracts with the MDOT for the inspection of the state's 238 public- use airports on an annual basis. The FAA has regulatory jurisdiction over operational safety and aircraft worthiness. The National Transportation Safety Board (NTSB) investigates all aircraft crashes that involve a fatality and publishes reports on its findings (see the NTSB section below).

National Transportation Safety Board:

The National Transportation Safety Board (NTSB) is an independent federal agency responsible for promoting aviation, highway, railroad, marine, pipeline, and hazardous materials transportation safety. The NTSB is mandated to investigate significant transportation accidents, determine the probable cause of such accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies that are involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations and statistical reviews. Although the NTSB has no regulatory or enforcement powers, it has nonetheless been successful in seeing the adoption and implementation of over 80% of its transportation accident recommendations.

An example of an NTSB recommendation being implemented is the agreement between the FAA and the Boeing Aircraft Company to redesign the rudder system on the company's popular 737 jetliners and to replace the rudder valve system in every one of the 737 jets in service. The rudder retrofit program cost Boeing nearly one-quarter of a billion dollars. (The 737 rudder system came under close scrutiny of the NTSB after crashes of 737s in 1991 and 1994 had resulted in over 150 deaths. The NTSB believed that the rudder system on the two jets might have been a contributing factor in the crashes.)

Bus Safety:

School bus safety programs and initiatives generally fall into two categories: 1) driver skill enhancement, competency training and 2) physical inspections of bus mechanical and safety equipment. The Motor Carrier Division, Michigan Department of State Police, inspects all school buses and other school transportation vehicles (21,000 units) on an annual basis. In addition, all school bus drivers in Michigan must take and pass a bus driver education and training program, and then take regular refresher courses to maintain their certification to operate a school bus. School bus drivers must also pass an annual medical examination.

CHAPTER 4: HAZARD IDENTIFICATION AND RISK ASSESSMENT

Hazard Rankings:
During the planning process, the planning team reviewed the list of hazards from the 2017 HMP and decided to continue with the same hazard list in the 2022 HMP update. Table 2.2 provides an updated list of rankings for each of the profiled hazards at the county level. Each of the participating jurisdictions completed an online survey tool to rank the hazards for each respective community to highlight jurisdictional differences in overall hazard risks, a full table of results can be found in appendix B. The planning team elected to update the ranking methodology based on potential impacts, likelihood of occurrence and the jurisdictions overall vulnerability to each identified hazard.

Ranking Methodology:
Impacts – *N/A* ***(0)*** = Jurisdiction considers hazard threat negligible. *Very Low Risk* ***(1)*** = An event with minimal impacts to people, property, no outside assistance required *Low Risk* ***(2)*** = An event with minor impact on people, property, local assistance may be required *Moderate Risk* ***(3)*** = An event that will impact people, property and/or community operations such that people need community assistance. A moderate amount of time will be needed for recovery. State or federal assistance may be required *High Risk* ***(4)*** = An event that will severely impact people, property and/or community operations. Significant amount of time will be needed for recovery. State and federal assistance will be required.
Likelihood of Occurrence- *Very Low* ***(1)*** = Occurs every 100-199 years. *Low* ***(2)*** = Occurs every 30-99 years. *Moderate* ***(3)*** = Occurs every 10-29 years. *High* ***(4)*** = Occurs every 3-9 years. *Very High* ***(5)*** = Occurs every 1-2 years.
Vulnerability- *Very Low* **(1)** = Minimal localized event
Low **(2)** = Specific neighborhoods more vulnerable to the hazard (example: Cross streets or cul-de-sac where frequent flooding occurs) . *Moderate* ***(3)*** = Widespread, approximately 25% of planning area vulnerable *High* ***(4)*** = Widespread, approximately 50% of planning area vulnerable *Very High* ***(5)*** = Substantial, entire planning area vulnerable
Overall Hazard Ranking Score – *Low =0-4, Moderate = 5-9, High=10-14*

Isabella County Hazard Ranking Chart

TABLE 2.2

Hazard Type	Impact	Likelihood of Occurrence	Vulnerability	Total Score	Overall Ranking
Infrastructure Failure	4	5	5	14	High
Severe Winter Weather	3	5	3	11	High
Severe Summer Weather	3	5	3	11	High
Public Health Emergencies	3	4	4	11	High
Riverine Flooding	3	3	3	9	Moderate
Transportation/Hazmat Incident	2	4	2	8	Moderate

Civil Disturbances	2	3	2	7	Moderate
Scrap Tire and Structural Fires	1	5	1	7	Moderate
Terrorism/Sabotage	3	3	5	11	High
Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	2	3	2	7	Moderate
Wildfires	1	4	2	7	Moderate
Dam Failures	3	4	4	11	High
Drought	3	4	2	9	Moderate
Major Population Changes	1	2	1	4	Low
Nuclear Attack	2	2	5	9	Moderate
Nuclear Power Plant Accident	2	1	1	4	Low
Subsidence	1	2	1	4	Low
Earthquakes	1	2	1	4	Low

Natural Hazards-Severe Summer Weather

HAIL

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Hazard Description

The NWS definition of "hail" is: Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud. Its size can vary from the defined minimum, a little over a quarter of an inch, up to 4.5 inches or larger. "Severe hail" is defined as being 0.75 inches or more in diameter. The largest hailstones are formed in supercell thunderstorms because of their sustained updrafts and long duration.

The Torro Hailstorm Intensity scale was developed by Jonathan Webb to measure and categorize hailstorms. It extends from H0 to H10 with its increments of intensity or damage potential related to hail size (distribution and maximum), texture, numbers, fall speed, speed of storm translation, and strength of the accompanying wind. The scale could be modified depending on factors such as building materials and types; e.g. whether roofing tiles are predominantly slate, shingle or concrete.

Hail Intensity Scale

Table 4. 2

Size code	Maximum diameter (mm)	Description
0	5-9	Pea
1	10-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > soft ball
9	91-100	Grapefruit
10	>100	Melon

Scale	Intensity category	Typical hail diameter (mm)*	Probable kinetic energy J m^{-2}	Typical damage impacts
H0	Hard hail	5	0-20	No damage
H1	Potentially damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25 40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Hailstorms in Isabella County

There were 35 dates with 50 hail events were reported by the National Centers For Environmental Information (NCEI) for Isabella County, Michigan between 01/01/1950 and 09/30/2021. There were $20,5500 estimated in property damages and $215,000 estimated crop damage for these events. Some of the

more notable hailstorms in Isabella County included the following events:

On 8/9/2000 extensive crop damage and the defoliation of numerous trees was reported. Over $25,000 in damages were reported for property damages and $75,000 was reported in crop damages.

On 6/17/2002 hail with a 1.75” diameter was reported in Beal City with over $5,000 in both property and crop damages.

On 6/28/2003 a major thunderstorm went through Isabella County with hail of 1.75" and damages of $50,000 being reported in both crop and property damages in the County.

On 7/13/2003 a major storm hit central Michigan with over $140,000 in damages to both property and crops. The storm with .75" hail hit Rosebush and caused $15,000 in damages to both property and crops.

On 10/4/2006 a large storm raged throughout the state with severe winds of 75 mph, 2" hail (in Shepherd), and heavy thunderstorms being reported. Over $425,000 in property damages and over $300,000 in crop damages were reported included $30,000 in both property and crop damages in Isabella County.

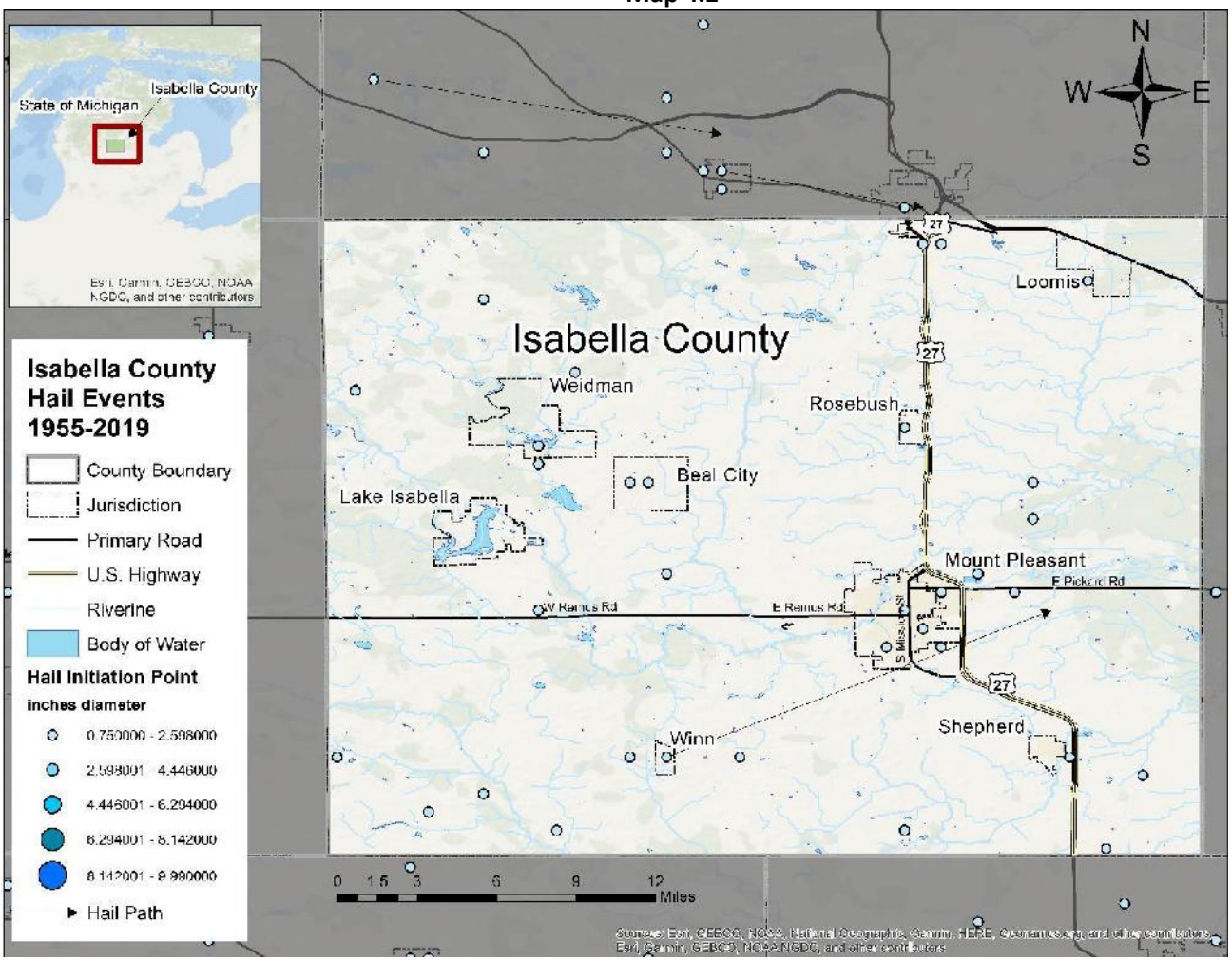
On 9/21/2010 another large storm raged throughout the state. With only spotty damage, it still had over $850,000 in combined in property and crop damages. Over $75,000 was reported in Weidman alone. Hail Overview
Since 1950 there have been 50 events in 35 days. Isabella County averages approximately 30 thunderstorms per year, but only about 5- 6 storms per decade produce noticeable hail. However, there has been an increase in hailstorms being reported with 30 of the 37 storms occurring within the past 25 years.

Hail Overview
Annually thunderstorms will occur on an average of about 30 days in Isabella County, and most occur in June, July, and August. The incidence of hail follows the incidence of thunderstorms. Therefore, those areas of the state most prone to thunderstorms are also prone to large and damaging hail. The National Weather Service which began recording hail activity in Michigan in 1967 indicate that approximately 50% of the severe thunderstorms that produce hail have occurred during the months of June and July. Nearly 80% have occurred during the prime growing season of May through August. As a result, the damage to crops can be extensive. Based on historic occurrences severe hail events in Isabella County have reached up to 2'' diameter.

Isabella County is a moderate risk county for these events to be impactful and the event is considered to be a severe weather activity, which was given a high priority to address.

Historic Hail Events 1955-2019

Map 4.1



LIGHTNING

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Hazard Description

Lightning is defined by the NWS as, "A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, between a cloud and the ground or between the ground and a cloud." A lightning discharge may be over five miles in length,
generate temperatures upwards of 50,000oF, and carry 50,000 volts of electrical potential. Lightning is most often associated with thunderstorm clouds but lightning can strike as far as five to ten miles from a storm. Thunder is caused by the rapid expansion of air heated by a lightning strike.

Most direct impacts from lightning are relatively site-specific in scope, and therefore do not have a tremendous impact on the community. The most common direct damage from lightning is fire. The most common indirect effect of lightning

is power outages. This indirect effect can have an impact on a much larger segment of the community, leaving hundreds and sometimes thousands of homes without electricity.

Lightning is a random and unpredictable product of a thunderstorm's tremendous energy. The energy in the storm produces an intense electrical field like a giant battery, with the positive charge concentrated at the top and the negative charge concentrated at the bottom. Lightning strikes when a thunderstorm's electrical potential (the difference between its positive and negative charges) becomes great enough to overcome the resistance of the surrounding air. Bridging that difference, lightning can jump from cloud to cloud, cloud to ground, ground to cloud, or even from the cloud to the air surrounding the thunderstorm. Lightning strikes can generate current levels of 30,000 to 40,000 amperes, with air temperatures often superheated to higher than 50,000 degrees Fahrenheit (hotter than the surface of the sun) and speeds approaching one-third the speed of light.

According to Applied Lightning Safety Group, globally, there are about 2,000 thunderstorms occurring at any given time, and those thunderstorms cause approximately 100 lightning strikes to earth each second. In the United States, approximately 100,000 thunderstorms occur each year, and every one of those storms generates lightning. It is commonplace for a single thunderstorm to produce hundreds or even thousands of lightning strikes. However, To the majority of the public, lightning is perceived as a minor hazard. That perception lingers despite the fact that lightning damages many structures and kills and injures more people in the United States per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat lightning presents to their safety. Buildings and Lightning Strikes - Applied Lightning (lightningproof.com)

Lightning deaths are usually caused by the electrical force shocking the heart into cardiac arrest or throwing the heartbeat out of its usual rhythm. Lightning can also cut off breathing by paralyzing the chest muscles or damaging the respiratory center in the brain stem. It takes only about one-hundredth of an ampere of electric current to stop the human heartbeat or send it into ventricular fibrillation. Lightning can also cause severe skin burns that can lead to death if complications from infection set in.

According to the Centers for Disease Control and Prevention (CDC) About 40 million lightning strikes hit the ground in the United States each year. But the odds of being struck by lightning in a given year are less than one in a million, and almost 90% of all lightning strike victims survive. The odds of being struck multiple times is even less, with the record being seven times in one lifetime. There are some factors that can put you at greater risk for being struck, such as participating in outdoor recreational activities or working outside. Regional and seasonal differences can also affect your risk of being struck by lightning.

Statistics compiled by the National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the period 1959-1994 revealed the following about lightning fatalities, injuries and damage in the United States:

Location of Lightning Strikes:
40% are at unspecified locations
27% occur in open fields and recreation areas (not golf courses)
14% occur to someone under a tree (not on golf course)
8% are water-related (boating, fishing, swimming, etc.)
5% are golf related
3% are related to heavy equipment and machinery
2.4% are telephone-related
0.7% are radio, transmitter and antenna-related

Additional data From 2006 through 2021, indicates that there were 444 lightning strike deaths in the United States. On average, 28 people in the United States die each year from lightning strikes. U.S. Lightning Strike Deaths | Lightning | CDC

The NLSI estimates that 85% of lightning victims are children and young men (ages 10-35) engaged in recreation or work-related activities. Approximately 20% of lightning strike victims die, and 70% of survivors suffer serious long-term after-effects such as memory and attention deficits, sleep disturbance, fatigue, dizziness and numbness.

Unfortunately, lightning prevention or protection in an absolute sense is impossible. However, the consequences of lightning strikes have been diminished (both in terms of deaths and injuries and property damage) through the implementation of programs and initiatives.

Lightning Events in Isabella County

One lightning event was reported by the National Centers For Environmental Information (NCEI) for Isabella County, Michigan between 01/01/1950 and 8/31/2022. The estimated damages were in the amount of $10,000, that being a construction barn near Rosebush on 7/3/12.

Thunderstorm Hazards – Lightning Overview

Only one (1) destructive lightning event has been recorded in Isabella County since 1996. Based on the one event, the likelihood of an event of this type is 3.8 percent per year. However, there have been over 100 thunderstorms (electrical storms) over this same time period, raising the likelihood of additional lightning events to nearly 2 per year. Isabella County is still considered a moderate risk area for lightning events due to the nature of these storms in central Michigan. Statewide Michigan is considered to be a high risk area for these events. Even though Isabella County has not experienced many lightning strike events, it is possible that future events could still occur. Lightning strikes are considered to be a severe weather activity, which was given a high priority to address.

TORNADOS

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

The NWS describes tornado as, “a violently rotating column of air, usually pendant to a cumulonimbus, with circulation reaching the ground. It nearly always starts as a funnel cloud and may be accompanied by a loud roaring noise. On a local scale, it is the most destructive of all atmospheric phenomena.” Like hail, most tornadoes are spawned by supercell thunderstorms. They usually last only a few minutes, although some have lasted more than an hour and traveled several miles. Wind speeds within tornadoes are estimated based on the damage caused and expressed using the Enhanced Fujita (EF) Scale.

Hazard Description

Tornadoes in Michigan are most frequent in spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the Polar Regions to generate severe thunderstorms. These thunderstorms often produce tornadoes. A tornado may have winds up to 300 miles per hour and an interior air pressure that is 10 to 20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles but tracks up to 200 miles have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in tremendous loss of life, with a national average of 111 deaths per year. Property damage from tornadoes is in the hundreds of millions of dollars every year in the United States.

NWS Alerts for Tornadoes

Table 4. 3

Alert	Criteria
Tornado Watch	This is issued by the National Weather Service when conditions are favorable for the development of tornadoes in and close to the watch area. Their size can vary depending on the weather situation. They are usually issued for a duration of 4 to 8 hours. They normally are issued well in advance of the actual occurrence of severe weather. During the watch, people should review tornado safety rules and be prepared to move a place of safety if threatening weather approaches. A Tornado Watch is issued by the Storm Prediction Center (SPC) in Norman, Oklahoma. Prior to the issuance of a Tornado Watch, SPC will usually contact the affected local National Weather Forecast Office (NWFO) and they will discuss what their current thinking is on the weather situation. Afterwards, SPC will issue a preliminary Tornado Watch and then the affected NWFO will then adjust the watch (adding or eliminating counties) and then issue it to the public. After adjusting the watch, the NWFO will let the public know which counties are included by way of a Watch Redefining Statement. During the watch, the NWFO will keep the public informed on what is happening in the watch area and also let the public know when the watch has expired or been canceled.
Tornado Warning	This is issued when a tornado is indicated by the WSR-88D radar or sighted by spotters; therefore, people in the affected area should seek safe shelter immediately. They can be issued without a Tornado Watch being already in effect. They are usually issued for a duration of around 30 minutes. A Tornado Warning is issued by your local National Weather Service office (NWFO). It will include where the tornado was located and what towns will be in its path. If the tornado will affect the near shore or coastal waters, it will be issued as the combined product--Tornado Warning and Special Marine Warning. If the thunderstorm which is causing the tornado is also producing torrential rains, this warning may also be combined with a Flash Flood Warning. If there is an ampersand (&) symbol at the bottom of the warning, it indicates that the warning was issued as a result of a severe weather report. After it has been issued, the affected NWFO will followed it up periodically with Severe Weather Statements. These statements will contain updated information on the tornado and they will also let the public know when warning is no longer in effect.

Note | Recent Changes: A Watch means you should prepare for a dangerous weather or water event (e.g. grocery shopping, emergency supply kit) and a Warning means you should take action to prevent or avoid a dangerous event (e.g. take shelter, don't drive). The current "Advisories" and "Special Weather Statements" will be removed and transitioned to plain language headlines for weather or water events that do not rise to the level of a Warning.

Source: National Weather Service

Tornado Intensity/Extent

Tornado intensity is measured on the Enhanced Fujita Scale, which examines the damage caused by a tornado on homes, commercial buildings, and other man-made structures. The Enhanced Fujita Scale rates the intensity of a tornado based on damage caused, not by its size Large tornadoes can be weak, and small tornadoes can be extremely strong. It

is very difficult to judge the intensity and power of a tornado while it is occurring. Generally, that can only be done after the tornado has passed (see following page for scale.)

The Enhanced Fujita Scale of Tornado Intensity

TABLE 4.4

F-Scale Number	Intensity Description	Wind Speed (mph)	Type/Intensity of Damage
EF-0	Gale tornado	65-85 mph	**Light damage**. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF-1	Moderate Tornado	86-110 mph	**Moderate damage.** The lower limit is the beginning of hurricane wind speed; roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2	Strong Tornado	111-135 mph	**Considerable damage.** Roofs torn off well-constructed houses; foundation of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3	Severe Tornado	136-165 mph	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; foundations blown away some distance.
EF-4	Devastating tornado	166-200 mph	**Devastating damage.** Whole frame houses, well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF-5	Incredible Tornado	200 mph+	**Incredible damage**. Strong frame houses lifted off foundations and carried considerable distances; automobile sized missiles fly through the air in excess of 100 meters; high-rise buildings have significant structural deformation; incredible phenomena will occur

Source: Storm Prediction Center Tornado Events

in Isabella County

A total of 12 tornadoes were reported in Isabella County, Michigan between 01/01/1950 and 09/30/2021. Of the reported tornadoes, all were EF-2 or below.

The tornado that was reported as an EF-2, occurred in 1965 and no information on the event was available from the National Weather Service. Out of the 12 events, seven resulted in minimal damages of $25,000 or less and two had damages of less than $45,000. The other tornadoes are identified below.

On 4/3/1988, a tornado tore off the roof to a mobile home, which was then hit by a tree with a 2-foot diameter. Six residents of the home were injured in the storm.

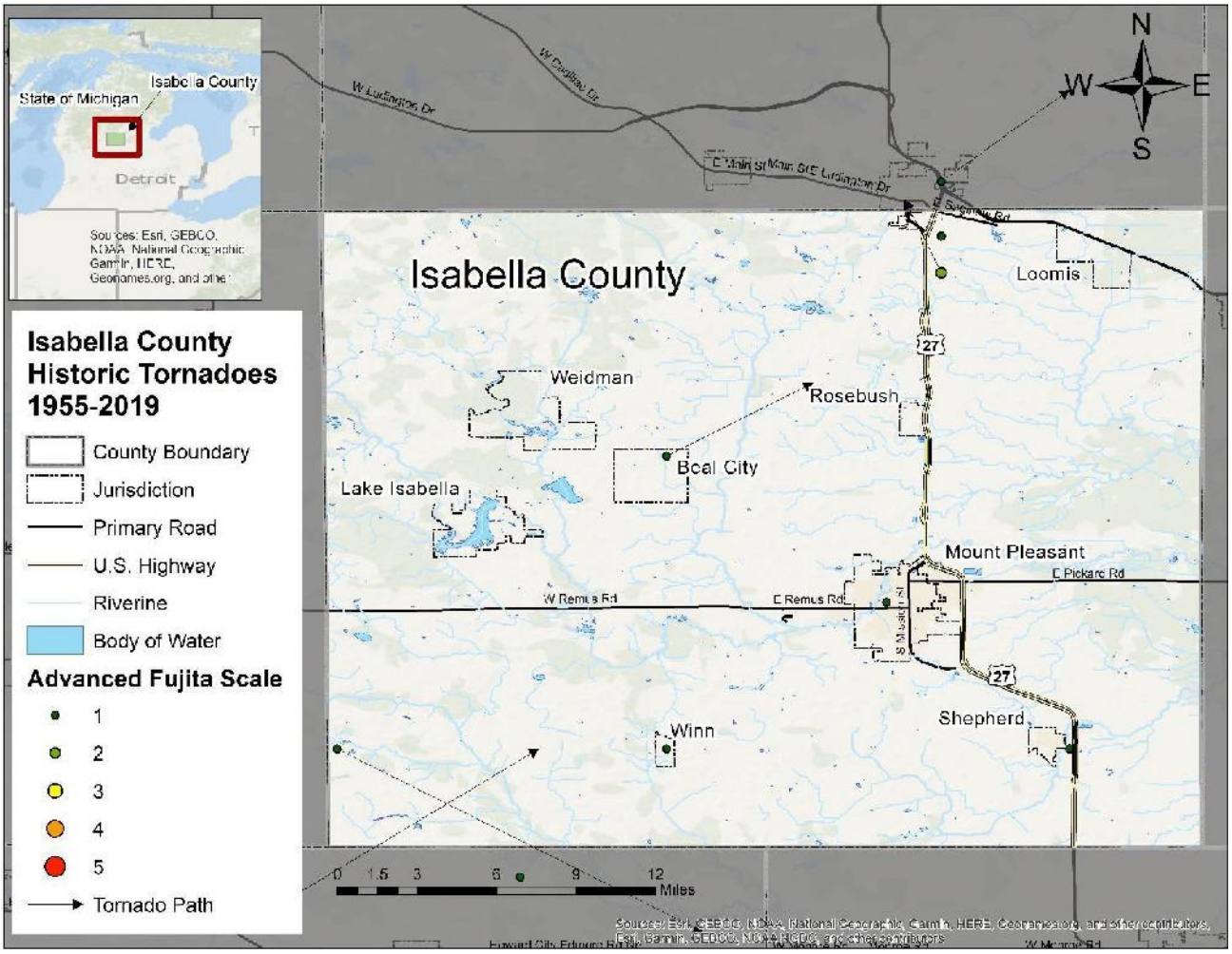
On 6/21/96 an EF-1 tornado struck and damaged three homes, four barns, and numerous outbuildings, machinery and silos totaling more than $500,000 in damages. No injuries or deaths were reported as a result of this tornado.

On 5/21/2001 an EF-1 tornado with a path length of four miles and a width of 40 yards produced maximum estimated wind speeds of 80 mph. It touched down north of Pleasant Valley Road and moved north, parallel to Mission Road, then ended just north of Wing Road. One man was slightly injured when his car was forced off the road by the tornado's

winds. A small radio tower was blown down and a barn sustained extensive damage. Over $150,000 in damages were reported.

Isabella County Tornado Occurrences 1955-2019

Map 4.2



Tornadoes Overview

Isabella County has experienced twelve tornadoes over the past 60+ years or about one (1) every five years. However, this number has increased in recent years and tornadoes are becoming more prevalent in mid- Michigan. With the changing climate this trend is expected to continue if not increase at a greater rate. Tornadoes are considered to be a severe weather activity, which was given a high priority to address. Michigan is located on the northeast fringe of the Midwest tornado belt. The lower frequency of tornadoes occurring in Michigan may be, in part, the result of the colder water of Lake Michigan during the spring and early summer months, a prime period of tornado activity.

Like severe wind events, tornado disasters require that communities plan and prepare for the mass care of residents left without electrical power and the clearance of trees and other debris from roadways. These are two primary challenges that face all Michigan communities in such an event. The planning and preparedness effort should include the identification of mass care facilities and supplies. In Isabella County, the local chapter of the American Red Cross would be called to prepare shelters.

SEVERE WINDS

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Hazard Description

The term "straight line wind" is used to describe any wind not associated with rotation, particularly tornadoes. Of concern is "high wind," defined by the NWS as, "Sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration."

Like tornadoes, strong, straight line winds are generated by thunderstorms and they can cause similar damage. Straight line wind speeds can approach 150 mph, equivalent to those in an F3 tornado. Two categories of straight line winds are "down-bursts" and "derechoes." A downburst is a small area of rapidly descending rain and rain-cooled air beneath a thunderstorm. The winds produced from a down-burst often travel in one direction, and the worst damage is usually on the forward side of the down-burst. Derechoes are created by the merging of many thunderstorm cells into a cluster or solid line extending for many miles. The width of such a storm can range from 20 to 65 miles, and the length can reach 100 miles or more. In extreme cases these storms can create maximum wind gusts of 150 mph and they are also capable of producing small tornadoes. Damaging, straight line winds are much more common than tornadoes and their damage is often incorrectly attributed to tornadoes. Severe winds sometimes occur during thunderstorms and other weather systems and can be very damaging to communities.

Severe winds have the potential to cause loss of life, property damage, and flying debris, but tend not to cause as many deaths as tornadoes do. However, the property damage from severe winds can be more widespread than a tornado, usually affecting multiple counties at a time. In addition to property damage to buildings, there is a risk for infrastructure damage from downed power lines due to falling limbs and trees. Large scale power failures are common during severe wind events.

According to data compiled by the National Weather Service Michigan has experienced over 9,000 severe wind events (not including tornadoes) that resulted in 122 deaths and millions of dollars in damage since 1970.

Wind Events in Isabella County

89 wind events were reported by the National Centers For Environmental Information (NCEI) for Isabella County, Michigan between 01/01/1955 and 09/30/2022. While many of these events occurred during thunderstorms, they were not limited to thunderstorm activity. Over $22 million in property and crop damages were reported. There were no deaths or injuries as a result of these storms.

On 10/30/2004 Law enforcement from all the counties in the area reported scattered downed trees and power lines due to gusty winds. Wind gusts of 58 to 60 mph were estimated across the area. A peak wind of 69 mph was recorded at along Lake Michigan in Holland. The wind knocked out power to about 100,000 people statewide. Over $1,000,000 in property and crop damages were estimated throughout the state.

On 7/10/2007 widespread wind damage occurred across portions of Isabella County. Shingles were blown of roofs two miles north of Mt. Pleasant. Numerous trees were blown down in and around Mt. Pleasant. A roof was blown off of a garage and bleachers in a ballpark were blown over a fence. Over $100,000 in property damages were realized in the area.

On 7/18/2007 severe thunderstorm wind gusts blew down multiple trees at the Pins Golf Course in Lake Isabella. Numerous trees were blown down in addition to the roof off of a home four miles southwest of Weidman. Boats were blown out of the water onto land and moderate to severe structural damage was incurred to buildings in the area as well. There was $100,000 in property damages estimated for the area.

On 9/3/2011 a line of severe thunderstorms struck from Muskegon to Newaygo and Isabella Counties in the morning. A National Weather Service storm survey found a 40 mile path of intermittent downburst

wind damage, with winds estimated to be from 40 to 70 mph. The most concentrated area of damage occurred in western Isabella County just northeast of Millbrook, where peak winds were estimated at 70 mph around 9:55 am. A tree fell on a house and roofs were damage on an outbuilding and trailer home. Over $100,000 in property damages were estimated for Isabella County.

On 11/17/2013 and 11/18/2013 a very strong low pressure system continued to intensify as it moved northeast across the Great Lakes region. The system brought a round of severe thunderstorms during the afternoon of the 17th, followed by very strong winds up to 80 mph in the evening and night hours. As a result, thousands of homes were without power across lower Michigan due to tree limbs knocking out power lines. In rural areas of the state some homes were without power for up to 4-5 days. Nearly a
$1,000,000 in estimated damages were incurred throughout the state with almost $100,000 in damages estimated in Isabella County alone.

On 4/12/2014 severe thunderstorms with damaging wind gusts developed near a warm front during the mid-afternoon hours and continued though the evening hours. There were numerous reports of straight line wind damage with gusts up to 85 mph. There was $200,000 in property damage in Isabella County and over $3,500,000 estimated in property damages throughout the state. Local damage included the destruction of a barn, the lofting of a pontoon boat into an open field, and the loss of trees.

On 3/18/2017 Widespread non thunderstorm wind gusts of 60 to 70 mph caused hundreds of thousands of people to lose power on March 8th. At one point slightly over one million people were without power in Michigan. The winds caused numerous trees and tree limbs to fall and downed thousands of power lines. The winds also caused damage to many homes and numerous homes incurred significant roof damage. Two people were killed in central lower Michigan in Clare county near the Osceola and Clare county line when a large tree fell on their vehicle while they were driving on M-115 in Freeman township.

On 8/28/2018 Wise, Beal City, A line of severe thunderstorms impacted lower Michigan during the evening hours of August 28th, 2018. Strong winds of 50 to 60 mph were common along the line with pockets of intense damaging winds of 75 to 90 mph. There were also two tornadoes embedded within the strongest winds near Baldwin and Idlewild. The most extensive damage was along US-10 from Ludington to Reed City, with separate areas of intense damage near Big Rapids and Le Roy. $100,000 in property damages were reported.

On 8/10/2021 Mt Pleasant, there were numerous reports of severe thunderstorm wind gusts in the 60 to 75 mph range that brought down numerous trees, tree limbs and power lines across southwestern lower Michigan. $50,000 in property damages reported.

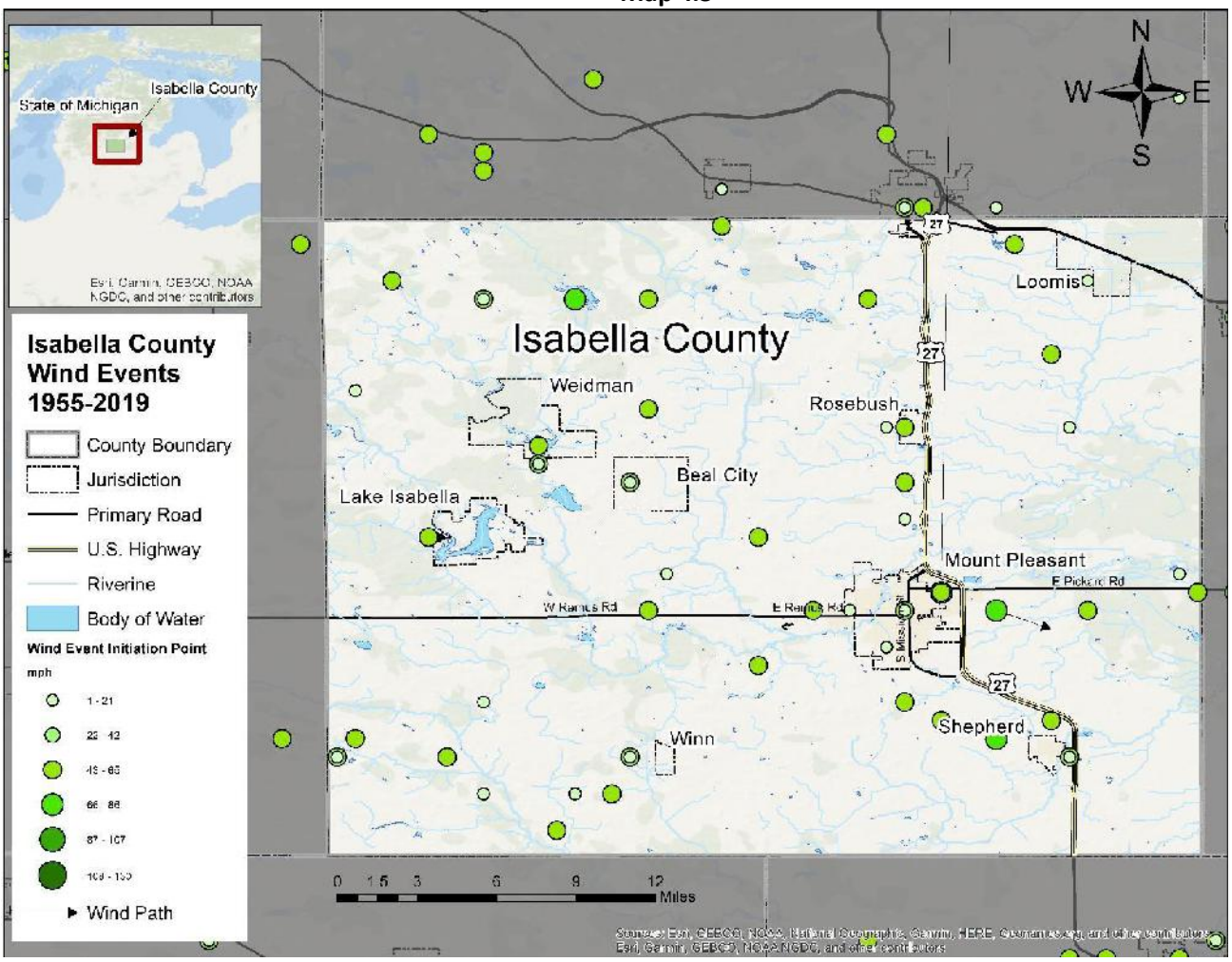
On 9/12/2021 Winn, Severe storms brought several reports of downed trees and large hail across portions of west central lower Michigan. Numerous trees were blown down and signs were ripped off some buildings. $100,000 in property damages reported.
On 8/29/2022 Shepherd, there were numerous reports of downed trees, tree limbs and power lines as a result of numerous severe thunderstorms on August 29th. Fourteen trees and several power lines were blown down across Isabella County. $75,000 in property damages reported.

Wind Events Overview

The recent trend in weather conditions has been an increase annual severe winds in Isabella County. Severe winds are considered to be a severe weather activity, which was given a high priority to address. Based on the number of occurrences of wind events from 1955-2022 (89 events) divided by the number of years. There is an average of 1.33 events per year.

Isabella County Wind Occurrences 1955-2019

Map 4.3



FOG

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Hazard Description

Fog forms near the ground when water vapor condenses into tiny liquid water droplets that remain suspended in the air. Many different processes can lead to the formation of fog, but the main factor is saturated air. Two ways that air can become saturated are by cooling it to its dew point temperature or by evaporating moisture into it to increase its water vapor content. Although most fog, by itself, is not a hazard because it does not actually apply destructive forces, the interaction between humans and fog can be a dangerous situation, sometimes resulting in disastrous consequences.

Haze and Smog

Haze occurs when dust, smoke and other pollutant particles obscure the normal clarity of the sky. It occurs when dust and smoke particles accumulate in relatively dry air. When weather conditions block the dispersal of smoke and other pollutants, they concentrate and form a usually low-hanging shroud that impairs visibility and may become a respiratory health threat, as well as make safe driving more difficult. Dense haze caused by industrial pollution is also known as

smog. This hazard may cause public health problems, so it is mentioned in this subsection but is not given particular emphasis since this plan has more of an emergency management focus. It is noted here as an area of potential overlap and future coordination with other agencies. The Michigan Department of Community Health and the Michigan Department of Natural Resources may do more with this issue in the future, if the effects become severe enough. Since it may be possible that climate change issues cause this to be a more frequent and ongoing concern in Michigan, it is mentioned here. In general, however, air quality has generally improved since the effects of the Clean Air Act, other legislation, regulatory measures, and shifts away from heavy industry in Michigan's economy.

Smoke-producing hazards may have an effect that seems visually comparable to fog. For example, wildfires, hazardous materials incidents, structural fires, major transportation accidents, or industrial accidents may produce clouds of smoke that can obscure visibility and increase the risk of transportation accidents.

Hazard Analysis

In considering severe and high-impact meteorological events, attention can easily become focused on the more dramatic storms. Tornadoes and hurricanes for example, are readily recognized by the public and the meteorological community alike for their devastating consequences. Fog, on the other hand, does not lend itself as readily to this categorization. Yet, both in cost and casualties, fog has consistently impacted society, and in particular the transportation sector - sometimes with deadly consequences. Fog has played a contributing role in several multi-vehicle accidents over the past several years. While statistics suggest that highway accidents and fatalities, in general, have fallen, that trend is not evident with respect to accidents and fatalities caused by fog.

Fog can be very dangerous because it reduces visibility. Although some forms of transport can penetrate fog using radar, road vehicles must travel slowly and use more lights. Localized fog is especially dangerous, as drivers can be caught by surprise. Fog is particularly hazardous at airports, where some attempts have been made to develop methods (such as using heating or spraying salt particles) to aid fog dispersal. These methods have seen some success at temperatures below freezing.

One major fog event is estimated to occur in Michigan approximately every two years. Property damage can be significant for vehicles, although real property and structures are usually unaffected. Fog has not yet been identified as one of the most significant hazards in any of Michigan's local hazard mitigation plans.

Fog Overview

No major events have occurred in Isabella County in recent years. One major fog event is estimated to occur in Michigan approximately every two years. Property damage can be significant for vehicles, although real property and structures are usually unaffected. Thus, while fog has not impacted the residents of Isabella County in recent years, it is not unforeseeable that fogs could impact the County in the future. However, fog is not considered to be a severe weather event and was not given a high priority to address.

EXTREME TEMPERATURES (HEAT)

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Prolonged periods of very high temperatures, often accompanied by exacerbating conditions such as high humidity and lack of rain.

Hazard Description

Extreme temperatures – whether it be extreme heat or extreme cold – share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in

poor health. The major threats of extreme heat are heatstroke (a major medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense.

Prolonged periods of extreme heat can pose severe and often life-threatening problems for Isabella County's citizens. Extreme summer weather is characterized by a combination of very high temperatures and humid conditions. When persisting over a long period of time, this phenomenon is commonly called a heat wave. The major threats of extreme summer heat are **heatstroke** (a major medical emergency), and **heat exhaustion**. **Heatstroke** often results in high body temperatures, and the victim may be delirious, stuporous, or comatose. Rapid cooling is critical to preventing permanent neurological damage or death. Heat exhaustion is a less severe condition than heatstroke, although it can still cause problems involving dizziness, weakness and fatigue. **Heat exhaustion** is often the result of fluid imbalance due to increased perspiration in response to the intense heat. Treatment generally consists of restoring fluids and staying indoors in a cooler environment until the body returns to normal. Other, less serious risks associated with extreme heat are often exercise-related and include heat syncope (a loss of consciousness by persons not acclimated to hot weather), and heat cramps (an imbalance of fluids that occurs when people unaccustomed to heat exercise outdoors).

How our bodies respond to heat is impacted by a combination of the air temperature and the relative humidity. Hydration and cooling needs are different for a 90°F day with 30% humidity versus a 90°F day with 90% humidity. The NWS has devised a measurement system known as the heat index (HI) to estimate the temperature a person is exposed to over a common temperature and humidity range. The NWS will initiate alert procedures when the HI is expected to exceed 105°- 110°F for at least two consecutive days. The chart below shows the HI that corresponds to the actual air temperature and relative humidity.

Because the combined effects of high temperatures and high humidity are more intense in urban centers, heatstroke and heat exhaustion are a greater problem in cities than in suburban or rural area. Nationwide, approximately 170 deaths a year are directly attributable to extreme heat. In Michigan, approximately 7% of weather-related fatalities (about 5 deaths per year) are attributed to extreme heat (according to the Michigan Department of Community Health and the National Weather Service). Extreme summer heat is also hazardous to livestock and agricultural crops, and it can cause water shortages, exacerbate fire hazards, and prompt excessive demands for energy. Roads, bridges, railroad tracks and other infrastructure are susceptible to damage from extreme heat (due to the effects of thermal expansion of the materials).

Air conditioning is probably the most effective measure for mitigating the effects of extreme summer heat on people. Unfortunately, many of those most vulnerable to this hazard do not live or work in air- conditioned environments, especially in major urban centers where the vulnerability is highest. The use of fans to move air may help some, but recent research indicates that increased air movement may actually exacerbate heat stress in many individuals.

<u>Extreme Heat Events in Isabella County</u>

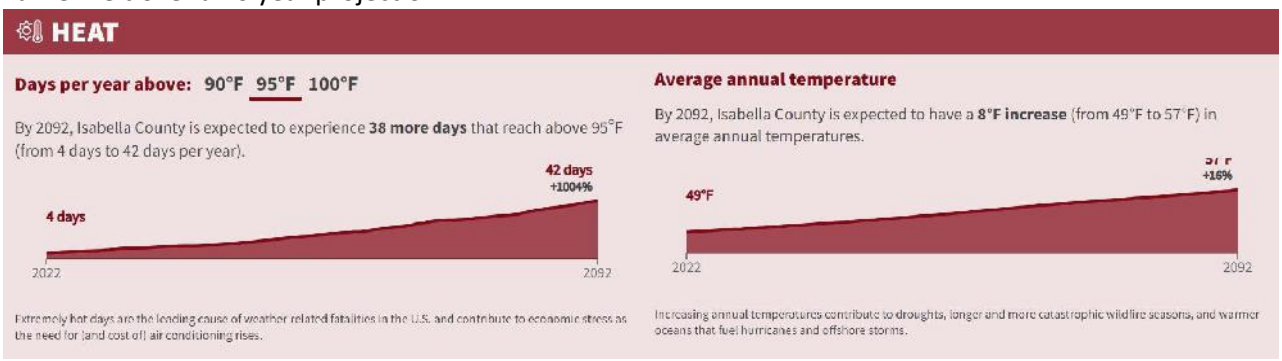
There has only been one extreme heat event reported by the National Centers For Environmental Information (NCEI) for Isabella County, Michigan between on 06/30/2018. According to the 2014 Michigan Hazard Mitigation Plan, compiled data suggests that hot weather (days over 90 degrees Fahrenheit) occurs on the average of nearly 9 days per year (2.4 percent of the year and 7.2 percent of the summer months of June through September). Although 90 degree days can be difficult for many of the residents to bear, the National Weather Service usually only includes multi-day periods which top 90 degrees as those of a significant heat wave for inclusion in the National Centers For Environmental Information (NCEI) database. The record high temperature for Isabella County is 108 degrees Fahrenheit, set in 1918.

<u>Extreme Heat Overview</u>

Isabella County is susceptible to extreme heat. The temperate climate of southern Michigan, combined with the unsettling effect of Lake Huron, make for extreme deviations in temperature, 50-degree swings in the temperature in a 24-hour period are not uncommon. These events can occur regularly depending on the year. Even though recent records do not show circumstances of extreme heat, these events can occur and could impact the safety of the elderly and special needs populations.

Climate Change Impacts

According to "Neighborhoods at Risk" climate change data portal, Isabella County can expect a 1004% or an additional 38 days per year exceeding 100 degrees Fahrenheit and an average annual temperature increase of 8 degrees Fahrenheit over a 70 year projection.



Neighborhoods at Risk (headwaterseconomics.org)

Natural Hazards-Winter Weather

ICE/SLEET STORMS

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Hazard Description

A storm that generates sufficient quantities of ice or sleet to result in hazardous conditions and/or property damage. Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) which bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities.

Ice and Sleet Storms in Isabella County

A total of six ice/sleet storms were reported by the NCDC for Isabella County, Michigan between 1/1/1950 and 12/31/2015. As a result of these storms damages in excess of $1.350 million has been estimated for Isabella County.

On 12/17/2002 a period of freezing rain began across the I-94/I-96 corridors of lower Michigan during the evening hours and lifted north overnight. The heaviest ice accumulations were reported in Osceola County, where approximately ¼ to

½ inch was reported. Around ¼ inch of ice accumulation was reported in Isabella County. Approximately $100,000 in damages were estimated for Isabella County.

On 4/3/2003 a major ice storm affected much of southern lower Michigan, causing hundreds of thousands of people to lose power. The weight of the ice brought down thousands of tree limbs and hundreds of power lines. Many people across the area lost poser for several days and some people in outlying areas were without power for a week. The ice storm resulted in approximately $5,000,000 in damages across the state and $200,000 in Isabella County. This is one of the biggest ice storms to affect lower Michigan in the last 60 years. Most counties across central and southern lower Michigan ended up having at least ½ inch of ice, with reports of ice accumulation of 1 to 1 ½ inches in some locations.

On 2/16/2006 to 2/17/2006 a major ice storm developed across much of central lower Michigan producing around ¼ to ½ inch of ice accumulation. Thousands of homes lost power throughout the state and depending on their location could have been without power for 3-5 days. In Isabella County there were over 100 calls made to the fire department for assistance in less than a 10 hour period.

On 02/05/2019, there was an ice storm that contributed to roughly 1 million dollars in property damages. The area saw moderate to heavy freezing rain, resulting in one-quarter to around or just greater than three-quarters of an inch of ice accretions.

Ice and Sleet Storms Overview

With six storm being reported, on the average, the storms have occurred once every 13 years. However, all of the storms have occurred in the past 15 years, which shows an increase in severe weather activity. Should this trend continue, an increase in these events is anticipated. One of the biggest problems with ice and sleet storms is loss of power. The weight of the ice causes power lines to snap and break. Sometimes it can take days to restore power. If this happens temporary shelters may need to be set up. The local chapter of the American Red Cross would be called. Also with the power loss would come loss of heat, which could cause death from hypothermia especially with the elderly population. Another problem caused by ice and sleet storms would be debris cleanup. The weight of the ice could cause tree limbs to snap and break.

Approximately 87% of ice storms occur during the months of January, February, March and April, when conditions are most conducive for the development of ice and sleet. Ice/sleet storms are considered to be severe weather events, which were given a high priority to address.

SNOWSTORMS

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Hazard Description

A period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility.
As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation ranges from 30 to 170 inches of snow. The highest accumulations are in the northern and western parts of the Upper Peninsula. In Lower Michigan, the highest snowfall accumulations occur near Lake Michigan and in the higher elevations of northern Lower Michigan.

Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds

(35+ miles per hour) bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles that are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous.

The western Upper Peninsula experiences the most snowstorms in Michigan each year. The western half of the Lower Peninsula also experiences a relatively large number of snowstorms. One reason for this is the "lake effect", a process by which cold winter air moving across Lakes Michigan and Superior picks up moisture from the warmer lake waters, resulting in significant snowfall amounts in the western part of the state.

Snowstorms in Isabella County

There have been a total of 55 events in the snowstorm category (blizzards, winter storms, winter weather, and heavy snows) from 1/1/1997 to 8/31/2022. Damages were estimated at $390,000 as a result of these storms; however, the data from these events is incomplete as not all damages that may have occurred were reported. Following are examples of the different types of snowstorms in this category that have affected the County.

Blizzard-On 1/2/1999 to 1/3/1999 blizzard conditions developed across lower Michigan the morning of January 2nd and continued through the afternoon, out ahead of an intensifying low pressure area over the western Tennessee Valley. East to southeast winds ahead of the system increased through the morning hours and by noon winds had gusted up to 65 mph in Muskegon County. Wind gusts from 45 to 60 mph were common across all of southern lower Michigan through the afternoon hours causing blowing and drifting snow with whiteout conditions at times. By late evening hours of the 2nd, 6-12 inches of snow had fallen across all of southwest and west central lower Michigan.

Heavy snows-On 2/20/2005 heavy snow developed during the early morning hours of the 20th and 6 to 12 inches fell across much of central lower Michigan. The heaviest snowfall was received from Alma where 14 inches was reported. Most of the snow fall in a six hour period between noon and 6 pm.

Winter storms-on 12/11/2010 to 12/12/2010 heavy snow fell near and north of Route 10 from the late evening hours on the 11th into the mid-morning hours of the 12th. The primary heavy snow area was from near Dighton southeast to just north of Mount Pleasant, where 10 to 15 inches of snow fell. Around 6 inches of heavy wet snow was reported across much of Isabella County with pockets of 8 inches of snow across the northern part. Numerous accidents were also reported across the county. Property damages were estimated to be $250,000.

Winter weather-On 3/04/1999 to 3/06/1999 a low pressure system moved into southern Missouri during the evening hours of the 5th. Out ahead of it, light to moderate snow developed across southern lower Michigan, accompanied by northeast winds of 15 to 25 mph. This produced blowing and drifting of snow. The heaviest snow fell during the afternoon and evening hours of the 5th, into the early morning hours of the 6th. By 7 am on 6th, the low pressure system had moved up into Ohio. Snowfalls for period of the 4th through the 6th in southern lower Michigan ranged from 10 inches to 2 inches of snow, with Isabella County receiving 6 inches.

Winter storms-on 4/14/2018-4-15-2018 A significant late season winter storm brought a mix of high winds, heavy rain, sleet and freezing rain. The highest wind gusts occurred on the 14th and heavy sleet and freezing rain developed during the early morning hours of the 15th through the early to mid afternoon hours of the 15th. Numerous accidents and slide-offs were reported across the region, including on I-94 during the early afternoon hours of the 15th. Michigan State Police requested weather conditions for an investigation into a serious head on accident on M-21 that shut the road down in both directions. Medical support from AeroMed was requested from Grand Rapids but denied due to hazardous weather conditions. Road conditions were poor in the morning into the afternoon with sleet-packed

roads and ice coated roads where freezing rain was prevalent. Total ice accumulations ranged from around a tenth of an inch to about half an inch. Total sleet accumulations reached 1 to 2 inches in some areas. Numerous flights were either delayed or cancelled. A total of 450,000 customers were impacted by power outages across Michigan, with 110,000 Consumers Energy Customers being impacted. Power was restored to the majority of Consumers Power customers by the evening hours of the 15th.

Snowstorms Overview

There have been 55 reported events from 1997 through 2022, with all of the reported events occurring in the last 25 years. Using the last 25 years, there has been an average of 2.2 events per year Severe snowstorms affect every Michigan community. While the number of events has not recently resulted in a large number of deaths/injuries in Isabella County, due to the nature of these events snowstorms are considered to be severe weather events, which were given a high priority to address.

EXTREME TEMPERATURES (COLD)

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Prolonged periods of very low temperatures, often accompanied by exacerbating conditions such as heavy snowfall and high winds.

Extreme temperatures – whether it be extreme heat or extreme cold – share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in poor health. The major threats of extreme cold are hypothermia (also a major medical emergency) and frostbite. Michigan is subject to both temperature extremes.

Isabella County is susceptible to extreme cold. The temperate climate of southern Michigan, combined with the unsettling effect of Lake Huron, make for extreme deviations in temperature. 50-degree swings in the temperature in a 24-hour period are not uncommon. These events occur regularly depending on the year.

Extreme Cold Events in Isabella County

There were no reported extreme cold events by the National Centers For Environmental Information (NCEI) for Isabella County, Michigan between 1/1/1950 and 8/31/2022.

Hazard Description

Prolonged periods of extreme cold can pose severe and often life-threatening problems for Isabella County's citizens. Like heat waves, periods of prolonged, unusually cold weather can result in a significant number of temperature-related deaths. Each year in the United States, approximately 700 people die as a result of severe cold temperature-related causes. This is substantially higher than the average of 170 heat-related deaths each year. It should be noted that a significant number of cold-related deaths are not the direct result of "freezing" conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia. It could be convincingly argued that, were it not for the extreme cold temperatures, death in many cases would not have occurred at the time it did from the illness or disease alone.

Hypothermia (the unintentional lowering of core body temperature), and **frostbite** (damage from tissue being frozen) are probably the two conditions most closely associated with cold temperature-related injury and death. Hypothermia is usually the result of over-exposure to the cold, and is generally thought to be clinically significant when core body temperature reaches 95 degrees or less. As body temperature drops, the victim may slip in and out of consciousness, and appear confused or disoriented. Treatment normally involves re-warming the victim, although there is some controversy in the medical community as to exactly how that should be done. Frostbite rarely results in death, but in extreme cases it can result in amputation of the affected body tissue.

Hypothermia usually occurs in one of two sets of circumstances. One situation involves hypothermia associated with prolonged exposure to cold while participating in outdoor sports such as skiing, hiking, or camping. Most victims of this form of hypothermia tend to be young, generally healthy individuals who may lack experience in dealing with extreme cold temperature. The second situation involves a particularly vulnerable person who is subjected to only a moderate, indoor cold stress. A common example would be that of an elderly person living in an inadequately heated home. In such circumstances, hypothermia may not occur until days or perhaps weeks after the cold stress begins.

The special vulnerability of elderly persons to hypothermia has become readily apparent. Over half of the approximately 700 persons who die each year due to cold exposure are 60 years of age or older, even though this age group only represents about 20% of the country's population. This remarkable statistic may be due, in part, to the fact that elderly persons appear to perceive cold less well than younger persons and may voluntarily set thermostats to relatively low temperatures. In addition, high energy costs and the relative poverty among some elderly people may discourage their setting thermostats high enough to maintain adequate warmth. Because many elderly people live alone and do not have regular visitors, the cold conditions may persist for several days or weeks, thus allowing hypothermia to set in.

Babies and very young children are also very vulnerable to hypothermia. In addition, statistics indicate that death due to cold is more frequent among males than females in virtually all age groups. Part of that may be explained by differences in risk factors, and part may be due to different rates of cold exposure between the sexes.

Extreme Cold Overview

While there have been minimal conditions with excessive cold, and no reported extreme cold events in Isabella County, these conditions can occur in Isabella County and would be a risk to the residents. Unfortunately, many of those most vulnerable to this hazard (children, elderly, and homeless individuals, and the critically ill) may not have access to sufficiently heated environments. Excessive cold is considered to be a severe weather event, which was given a high priority to address.

Hydrological Hazards

DAM FAILURES

Location This hazard effects those communities within the identified potential inundation areas associated with Dams with Emergency Action Plans (EAPs). The areas in and around Weidman and Lake Isabella are the locations identified with greatest risk of this hazard due to proximity of High and Significant Hazard Dams.

The collapse or failure of an impoundment (water held back by a dam) resulting in downstream flooding, specific inundation modeling is available within Emergency Action Plans (EAPs) associated with high hazards dams and is not a publicly available data source.

Hazard Description

A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dam failures occur not only during flood events, which may cause overtopping of a dam, but also as a result of mis operation, lack of maintenance and repair, or vandalism. A common form of dam failure occurs when tree roots disrupt the integrity of an earthen dam. Water can pass through the dam where the soil has been broken apart by the roots. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation.

In Michigan, all dams over 6 feet high that create an impoundment with a surface area of more than 5 acres are regulated by Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. This statute requires the Michigan Department of Environmental Quality (DEQ) to rate each dam as either a low, significant, or high hazard potential this rating system is based solely on the potential downstream impact if the dam were to fail, and is not according to the physical condition of the dam.

The National Inventory of Dams lists 15 dams within Isabella County with one (1) dam identified as High Hazard Potential Dams and three (3) identified as Significant Hazard Potential Dams. The definitions for these ratings by Michigan Law (Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act) are as follows:

“High hazard potential dam” means a dam located in an area where a failure may cause serious damage to inhabited homes, agricultural buildings, campgrounds, recreational facilities, industrial or commercial buildings, public utilities, main highways, or class I carrier railroads, or where environmental degradation would be significant, or where danger to individuals exists with the potential for loss of life.

“Significant hazard potential dam” means a dam located in an area where its failure may cause damage limited to isolated inhabited homes, agricultural buildings, structures, secondary highways, short line railroads, or public utilities, where environmental degradation may be significant, or where danger to individuals exists.

Dam Failures in Isabella County

There are no records of recent Dam failures in Isabella County.

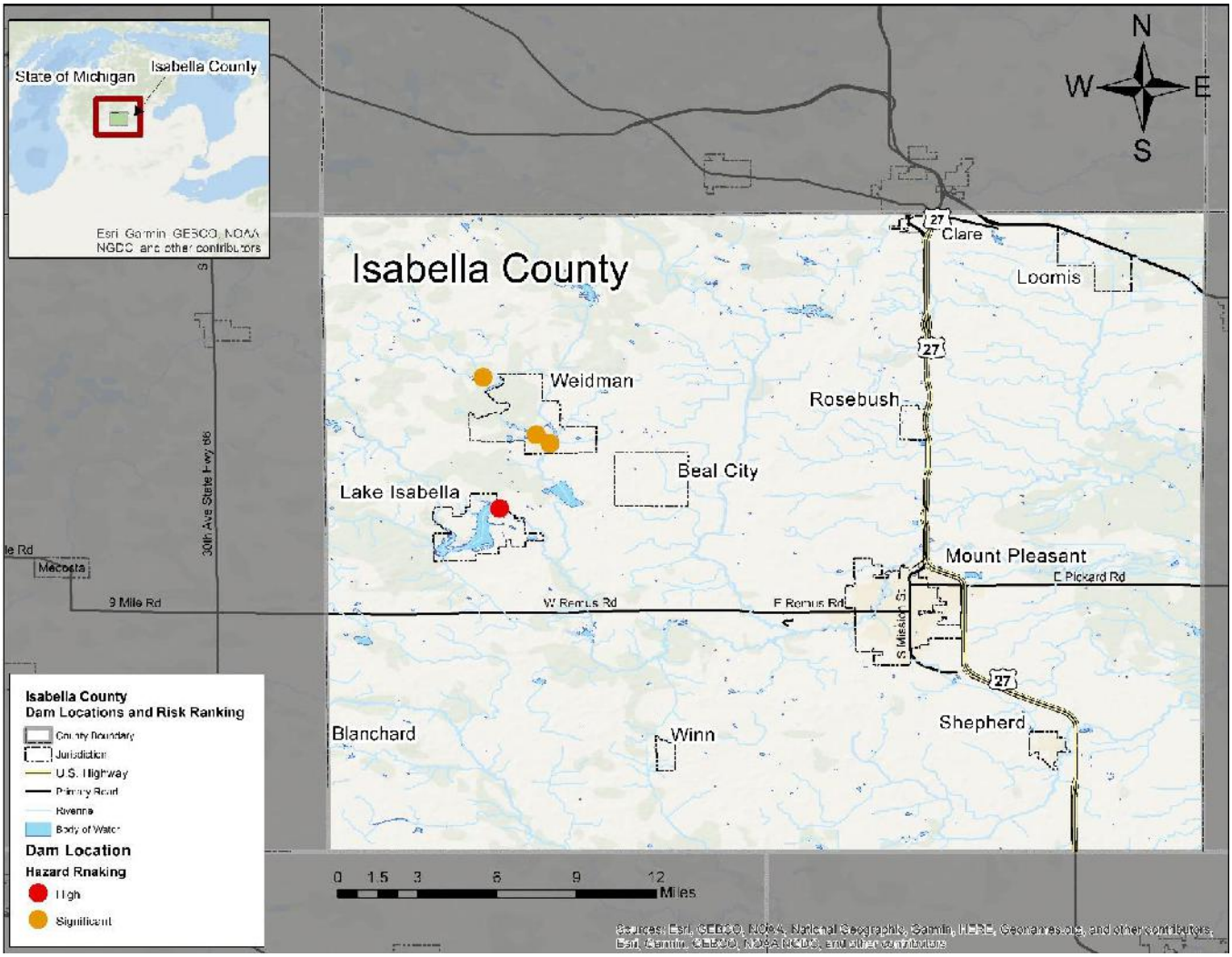
Dam Failure Flooding Overview

According to the National Inventory of Dams Isabella County has one (1) dam that are rated as a High Hazard Potential Dams and three (3) dams rated as Significant Hazard Potential Dam. The High Hazard Potential Dam that is located in Isabella County is Lake Isabella Dam. The three (3) Significant Hazard Potential Dams are: Weidman Mill Pond Dam, Weidman Development Dam, and Walker Creek Dam. The Federal Emergency Response Commission (FERC) has emergency planning oversight of the dams. Dam owners are required to maintain an emergency action plan (EAP) for significant and high hazard potential dams. Owners are also required to coordinate with local emergency management

officials to assure consistency with local emergency operations plans. Dam failures have been given a medium priority to address. Due to For Official Use Only "FOUO" Dam EAPs are not made available within the Hazard Mitigation Plan. The following maps depict locations of High and Significant hazard dams throughout Isabella County. Map 4.4 provides location only while map 4.5 provides a basic 1-mile buffer area around the dams to identify critical assets that fall within the immediate areas. Structures within the buffer areas include Lake Isabella - Cal Brewer, Memorial Nottawa/Sherman Township Fire Department, Sherman Township Marshals Office and Weidman Elementary School

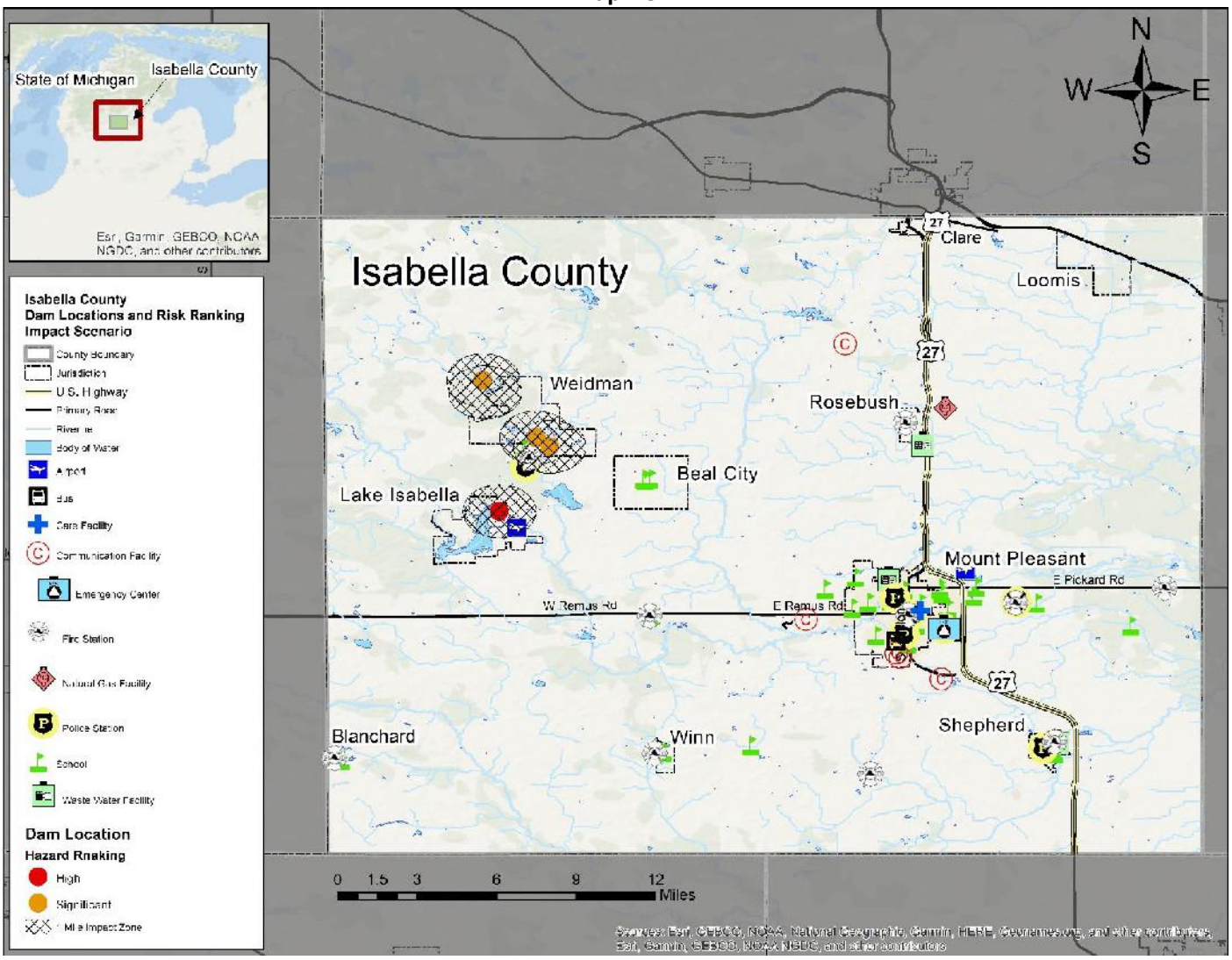
Isabella County High and Significant Hazard Dams

Map 4.4



Isabella County High and Significant Hazard Dams (With Buffers)

Map 4.5

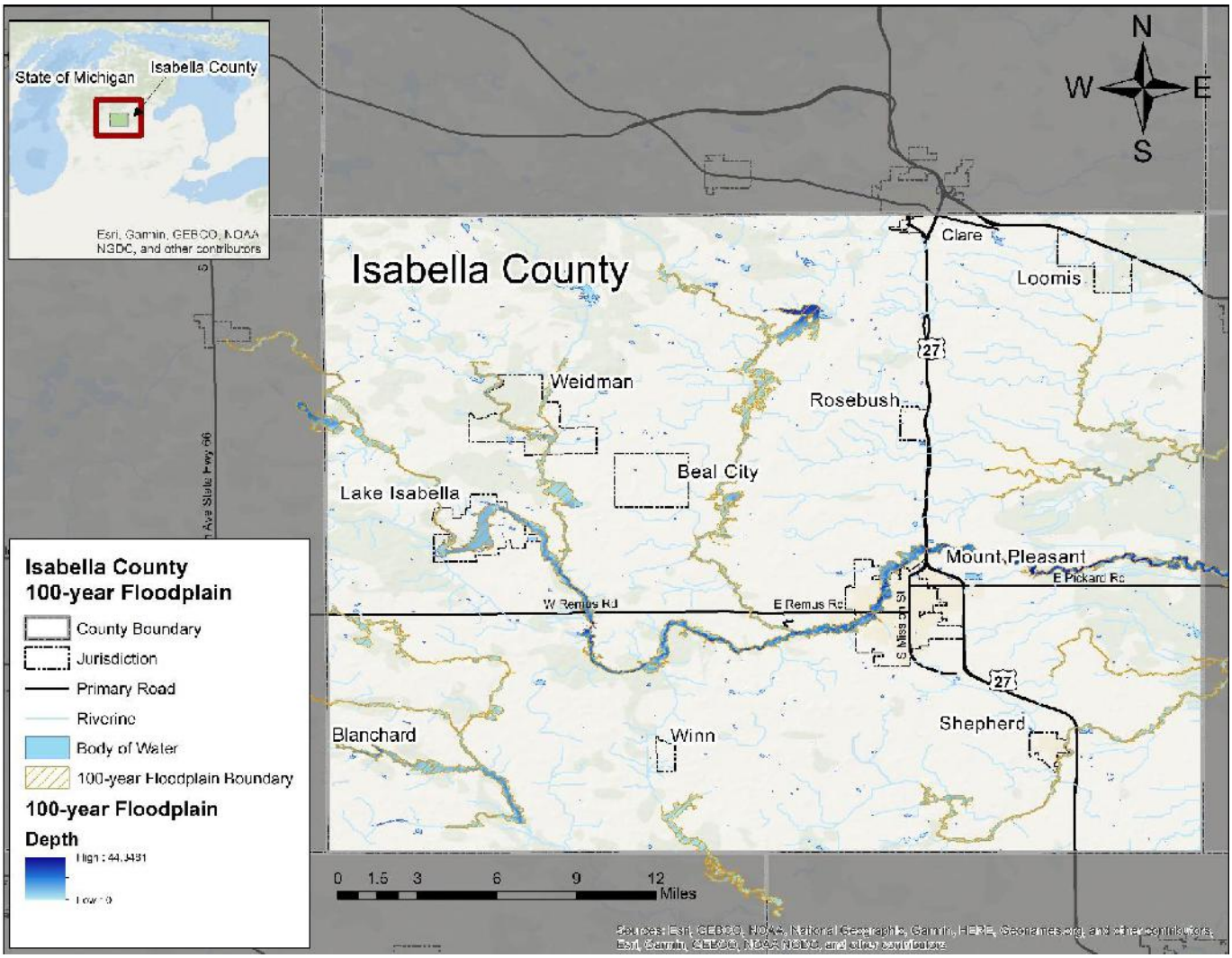


RIVERINE AND URBAN FLOODING

Location The riverine flood hazard is identified by areas that fall within the 100 (1% annual flood probability) and 500 (.2% annual flood probability) year FEMA special flood hazard areas. Urban/Flash Flooding occurs in locations with less drainage capacity and low lying areas throughout the county. Many of the Urban/Flash Flood areas can be identified through the narratives provided via NCEI recorded events as well as locations identified within the mitigation actions for specific flood prone areas.

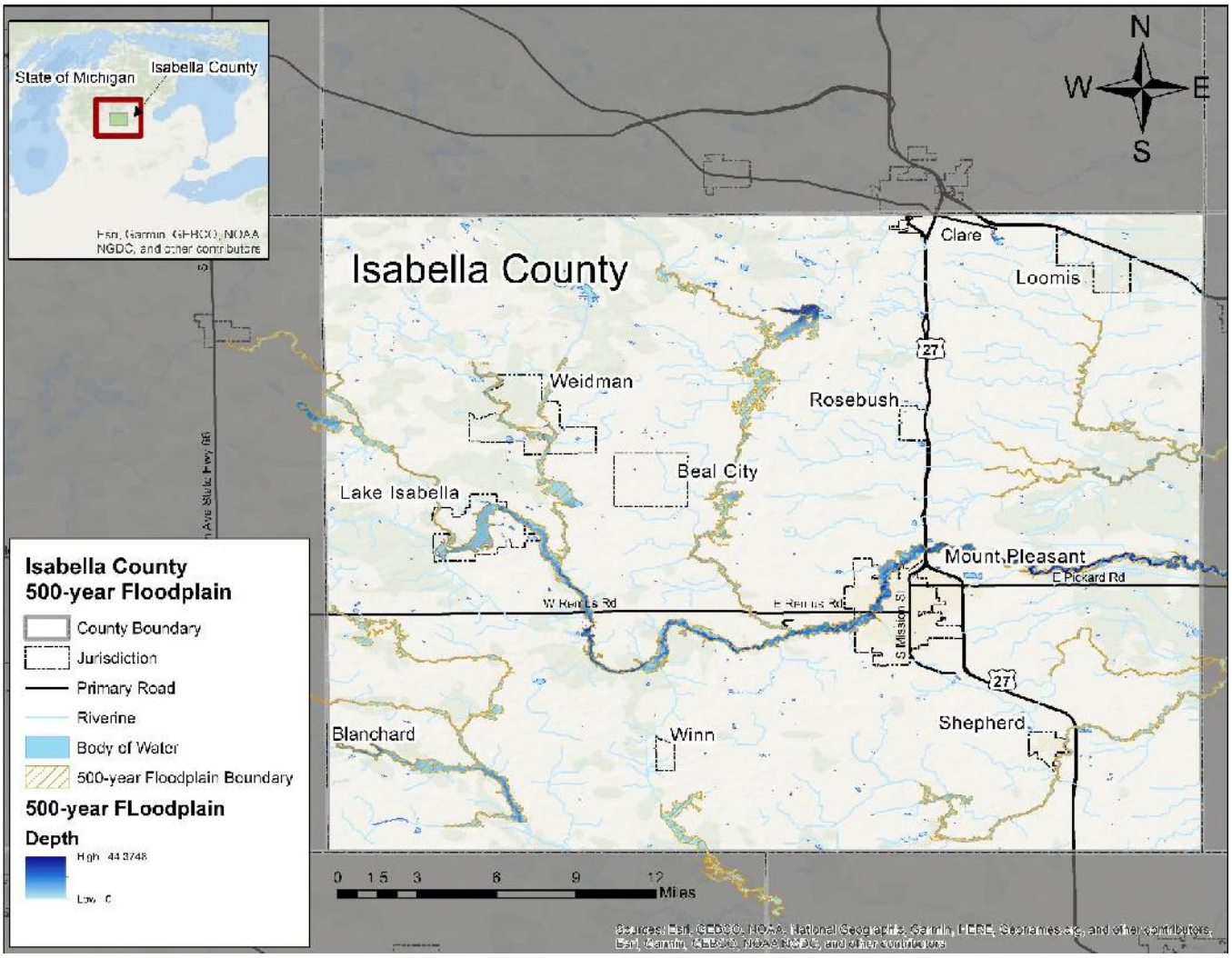
Isabella County 100 Year (1% annual flood probability) Floodplain

Map 4.6



Isabella County 500 Year(.2% annual flood probability) Floodplain

Map 4.7



Hazard Description

The overflowing of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice. Flooding of land adjoining the normal course of a stream or river has been a natural occurrence since the beginning of time. If these floodplain areas were left in their natural state, floods would not cause significant damage. Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes.

Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all. Long-term collateral dangers include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and

snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns.

Ice Jams

Cold winters like those we experience in Isabella County can produce thick river ice and the potential for ice jams. An ice jam develops when pieces of snow and ice buildup along a river. As the ice buildup increases, water passes slowly, and flooding develops behind the dam of ice. Water levels can also rise rapidly when temperatures rise and result in snowmelt runoff or rain, thus adding more water to the river behind an ice jam.

In the spring, or when temperatures rise, the ice buildup will thaw and break up, and may unleash all of the damned up water in a short period of time. When this occurs, flooding can rapidly result downstream from the ice jam. The combination of ice, debris, and water released from the ice jam can cause tremendous physical damage to homes, docks, and other structures.

Monthly Mean Precipitation* in Isabella County, 1917-2022

TABLE 4.5

Month	Isabela County	
	1917-2000	2001-2022
January	1.95	2.42
February	1.55	2.45
March	2.40	2.48
April	3.11	3.97
May	3.21	4.11
June	3.54	3.98
July	3.50	3.60
August	3.99	3.58
September	4.14	3.05
October	3.31	4.63
November	2.68	2.93
December	2.04	2.73
Annual Average	35.42	39.98

Source: National Weather Service

*All measurement are liquid equivalent inches.

The data from the past 20 years may suggest a significant change in the precipitation patterns from the previous 80 years. However, the precipitation for several of the surrounding counties does not indicate a change in the precipitation pattern. Due to a small sample size more data over an extended period of time will have to be collected before a determination can be made.

Riverine Flooding in Isabella County

Eight flood incidents were reported by the NCEI for Isabella County, Michigan between 1/1/1950 and 8/31/2022. Over $94 million in property damages and approximately $21 million in crop damages were estimated as a result of these events.

On 5/23/2004 the biggest and longest flooding event in the past 10 to 20 years occurred across southwestern and south central lower Michigan from May 20th through June 3rd. The heaviest rain fell on Saturday, May 22nd when over two inches of rain fell over the area. Over $1 million in property damages and $200,000 were estimated for Isabella County. No deaths or injuries were reported during this event.

On 8/12/2010 Flash flooding occurred in downtown Mt. Pleasant from the evening hours of August 11th into the early morning hours of August 12th due to approximately four inches of rain which fell in just two and a half to three hours time. A trained spotter one mile south of downtown Mt. Pleasant reported that 4.16 inches of rain fell from 8 pm to 10:30 pm on August 11th. Flash flooding caused over three million dollars worth of damage to 39 buildings on the campus of Central Michigan University. Street flooding was reported in downtown Mt. Pleasant and the intersection of Isabella and Baseline roads was washed out. The heavy rain flooded portions of Central Michigan Community Hospital and left up to a foot of water on some roads on the east side of downtown Mt. Pleasant including at High and Bellows streets.

On 4/23/2013 record flooding occurred during the month of April and record crests occurred on the lower portions of the Grand River. Two to four inches of rain fell on already wet land due to previous rains. Due to the severity of the flooding, Michigan's Governor Rick Snyder declared a state of disaster for 19 counties and two cities. Hundreds of homes were flooded, over 300 roads closed and preliminary flood damage estimates were in excess of $32 million, $3 million in Isabella County alone. No deaths or injuries were reported as a result of the floods.

On 6/24/2017 Several rounds of torrential rainfall resulted in major flooding in portions of Isabella county, where some locations received close to seven inches of rain. The flooding resulted in over 90 million dollars worth of damage to homes, roads and bridges in Isabella county. At one point over 100 roads were closed due to flooding. Over 20 million dollars worth of damage to crops was incurred. This event received a presidential disaster declaration # 4326 for both individual and public assistance.

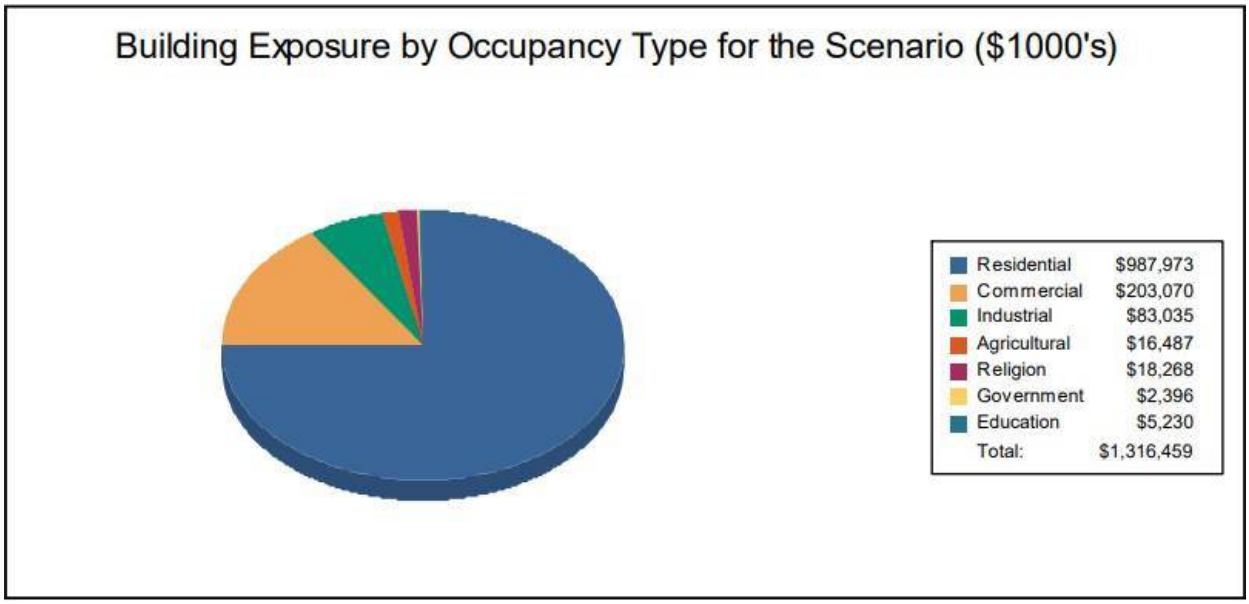
On 10/1/2019 Two to nearly five inches of rain fell across portions of west central lower Michigan and resulted in some flooding of area roads and low lying areas. Several roads were closed.

On 5/18/2020 Beal City, Significant rainfall fell across all of Lower Michigan on May 17 and 18 with many locations in Southwest Lower Michigan reporting over 3 inches of rain. This was the culmination of an already wet week that had experienced three separate episodes of heavy rain. As a result, soil was already saturated and this additional rain immediately became runoff instead of soaking into the ground. There were many reports of road closures due to water over roads and some significant damage to homes which were flooded particularly across western portions of Ottawa and Muskegon counties. The Muskegon and Grand River Basins saw the brunt of the heaviest rain and were therefore impacted the most. This was particularly evident at Evart, near the uppermost reaches of the Muskegon River. Slightly farther north, the White River also saw sharp rises that resulted in minor flooding. Lakeshore flooding also occurred in this area, resulting a temporary closure of the causeway (Dowling Street) that connects Whitehall and Montague. A few buildings were flooded in Mt. Pleasant.

The HAZUS-MH application was utilized in modeling riverine flooding exposure throughout Isabella County. The below table and graph provide an overview of potential damages associated with general building exposure by occupancy type to the 100-year return period. Full HAZUS reports for 100 and 500 year return periods are provided in Appendix G

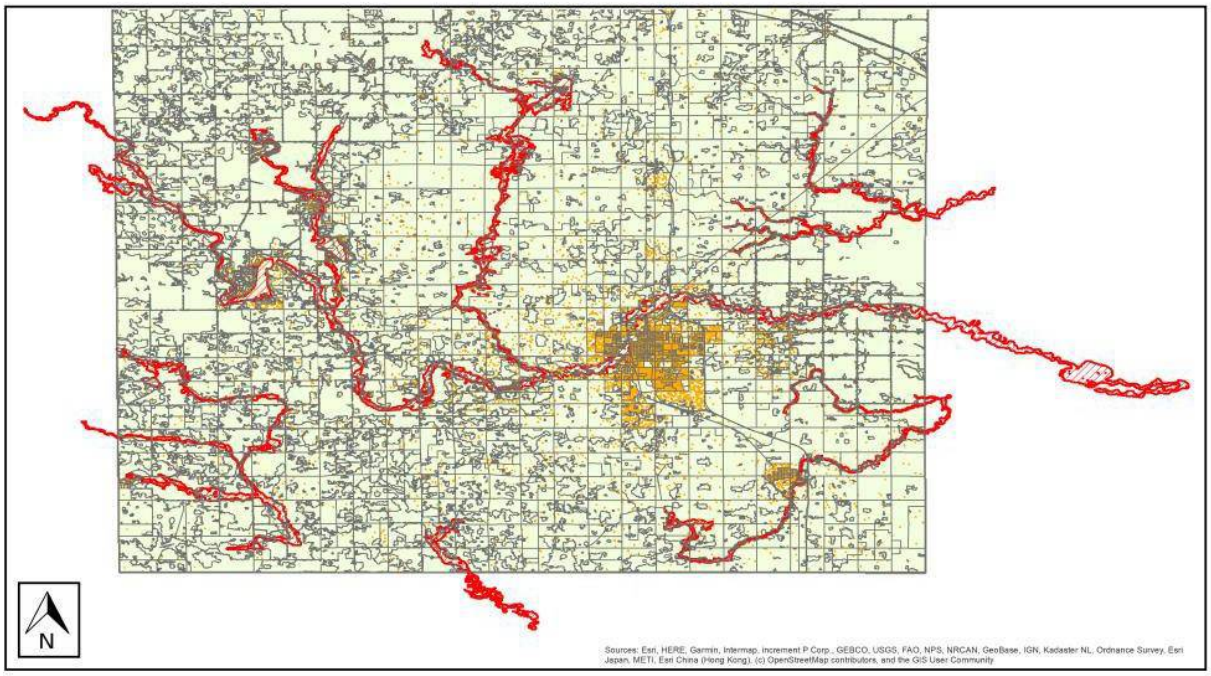
Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	987,973	75.0%
Commercial	203,070	15.4%
Industrial	83,035	6.3%
Agricultural	16,487	1.3%
Religion	18,268	1.4%
Government	2,396	0.2%
Education	5,230	0.4%
Total	**1,316,459**	**100%**



Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Riverine and Urban Flooding Overview

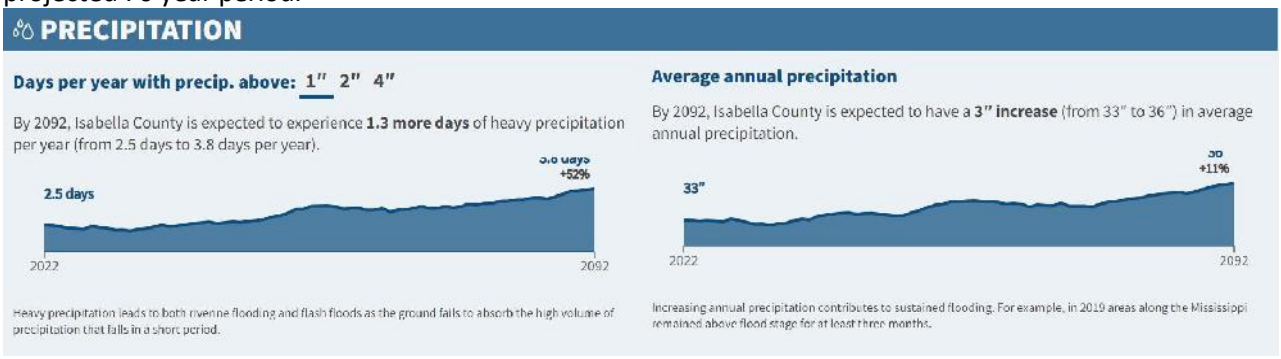
Since 1950 eight floods have been recorded in Isabella County, or about one every 9 years. However it is important to note that all eight of the floods have occurred within the past 26 years, changing the average duration between floods from 9 years to 3.25 years. Furthermore, the floods have been occurring more often with shorter periods between floods, as the summer storms have become more frequent and more powerful.

Currently fifteen of the sixteen townships, both cities, and all three villages in Isabella County participate in the National Flood Insurance Program (NFIP). To maintain their participation in the NFIP ordinances have been adopted that prohibit new construction within floodplains and modifications to existing buildings within floodplains must be approved by a certified floodplain manager within the County. During the 2022 plan update process, updated NFIP and Repetitive/Severe Repetitive Loss data was requested via FEMA. Updated data was not available through FEMA at the time of the update. Data provided by the National Resource Defense Council (NRDC) indicates that Isabella County has a total of **34 NFIP claims** totaling **$534,916 in damage payments** with no repetitive or severe repetitive loss properties identified within the county. This is considered best available data during the 2022 update process.

Flooding was given a high priority by the County. This was also identified as a major hazard by the City of Clare, and has experienced numerous floods from Tobacco River, which has resulted in a high priority project to mitigate the flooding

in downtown Clare, which is found in the Clare County Hazard Mitigation Plan.

Climate Change Considerations:
According to "Neighborhoods at Risk" climate change data portal, Isabella County can expect to experience 1.3 more days of heavy precipitation and have a 3'' increase in annual precipitation over a projected 70 year period.



Neighborhoods at Risk (headwaterseconomics.org)

DROUGHT

"A water shortage caused by a deficiency of rainfall, generally lasting for an extended period of time."

Location This hazard has an equal chance of affecting all jurisdictions within Isabella County.

Hazard Description
Drought is the consequence of a reduction in the amount of precipitation that was expected over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation. drought can cause many severe hardships for communities and regions. Probably one of the most common and severe impacts to a community like Isabella County would be the threat of wildfires as sixty- three percent of the County is forests. Also there would be a drop in the quantity and quality of agricultural crops. Other negative impacts that can be attributed to a drought include water shortages for human consumption, industrial, business and agricultural uses, recreation and navigation, declines in water quality in lakes, streams and other natural bodies of water, malnourishment of wildlife and livestock, increases in fires and wildfire related losses to timber, homes, and other property, increases in wind erosion, and declines in tourism in areas dependent on water-related activities.

These direct impacts can further result in indirect impacts to a community, such as reduced revenue due to income losses in agriculture, retail, tourism and other economic sectors; declines in land values due to physical damage from the drought conditions and decreased functional use of the property, and possible loss of human life due to extreme heat, fire, and other heat-related problems.

Two common measurement tools of dry weather conditions are the Palmer Drought Indices (including the Palmer Drought Severity Index and the Palmer Hydrological Drought Index) and the Crop Moisture Index. The Palmer Drought Severity Index is a good long-term drought monitoring tool. It is a monthly index that indicates the severity of a wet or dry spell. This index is based on average temperature and rainfall information for a particular location in a formula to determine dryness. It uses a value of 0 for the normal amount of rainfall in a particular location, and drought is shown in terms of negative numbers, for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. Any value above 0 demonstrates that there has been above normal amounts of precipitation. This

index can be used for indicating lake levels and surface water supply abnormalities but is not all that good for monitoring climatic impacts on vegetation, especially crops.

The Crop Moisture Index (CMI) evaluates short-term moisture conditions across crop producing regions. The CMI measures how much moisture is in the plant root zone of the soil. This index is based on the mean temperature and total precipitation that occurs each week, as well as the CMI from the previous week. The CMI changes as quickly as the weather changes. A heavy rainstorm can dramatically change the CMI for a region. Since this index changes so quickly and in response to a single weather event, the CMI is not considered a good long-term drought measurement tool.

Droughts/Drought Related Events in Isabella County

While drought conditions occur periodically, in Isabella County, the Palmer Drought Index indicated drought conditions reached extreme severity only 2% of the time. According to data provided by the Michigan Hazard Analysis 2019 for Climate Division 6 which includes Isabella County. The most extreme drought was in February 1931, when the Palmer index hit a record low of -6.22. Lengthy drought incidents took place in 1895-1896 (15 months), 1910-1911 (18 months), 1930-1931 (14 months), 1934- 1935 (9 months), 1936-1937 (13 months), 1963-1964 (15 months), and 1976-1977 (9 months). As of November 2022 the Palmer drought index shows Isabella County to be in the Mid-range value of the indices.

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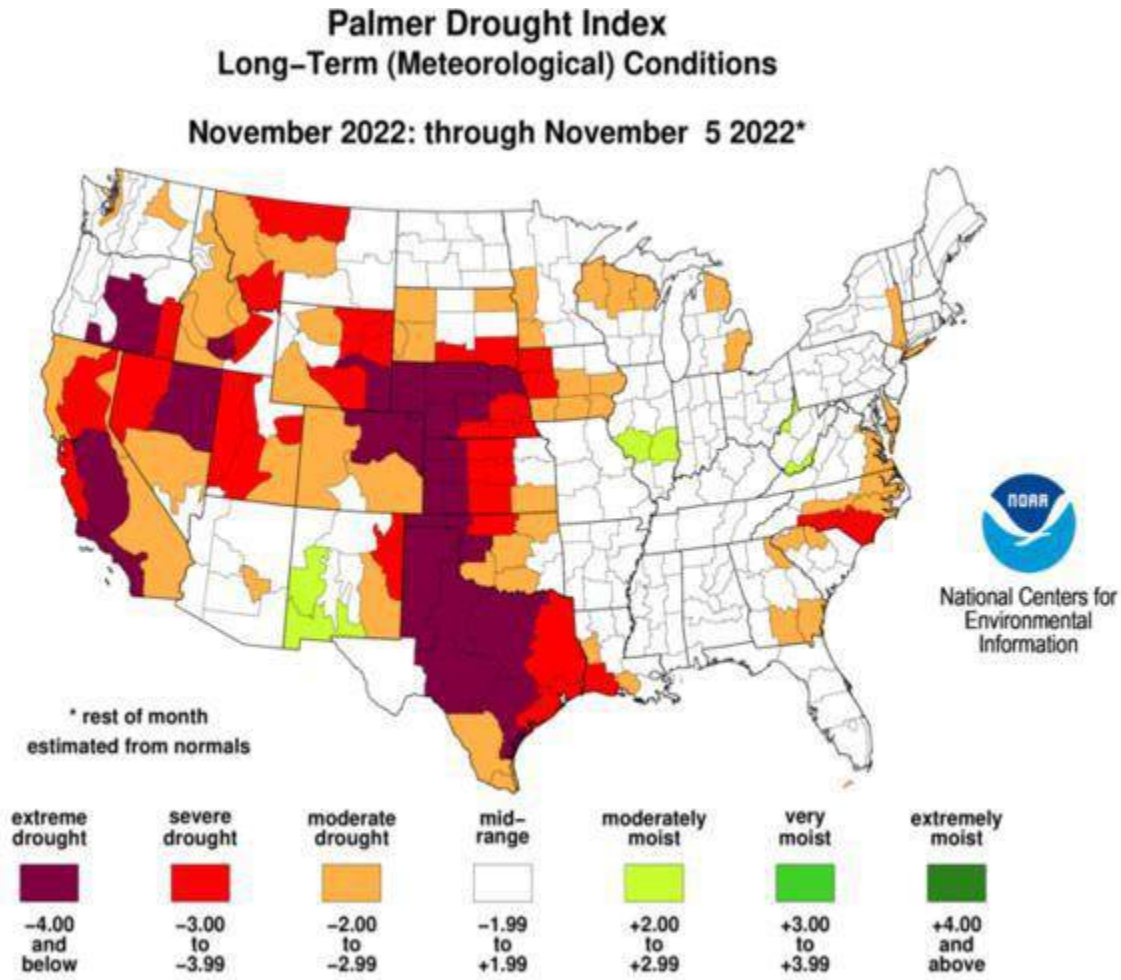


The following two tables summarize 124 years of drought records in all 10 of Michigan's specified climate divisions. There are many

possible ways of expressing this data and comparing Michigan's geographic areas. A consideration of the most severe Palmer Drought Severity Index values has already been provided (which found that division number 1 had the most severe drought in Michigan, with a Palmer index of -7.33 for January 1977), along with lists of lengthy drought periods (which numbered from 6 to 16 per division, during the period from 1895 to 2018). The first table below expresses the percentage of years that either had no drought months at all (with the Palmer Index always above a value of -2.0), or had drought months beyond a certain level of severity. Since a Palmer Index of -2.0 is considered to be a moderate drought (U.S. Drought Monitor category D1), this was the base criterion used to establish the presence of drought in the area during a given month. The percentage of years in which Palmer Index values met various thresholds for drought severity are provided in the table. The annual figures suggest that climate divisions 1, 3, and 4 are more drought-prone within Michigan

Drought Years in Michigan, by Climate Division

(covering the 124 years from 1895 to 2018)

Climate Division	Years without any drought months	With drought ≤ - 2.0 Palmer	With drought ≤ - 3.0 Palmer	With drought ≤ - 4.0 Palmer	With drought ≤ - 5.0 Palmer	With drought ≤ - 6.0 Palmer	With drought ≤ - 7.0 Palmer
1	51%	49%	**33%**	15%	**7%**	**3%**	**1%**
2	49%	51%	30%	14%	4%	0%	0%
3	46%	**54%**	28%	9%	3%	1%	0%
4	51%	49%	30%	**17%**	4%	1%	0%
5	45%	55%	21%	10%	2%	1%	0%
6	53%	47%	20%	10%	2%	1%	0%
7	**54%**	46%	23%	7%	2%	1%	0%
8	52%	48%	28%	10%	2%	1%	0%
9	**54%**	46%	22%	9%	4%	2%	0%
10	**54%**	46%	24%	15%	6%	**3%**	0%

Source: MHA_2019__full_update_natural_hazards.pdf.

Drought Overview

As 25 percent of Isabella County consists of forested lands, the biggest problem drought presents is the increased threat of wildfire. A drought impacted landscape could quickly turn a small fire into a raging out of control blaze. Wildfires could destroy homes, businesses, and other property located in the County's rural residential areas.

A drought could also impact the agricultural areas of the County, alter the quantity and quality of crops, livestock and other agricultural activities, resulting in severe economic and social hardships throughout the County. Droughts were given a moderate priority ranking by the County.

Transportation Hazards

TRANSPORTATION ACCIDENTS: AIR, LAND, AND WATER

A crash or accident involving an air, land or water-based commercial passenger carrier resulting in death or serious injury.

Hazard Description Air Transportation Accidents

There are four circumstances that can result in an air transportation accident:

An airliner colliding with another aircraft in the air.

An airliner crashing while in the cruise phase of a flight due to mechanical problems, sabotage, or other cause.

An airliner crashing while in the takeoff or landing phases of a flight.

Two or more airliners colliding with one another on the ground during staging or taxi operations.

When responding to any of these types of air transportation accidents, emergency personnel may be confronted with a number of problems, including:
Suppressing fires.
Rescuing and providing emergency first aid for survivors.
Establishing mortuary facilities for victims.
Detecting the presence of explosive or radioactive materials.
Providing crash site security, crowd and traffic control, and protection of evidence.

Land Transportation Accidents
A land transportation accident in Michigan could involve a commercial intercity passenger bus, a local public transit bus, a school bus, or an intercity passenger train. Although these modes of land transportation have a good safety record, accidents do occur. Typically, the bus slipping off a roadway in inclement weather, or colliding with another vehicle causes bus accidents. Intercity passenger train accidents usually involve a collision with a vehicle attempting to cross the railroad tracks before the train arrives at the crossing. Unless the train accident results in a major derailment, serious injuries are usually kept to a minimum. Bus accidents, on the other hand, can be quite serious – especially if the bus has tipped over. Numerous injuries are a very real possibility in those types of situations. Existing Prevention Programs

Air Transportation
The Michigan Aeronautics Commission of the Michigan Department of Transportation administers several programs aimed at improving aviation safety and promoting airport development. The Commission's safety programs include:
Registering aircraft dealers, aircraft, and engine manufacturers.
Licensing airports and flight schools.
Inspecting surfaces and markings on airport runways.
Assisting in removal of airspace hazards at airports.
The Commission's airport development program includes providing state funds for airport development and airport capital improvements – many of which contribute to overall air transportation safety.

The Federal Aviation Administration (FAA) contracts with the Michigan Department of Transportation for the inspection of the state's 238 public-use airports on an annual basis. The FAA has regulatory jurisdiction over operational safety and aircraft worthiness. The National Transportation Safety Board (NTSB) investigates all aircraft crashes that involve a fatality and publishes reports on its findings. (See the NTSB section below). A map identifying all the airports within the state is included in this section.

Land Transportation
School bus safety programs and initiatives generally fall into two categories:
Driver skill enhancement and competency training.
Physical inspections of bus mechanical and safety equipment.

The Motor Carrier Division, Michigan Department of State Police, inspects all school buses and other school transportation vehicles (21,000 units) on an annual basis. In addition, all school bus drivers in Michigan must a take and pass a bus driver education and training program, and then take regular refresher courses to maintain their certification to operate a school bus. School bus drivers must also pass an annual medical examination.
Local transit and intercity bus safety falls under the purview of the Michigan Department of Transportation's Bureau of Urban and Public Transportation. Generally, the issue of intercity and transit bus safety is handled on a partnership basis with the service providers, with MDOT providing oversight of the initiatives undertaken by the providers to ensure

mechanical and operational safety.

The Michigan Department of Transportation is the state regulatory agency for railroad-highway grade crossing safety issues. In this role, MDOT conducts biennial, on-site crossing reviews for Michigan's 5,535 public crossings, and reports observed crossing maintenance deficiencies to the responsible railroad or roadway authority. In addition, MDOT conducts diagnostic study team reviews at selected crossings to determine whether the current level of warning device requires enhancement. At the present time, 42% of Michigan's public crossings have at least automatic side-of-street flashing light signals, and 16% have automatic gates.

In January 2001 an amendment (367 P.A. 2000) to the Michigan Vehicle Code went into effect allowing the MSP, MDOT, or specified local officials to install video cameras at railroad crossings to serve as a deterrent to motorists who might attempt to go around or through activated railroad crossing lights and gates. Although the ultimate purpose of this law is to reduce pedestrian and vehicular deaths and injuries at railroad crossings, the law will also likely reduce passenger train accidents caused by collisions with vehicles on the tracks – a major cause of many passenger train derailments.

Michigan's "Operation Lifesaver" Coalition – part of a national, non-profit education and awareness program dedicated to ending tragic collisions, fatalities and injuries at highway-rail grade crossings and on railroad rights of way- has helped reduce the number of serious crashes at railroad crossing in the state. The Operation Lifesaver coalition in Michigan is spearheaded by the MSP and MDOT and is comprised of state and local government officials, law enforcement, and employees of the railroad companies operating in Michigan. The Operation Lifesaver program emphasizes education and enforcement and its efforts appear to be working. Since 1996, the number of crashes, injuries, and fatalities at railroad crossing in Michigan has shown a steady decline. Any reduction in vehicle-train crashes at railroad crossings helps reduce the likelihood of a passenger transportation accident involving a train, school bus, local transit bus, or commercial intercity passenger bus.

Another MDOT program that can help improve rail safety is the Michigan Rail Loan Assistance Program. Established under Act 117, P.A. 1997, this program was initiated to help finance capital improvements on Michigan's rail infrastructure. Although the program is designed primarily to help preserve and improve rail freight service, any improvements made to the rail infrastructure that serves passenger rail service can only help improve passenger rail safety. Track rehabilitation is one of the eligible projects that can be funded under this program, and the safety value of a project is one of the primary selection criteria. (The Isabella County road map and a map of Michigan's Rail system are included in this section. On the Rail map, Isabella County is highlighted in yellow.)

National Transportation Safety Board

The National Transportation Safety Board is an independent federal agency responsible for promoting aviation, highway, railroad, marine, pipeline, and hazardous materials transportation safety. The NTSB is mandated to investigate significant transportation accidents, determine the probable cause of such accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews. Although the NTSV has no regulatory or enforcement powers, it has nonetheless been successful in seeing the adoption and implementation of over 80% of its transportation accident recommendations.

An example of an NTSB recommendation that is being implemented is the recent agreement between the FAA and the Boeing Aircraft Company to redesign the rudder system on the company's popular 737 jetliners and to replace the rudder valve system in every one of the 3,200 737 jets now in service. The rudder retrofit program will cost Boeing nearly one-quarter of a billion dollars. (The 737 rudder system came under close scrutiny of the NTSB after crashes of 737s in 1991 and 1994 resulted in over 150 deaths. The NTSB

believes the rudder system on the two jets might have been a contributing factor in the crashes.)

Transportation Overview

Transportation accidents occur in many forms on land, water, or air. Major transportation accidents have not occurred in recent years in Isabella County but with a major university being located in the County and several major highways going the through the County, it would not be unreasonable to prepare for a large event. The County has identified transportation accidents has a medium priority.

Hazardous Material Incidents

HAZARDOUS MATERIAL INCIDENTS - TRANSPORTATION

An uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment.

Hazard Description

As a result of the extensive use of chemicals in our society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments on a daily basis through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people.

Michigan has had numerous hazardous material transportation incidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. Those types of incidents, while problematic for the affected community, are fairly commonplace. They are effectively dealt with by local and state emergency responders and hazardous material response teams. Larger incidents, however, pose a whole new set of problems and concerns for the affected community. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material (or have the potential for such a release) can adversely impact the life safety and/or health and well-being of those in the immediate vicinity of the accident site, as well as those who come in contact with the spill or airborne plume. In addition, damage to property and the environment can be severe as well. Statistics show almost all hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure of the carrying vessel.

Hazardous Material Incidents: Transportation Overview

Although there have not been any significant hazardous materials transportation incidents, there have been many minor petroleum and hazardous materials spills throughout the years. Most major highways within the county are primarily two lanes and interstates. These routes are heavily congested in the summer months and often icy or impassible in the winter. It is certainly only a matter of time before a serious hazardous materials incident occurs on a county roadway, railway, or waterway.

OIL/GAS WELL INCIDENT

An uncontrolled release of oil or gas, or the poisonous by-product hydrogen sulfide, from wells.

Hazard Description

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula. Since 1925 over 44,000 oil and natural gas wells have been drilled in Michigan, of which roughly half have produced oil and gas. To date, Michigan wells have produced approximately 1.4 billion barrels of crude oil and 4 trillion cubic feet of gas.

The petroleum and natural gas industry is highly regulated and has a fine safety record, but the threat of accidental releases, fires and explosions still exists. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide (H2S) gas. Hydrogen sulfide is a naturally occurring gas mixed with natural gas or dissolved in the oil or brine and released upon exposure to atmospheric conditions. Over 1,300 wells in Michigan have been identified as having H2S levels exceeding 300 parts per million (ppm).

As the table below indicates, at concentrations of 700 ppm, as little as one breath of hydrogen sulfide can kill. Although hydrogen sulfide can be detected by a "rotten egg" odor in concentrations from .03 ppm to 150ppm, larger concentrations paralyze a person's olfactory nerves so that odor is no longer an indicator of the hazard. Within humans, small concentrations can cause coughing, nausea, severe headaches, irritation of mucous membranes, vertigo, and loss of consciousness. Hydrogen sulfide forms explosive mixtures with air at temperatures of 500 degrees Fahrenheit or above, and is dangerously reactive with powerful oxidizing materials. Hydrogen sulfide can also cause the failure of high-strength steels and other metals. This requires that all company and government responders be familiar not only with emergency procedures for the well site, but also with the kinds of materials that are safe for use in sour gas well response.

Physiological Response to H2S

TABLE 4.6

Parts Per Million	Effect on Humans
10ppm	Beginning eye irritation.
50-100 ppm	Slight conjunctivitis and respiratory tract irritation after 1 hour exposure.
100 ppm	Coughing, eye irritation, loss of sense of smell after 2-15 minutes. Altered respiration, pain in the eyes and drowsiness after 15-30 minutes followed by throat irritation after 1 hour. Several hours of exposure results in gradual increase in severity of these symptoms and death may occur within the next 48 hours.
200-300 ppm	Marked conjunctivitis and respiratory tract irritation after 1 hour of exposure.
500-700 ppm	Loss of consciousness and possibly death in 30 minutes to 1 hour.
700-1000 ppm	Rapid unconsciousness, cessation of respiration and death.
1000-2000 ppm	Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if the individual is removed to fresh air at once.

Oil and Gas Well Accidents Overview

There are 443 oil and natural gas wells in Isabella County along with 35.2 miles of gas pipeline. This is a relatively small quantity when compared with state leader, Otsego County, with over 5700 wells. Of almost as great a concern is the fact that a combination of multiple organizations and individuals own the wells. As a general rule, most gas companies prefer to respond to incidents involving their wells themselves – and in the vast majority of cases that is what happens. Because gas companies often have

controlled burns, and deal with wells on a daily basis, it is impossible to ascertain how many incidents have actually occurred in the county. However, there is still the possibility that an emergency response agency could find themselves in the situation of responding to an incident at a gas well. Responders must understand the dangers associated with HS2 and must have a working knowledge of these wells that are in their areas of responsibility.

PETROLEUM AND NATURAL GAS PIPELINE ACCIDENTS

An uncontrolled release of petroleum or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline.

Hazard Description

Though often overlooked, petroleum and natural gas pipelines pose a real threat in many Michigan communities. Petroleum and natural gas pipelines can leak or fracture and cause property damage, environmental, contamination, injuries, and even loss of life. The vast majority of pipeline accidents that occur in Michigan are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations.

Michigan is both a major consumer and producer of natural gas and petroleum products. According to the Michigan Public Service Commission (MPSC), approximately 25% of the natural gas consumed in Michigan is produced within the state. The remaining 75% is imported by five interstate pipeline companies that have access to the major natural gas producing regions in North America. Michigan cycles more natural gas through its storage system than any other state. Michigan ranks 11th in the nation in production of natural gas, and ranks 6th in consumption at 937.2 billion cubic feet. Michigan's petroleum product consumption in 1997 was 189 million barrels, ranking it 10th nationally. These figures underscore the fact that vast quantities of petroleum and natural gas are extracted from, transported through, and stored in the state, making many areas vulnerable to petroleum and natural gas emergencies. Michigan's gas and petroleum networks are highly developed and extensive, representing every sector of the two industries – from wells and production facilities, to cross-country transmission pipelines that bring the products to market, to storage facilities, and finally to local distribution systems.

While it is true that the petroleum and natural gas industries have historically had a fine safety record, and that pipelines are by far the safest form of transportation for these products, the threat of fires, explosions, ruptures, and spills nevertheless exists. In addition to these hazards, there is the danger of hydrogen sulfide (H2S) release. These dangers (fully explained in the Oil and Natural Gas Well Accidents section) can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has a high sulfur content. Hydrogen sulfide is not only an extremely poisonous gas, but is also explosive when mixed with air at temperatures of 500 degrees Fahrenheit or above.

Petroleum and Natural Gas Pipeline Accidents in Isabella County

No major events have been identified in Isabella County in recent years.

Petroleum and Natural Gas Pipeline Accidents Overview

There are several petroleum and natural gas pipelines running throughout the County. Isabella County has several compressor stations and storage fields in the area. In the Emergency Service Office are plans and emergency contact numbers for these locations. One point that is stressed in most of these plans is for local emergency crews not to do anything on scene until a representative from the company arrives.

Because petroleum and natural gas pipeline accidents are an inevitable occurrence, affected local communities must be prepared to respond to the accident, institute necessary protective actions, and coordinate with federal and state officials and the pipeline company emergency crews to effectively manage and recover from the accident. That can best be accomplished through collaborative planning, training, and exercising of emergency procedures with all potentially involved parties.

HAZARDOUS MATERIAL INCIDENTS - FIXED SITE AND PROPANE STORAGE SITES

Hazardous Material Incident-An uncontrolled release of hazardous materials from a fixed site, capable of posing a risk to health, safety, property, and the environment.

Industrial Accidents-A fire, explosion, or other severe accident (especially if it involves hazardous materials) at an industrial facility that results in serious property damage, injury, or loss of life.

Hazard Description (Hazardous Material Incidents)

Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials are materials or substances which, because of their chemical, physical, or biological nature, 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.

Hazardous materials are highly regulated by the government to reduce risk to the general public, property and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use and disposal of these materials, accidental releases are bound to occur. Areas at most risk are within a 1-5 mile radius of identified hazardous material sites. Many communities have detailed plans and procedures in place for responding to incidents at these sites, but release can still cause severe harm to people, property, and the environment if proper mitigative action is not taken in a timely manner.

Hazard Description-Industrial Accidents

Industrial accidents differ from hazardous material incidents in the scope and magnitude of offsite impacts. Whereas hazardous material incidents typically involve an uncontrolled release of material into the surrounding community and environment that may require evacuations or in-place sheltering of the affected population, the impacts from industrial accidents are often confined to the site or facility itself, with minimal physical outside impacts. Nonetheless, industrial accidents, such as fires, explosions, and excessive exposure to hazardous materials, may cause injury or loss of life to workers at the facility, and significant property damage. In addition, industrial accidents can cause severe economic disruption to the facility and surrounding community, as well as significant long-term impacts on the families of the workers injured or killed.

Hazardous Material Incidents/Industrial Accidents in Isabella County No major events have occurred in recent years.

Hazardous Material Incidents/Industrial Accidents Overview

Like all heavily industrialized states, Michigan will always be concerned with the risk of accidental hazardous material releases. However, the threat of accidental hazardous material releases that can affect life, health, property or the environment can be greatly reduced by: 1) developing and maintaining adequate community hazardous material response plans and procedures; 2) adequately training hazardous material workers and off-site emergency responders; 3) educating the public about hazardous materials safety; 4) enforcing basic hazardous material safety regulations; and 5) mitigating, wherever possible, the threat of accidental hazardous material releases. Fortunately, many Michigan communities are making great strides in these important areas.

NOTE: Nuclear research facilities can produce / use radioactive materials, as well as other hazardous substances, and therefore need to be dealt with by specially trained personnel. Caution should be exercised at these facilities, and proper radiological survey equipment should be used during a response.

As a major manufacturing and industrial center, Michigan has had its share of industrial explosions and/or fires that resulted in deaths or injuries. Fortunately, industrial and fire safety regulations enacted over the years have kept these types of accidents to a minimum. Although industrial accidents occur with regularity in Michigan, major incidents with mass casualties, such as the four deadly explosions that occurred in 1998 and 1999, are relatively rare.

Superfund Amendments and Reauthorization Act (SARA), Title II

There are currently 5 Sites in Isabella County designated SARA Title III, Section “302 Sites”. These sites are required to have an emergency plan on file with the Local Emergency Planning Commission, Fire Department, and their facility. All

5 “302 Sites” in Isabella County have an emergency plan on file with the Local Emergency Planning Committee and their individual Fire Departments.

The meetings that were held in the county, attendees and the emergency manager expressed some concern for the safety and security of propane storage sites. The county would like to improve security and inventory the sites for the future safety of the residents. 302 Sites maps are located at the end of this section. (Buffer Zones for 302 Sites are half-mile radius.)

Nuclear Power Plant Accidents

An actual or potential release of radioactive material at a commercial nuclear power plant or other nuclear facility, in sufficient quantity to constitute a threat to the health and safety of the off-site population.

Hazard Description

Such an occurrence, though not probable, could affect the short and long-term health and safety of the public living near the nuclear power plant, and cause long-term environmental contamination around the plant. As a result, the construction and operation of nuclear power plants are closely monitored and regulated by the Federal government.

Nuclear Power Plant Failures Overview

Communities with a nuclear power plant must develop detailed plans for responding to and recovering from such an incident, focusing on the 10 mile Emergency Planning Zone (EPZ) around the plant, and a 50 mile Secondary EPZ that exists to prevent the introduction of radioactive contamination into the food chain. Michigan has 3 active and 1 in-active commercial nuclear power plants, in addition to 4 small nuclear testing/research facilities located at 3 state universities and within the City of Midland. Isabella County does not have a nuclear power plant.

Isabella County does not have a nuclear power plant located within 50 miles and is not within the Secondary EPZ or ingestion pathway zone. Thus, they are not required to have a plans in place for that zone. The closest active Nuclear Power Plant is located within the US is 142 miles, which is the Point Beach

Nuclear Plant in Wisconsin, and the closest nuclear plant in Michigan is 169 miles, which is the Palisades Nuclear Generating Station.

Technological Failures

INFRASTRUCTURE FAILURES

A failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services.

Hazard Description

Michigan’s citizens are dependent on the public and private utility infrastructure to provide essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems fail due to disaster or other cause – even for a short period of time – it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes if immediate mitigative action is not taken. When the water or waste treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur.

These are just some examples of the types of infrastructure failures that can occur, and all of these situations can lead to disastrous public health and safety consequences if immediate mitigative actions are not taken. Typically, it is the most vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) that are the most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and possibly even regions can be severely impacted.

Communication Loss

Communication loss can be catastrophic in emergency situations in the county. Power outages or direct damage to communication equipment could mean life or death in certain situations. The population is dependent on emergency services getting to the incident site in a timely manner, and if there is damage to the equipment, the services may not reach their destination at all. The elderly population in the county is especially vulnerable to power outages and times of extreme weather, and these times are the most important to get services to them. In that case, there needs to be an alternative way of communication for the emergency services to reach their destination.

The county has come up with a few ideas to help solve this problem. They suggested that Mutual aid assistance for failures in utility and communications systems (including 9-1-1) could help alleviate the problem. Alternative 9-1-1 access could be done through radio operators whose homes are identified through special markings. Also, they could use generators for backup power at critical facilities. Finally, the replacement or renovation of aging structures and equipment (to make as hazard-resistant as economically possible).

Infrastructure Failures Overview

Most of Isabella County's infrastructure failures are secondary hazards caused by other major events such as floods, windstorms, snow and ice storms. The main infrastructure failures are power outages, which are normally restored in a matter of hours. However, if the power were out for a longer period of time, the local chapter of the American Red Cross would be called to set up temporary shelters. Infrastructure failures has been given a high priority by the County.

Fire Hazards

WILDFIRES

Location: Although wildfire impacts can be felt throughout the county, certain areas are more susceptible based on a variety variables. Although nearly the entire county falls within the low burn probability category denoted in Map 4.5, areas of higher concern can be found utilizing the Wildland Urban Interface data provided in Map 4.4.

An uncontrolled fire in grass or brushlands, or forested areas.

Hazard Description

Contrary to popular belief, lightning strikes are not a leading cause of wildfires in Michigan. Today, lightning causes only 2 percent of all wildfires, and the rest are caused by human activity. Outdoor burning is the leading cause of wildfires in Michigan. Debris burning was responsible for 32 percent of the wildfires in Michigan in 1999. Incendiary, or intentional, fires accounted for another 12 percent of the total wildfires.

Upon examination of the causes of fire, it becomes apparent that most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from uncontrolled wildfires is the destruction of timber, structures, other property, wildlife, and injury or loss of life to people who live in the affected area or who are using recreational facilities in the area.

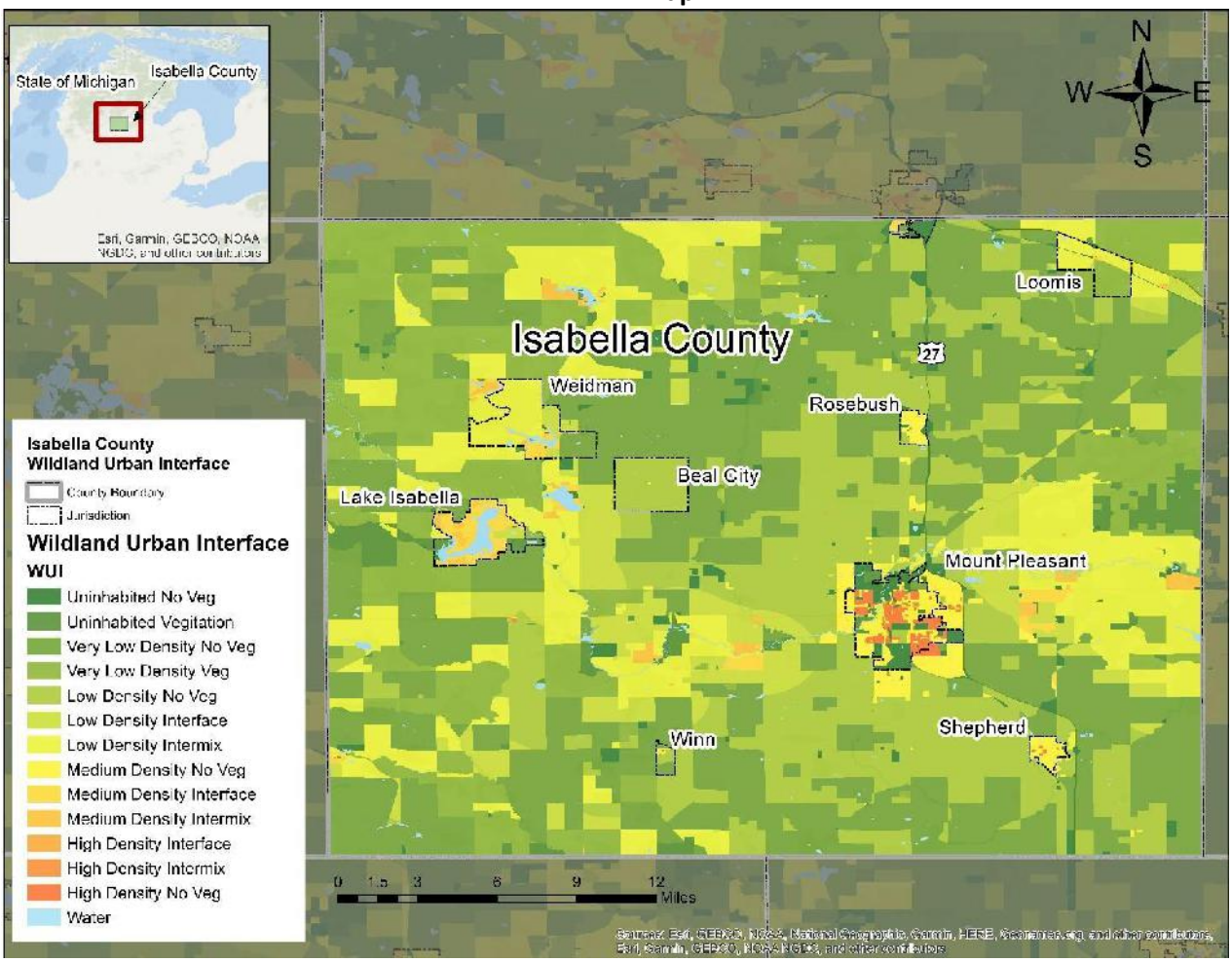
Wildfire Overview

Very little land in Isabella County is identified as forest. The County does not experience many wildfires and has identified them as a medium priority. However, the fire departments within the County are trained to fight them and a mutual aid agreement provides additional support should it be required. According to the Michigan Hazard Analysis 2019 DNR lands reported 3.8 fires per year, no other historic occurrences were recorded for the planning area.

Multiple sources were utilized to produce mapping analyses associated with wildfires throughout Isabella County. For the purposes of identifying vulnerable locations to the wildfire hazard, the Wildland Urban Interface and Burn Probability (Burn Probability (firenet.gov) data sources were utilized in the ArcGIS Desktop mapping application. The below maps depict these areas of vulnerability.

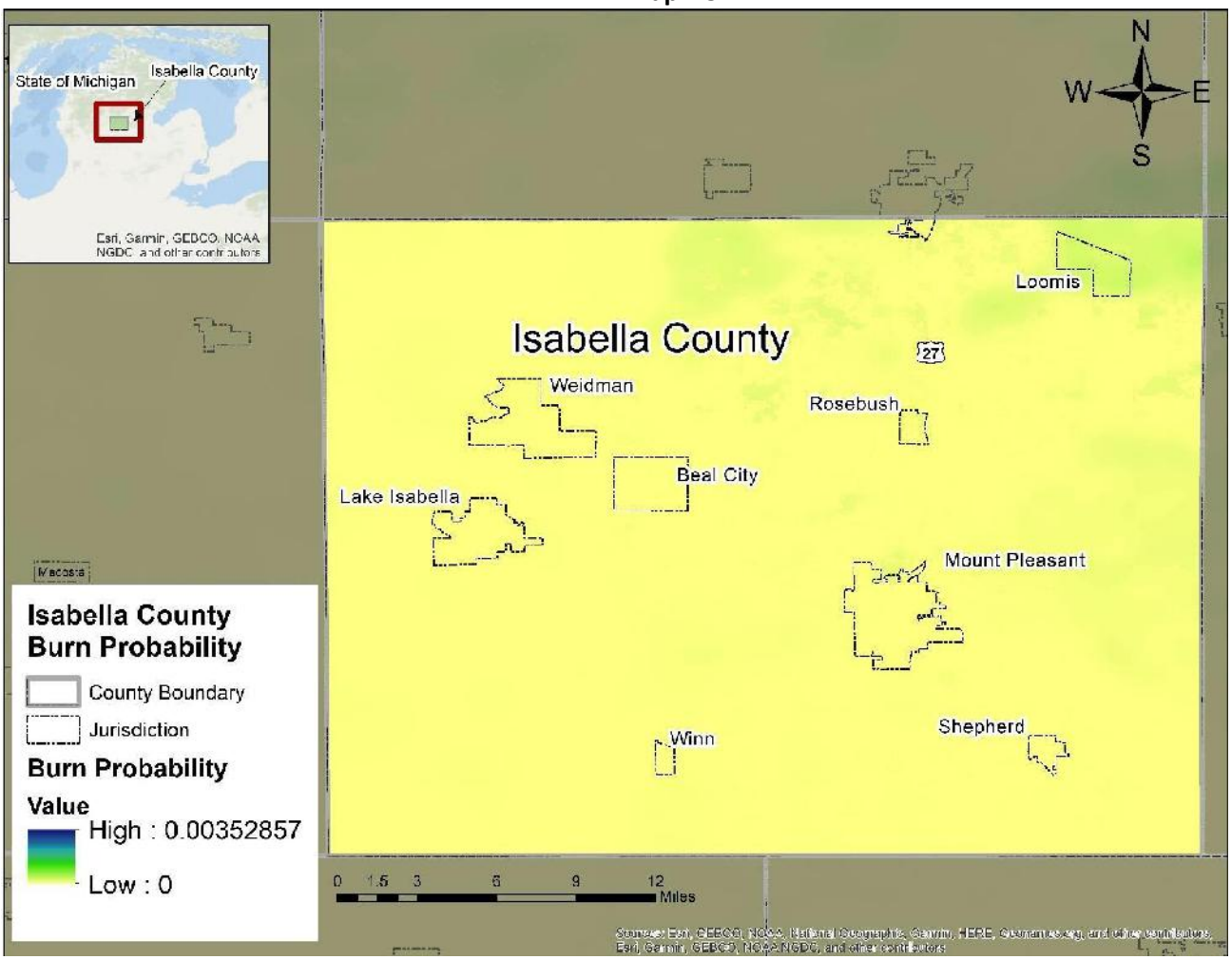
Isabella County Wildland Urban Interface

Map 4.4



Isabella County Burn Probability

Map 4.5



STRUCTURAL FIRES

A fire, of any origin that ignites one or more structures, causing loss of life and/or property. Hazard

Description

In terms of average annual loss of life and property, structural fires – often referred to as the "universal hazard" because they occur in virtually every community – are by far the biggest hazard facing most communities in Michigan and across the country. Each year in the United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. According to some sources, structural fires cause more loss of life and property damage than all types of natural disasters combined. Direct property losses due to fire exceed $9 billion per year – and much of that figure is the result of structural fire.

According to the Federal Emergency Management Agency's National Fire Data Center, residential fires represent 74% of all structural fires and cause 80% of all fire fatalities. Approximately 85% of those

fatalities occur in single- family homes and duplexes. Perhaps the most tragic statistic of all is that over 40% of residential fires and 60% of residential fatalities occur in homes with no smoke alarms.

According to statistics compiled by the Fire Marshal Division, Michigan Department of State Police for 2003 (the last year for which statewide statistics are available), nearly 19,000 structural fires occurred in Michigan, resulting in 161 deaths and 624 injuries. Dollar losses for structural fires were estimated at nearly $230 million. The Fire Marshal Division estimated that a structural fire occurred in Michigan every 28 minutes in 2003. Nationally, Michigan's fire death rates in 2007 of 15.4 persons per million (population) puts it in the upper third of all states in the nation.

A major challenge facing the Michigan fire service is the lack of a state-mandated fire safety code and code enforcement program for all occupancies.

Structural Fires in Isabella County

There are numerous structural fires annually in Isabella County. Often these fires result in the loss of a home or a business.

On 3/10/2015, a major fire resulted in the loss of multiple commercial buildings in downtown Shepherd. No human lives were lost or injured, however, several pets (dogs and cats) died in the blaze. At the time, of this writing the origin of the fire has not been determined.

Structural Fires Overview

Major impacts occur every year, beyond the ordinary single-home fires that happen in every community. Since historic areas are less well-fireproofed and tend to have greater densities, the risk of major fire impacts seems to be higher there. Due to the intensity and danger of the fires, the County has identified structural and scrap tire fires as a medium priority.

SCRAP TIRE FIRES

A large fire that burns scrap tires being stored for recycling/re-use. Hazard Description

Michigan generates some 7.5 to 9 million scrap tires each year. Although responsible means of disposal have become more common, tire dumps of the last forty years present environmental and safety hazards that will last into the foreseeable future. By 2001, the State of Michigan had identified a total in excess of 24 million scrap tires in disposal sites scattered around the state.

The Scrap Tire Regulatory Program is implemented by the Waste Management Division of the Michigan Department of Environmental Quality, under the authority of Part 169 of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. Policies and regulations established under this law provide the basis for the MDEQ to implement and administer an effective scrap tire management program per the following initiatives: 1) a compliance and enforcement program was implemented; 2) a scrap tire policy recycling hierarchy was established; 3) special uses of scrap tires were approved; and 4) a grant program was established to address abandoned tires.

In 1997, Part 169 was amended to require that a statewide emergency response plan be put into place to address response to fires at collection sites.

Scrap Tire Fires in Isabella County

Isabella County has not had a significant tire fire in recent memory, and the scrap tires that were identified in 2001 have since been removed from the County.

Scrap Tire Overview

With the elimination of scrap tire sites within Isabella County, this hazard has been greatly reduced. As there are old tires located at car dealerships and other sites, this hazard has not been completely eliminated. Scrap tires has been combined with structural fires as a hazard and was given a medium priority to address.

Seasonal Population Increase

SEASONAL POPULATION INCREASE

Location: This hazard has can affect all jurisdictions within Isabella County. Although the entire planning area can experience this hazard major population centers such as Mt. Pleasant may require greater responses to this hazard.

A population, in the county, beyond the normal level of people to which resources are allocated. Hazard Description

As more and more people vacation to the northern portions of Michigan, local communities in northern Michigan are going to find it harder to maintain levels of safety and resources to keep the population in the jurisdictions comfortable and safe. The trend of people buying summer homes or cottages is growing, and with the advent of Baby-Boomers reaching retirement age, the seasonal and permanent populations of the northern counties will continue to slowly grow.

Many stresses are put on local governmental agencies such as fire departments, police departments, as well as hospitals, the road commission, and ambulance services to maintain the status quo of service for their county. With more people relocating to the northern counties for extended periods of time, the level of staff and resources may not suffice to the needs of the population.

Isabella County is no exception to seasonal population spikes in the summer, deer season, and to a lesser extent, the winter months. On top of population growth, which grew from 65,351 in 2000 to 70,311 in 2010 (+4960), Isabella County has approximately 10,000 housing units classified as seasonal, recreational, and occasional.

Seasonal Population Increases in Isabella County

With the power outages across the country in the summer of 2003, Isabella County experienced a high influx of people from the Detroit area going to their seasonal homes. The emergency management office reported that there were low supplies of food and stresses on emergency services in Isabella County.

Seasonal Population Increase Overview

Seasonal population increases will continue to be a concern in Isabella County unless there are preventative measures taken to solve it. The population of Isabella County is projected to steadily increase and with budget cuts, Isabella County is finding it hard to maintain the status quo for emergency services. The seasonal population influx will only make the situation harder to manage. Also, infrastructure problems in southern Michigan (power outages) can be a factor that directly affects Isabella County.

Civil Disturbances

CIVIL DISTURBANCES

Collective behavior that results in a significant level of law-breaking, perceived threat to public order, or disruption of essential functions and quality of life.

Hazard Description

Civil disturbances can be classified within the following four types: (1) acts or demonstrations of protest, (2) hooliganism, (3) riots, or (4) insurrection. Since most of these types of disturbance share similarities with each other, and the classifications presented here are not absolute and mutually exclusive, it is recommended that this entire section be studied as a whole. The descriptions that follow, while roughly organized by type of disturbance, provide information of interest in evaluating and understanding all types of civil disturbance, and therefore should not be treated as independent subsections or read in isolation from each other.

The first type, demonstrations of protest, usually contains some level of formal organization or shared discontent that allows goal oriented activities to be collectively pursued. This first category includes political protests and labor disputes. Many protest actions and demonstrations are orderly, lawful, and peaceful, but some may become threatening, disruptive, and even deliberately malicious (on the part of at least some of those involved either in the protest itself or in reaction to the protest). It is only the latter type of event that should properly be classified as a civil disturbance. The destruction of property, interruption of services, interference with lawful behaviors of ordinary citizens and/or emergency responders, the use of intimidation or civil rights violations, and threats or actual acts of physical violence may all occur during civil disturbance events. Actual Michigan events have included the willful destruction of property and impeded property access during labor strikes, and heated conflicts between opposing participants at political rallies or issue-driven demonstrations. Different risks and forms of disturbance are connected with the nature and perceived importance of the cause, the degree of organization among those who are active in the protest, and the amount of group cohesion among those who are involved.

The second category of civil disturbance, hooliganism, is relatively unorganized and involves individual or collective acts of deviance inspired by the presence of crowds, in which the means (and responsibility) for ordinary levels of social control are perceived to have slackened or broken down. Certain types of events, such as sporting events, “block parties,” or concerts, become widely publicized and, in addition to normal citizens who merely seek entertainment, tend to also attract certain types of persons who seek situations in which anonymity, confusion, and a degree of social disorder may allow them to behave in unlawful, victimizing, or unusually expressive ways that would normally be considered unacceptable by most ordinary people. An Example includes the disorder that has followed various championship sporting events. Although the majority of persons present are ordinary citizens (although many may have some level of intoxication), a minority of persons begin making itself known through unlawful or extreme acts of deviance, and it is from this part of the crowd that the hazard primarily stems.

Common problems include the widespread destruction of property, numerous types of assault and disorderly conduct, and criminal victimization. It should also be noted that many persons who are normally law-abiding may temporarily behave in unusually aggressive ways during these events, often prompted by an understandably defensive anxiety about the disorder and behavior exhibited by the

deviant minority, but also possibly exacerbated by a level of alcoholic intoxication as well as the temptation by some to engage in appealing deviant behaviors that under normal circumstances of social control would not be selected. Many citizens remain law-abiding, but may remain in the area of a civil disturbance either because they live in the area, have activities (including social and recreational ones) that they wish to continue engaging in, have legitimate business to conduct, or because they are curious or concerned and wish to observe or witness the situation as it occurs. The majority of such law-abiding citizens will leave the area in an orderly way when given clear instructions by a legally-recognized authority to do so. There are cases in which hooliganism may become combined with protest, and thus complicate the situation for law enforcement personnel. In some circumstances, elements of protest are added only by a small minority of participants after the disturbances have already begun, but in other circumstances, protest activity may arise out of concerns regarding the extent and nature of pre-emptive law enforcement activities that were intended to prevent a civil disturbance.

The third type, riots, may stem from motivations of protest, but lacks the organization that formal protests include. Although legitimate and peaceful protests may spontaneously form when people gather publicly with the perception that they already share certain values and beliefs, riots tend to involve violent gatherings of persons whose level of shared values and goals is not sufficiently similar to allow their collective concerns or efforts to coalesce in a relatively organized manner. Instead, there tends to be a diffuse sense of shared discontent, but relatively few norms to shape these strivings into clearly coherent action. For example, widespread discontent within a community that is sufficiently cohesive may quickly take on a set of shared leaders and clear organization, such as a march or chant that is clearly in the form of a protest or demonstration, but in an area that doesn't have the same cohesiveness and shared norms and values, a relatively chaotic form of expression may take place instead, involving assaults, intimidation, and unlawfully destructive expressions of discontent, possibly including the victimization of innocent citizens or businesses who have been selected by part of the crowd to function as scapegoats during their expression of discontent. In addition to the sentiments of discontent that may have sparked the initial activities, however, elements of hooliganism may emerge and even come to predominate, as certain persons may attempt to exploit the social disorder for their own individual ends. In other cases, elements of legitimate protest may also form within this type of civil disturbance, and pockets of organized protest may help to channel and contain the negative elements of hooliganism, looting, etc. that might otherwise threaten all area residents. The complexity of these events for law enforcement can be very great, demanding carefully calculated efforts to analyze the nature of the disturbance, and difficult decisions about how to approach and possibly involve the numerous types of persons, gatherings, groups, and behaviors that may have the potential to either mitigate or exacerbate the situation.

The fourth type of civil disturbance, insurrection, involves a deliberate collective effort to disrupt or replace the established authority of a government or its representatives, by persons within a society or under its authority. Some prison uprisings may fall into this category, although others may more properly be classified as riots or protests, depending upon the presence and extent of specific goals and organization, and the type of action used in achieving such goals. An insurrection has the deliberate goal of either replacing established authorities with a new distribution of power, or with the destruction of established power structures in favor of (usually temporary) anarchy or a smaller-scale set of recognized criminal (gang), ethnic, or other group networks and power structures. The latter circumstances tend to involve disturbances that exist on a relatively small scale, such as in a single local area or involving a prison network or "cult compound" (or any other similarly self-aware group or subculture with identified collective interests and a network that allows rapid communication). However, larger-scale insurrections are also possible, involving issues of class conflict or other widespread social inequalities, highly divisive political issues, or other important large-scale events that disrupt the social equilibrium because they

illuminate areas in which cultural values are not sufficiently shared throughout the society or region that is experiencing the conflict, disruption, or strain. In many cases, this kind of large-scale social strain has developed gradually over time, and involves an entire series of compromises, concessions, and migrations that may temporarily relieve the disruptive social and value conflicts, only to reemerge after another period of changes and population growth has caused a breakdown in previous arrangements. This description of the causes of social discontent applies to many protests and riots, as well as insurrection. In cases involving the formation or emergence of significant subcultures or counterculture, such as during the Vietnam era, or when dominant values break down or fail to be established on important key issues or mores, there is the potential for insurrection on a larger scale. The Civil War of 1861-1865 was one such instance, in which the authority of the federal government was either accepted or rejected by various states which then aligned themselves in opposition to each other. Between these two extremes (of a purely localized civil disturbance and a national civil war) are numerous other possibilities for regional, political, class, or ethnic conflicts that may involve one or more categories of citizen in conflict with others. Examples could include prisoners versus law enforcement personnel, a countercultural group versus the establishment, or a violent political activist group in conflict with selected representatives of a contrary viewpoint. (Some such actions may overlap with those of terrorism, q.v.)

Civil Disturbance Overview

Civil disturbances occur rarely in Isabella County. However, with the ever increasing threats throughout society, and a major four-year university located in the County, this is a growing concern. Should a major event occur, other local and/or state law enforcement personnel may have to be called in to assist the local public safety personnel.

NUCLEAR ATTACK

A hostile action taken against the United States which involves nuclear weapons and results in destruction of property and/or loss of life.

Hazard Description

Any hostile attack against the United States, using nuclear weapons, which results in destruction of military and/or civilian targets. All areas of the United States are conceivably subject to the threat of nuclear attack. However, the strategic importance of military bases, population centers and certain types of industries place these areas at greater risk than others. The nature of the nuclear attack threat against the U.S. has changed dramatically with the end of the "Cold War" and the conversion of previous adversaries to more democratic forms of government. Even so, the threat still exists for a nuclear attack against this country. Despite the dismantling of thousands of nuclear warheads aimed at U.S. targets, there still exists in the world a large number of nuclear weapons capable of destroying multiple locations simultaneously. In addition, the number of countries capable of developing nuclear weapons continues to grow despite the ratification of an international nuclear non-proliferation treaty. It seems highly plausible that the threat of nuclear attack will continue to be a hazard in this country for some time in the future.

At this point, attack-planning guidance prepared by the Federal government in the late 1980s still provides the best basis for a population protection strategy for Michigan. That guidance has identified 25 potential target areas in Michigan, and 4 in Ohio and Indiana that would impact Michigan communities, classified as follows: 1) commercial power plants; 2) chemical facilities; 3) counterforce military installations; 4) other military bases; 5) military support industries; 6) refineries; and 7) political targets. For each of these target areas, detailed plans have been developed for evacuating and sheltering the impacted population,

protecting critical resources, and resuming vital governmental functions in the post-attack environment. Even though Iosco County has an airbase; the threat of a nuclear attack has been lowered due to the end of the "Cold War" and the closure of the base. There still may be a small threat to the former base because it could still be reused for B-52 Stratofortress bomber operations in case the current Stratofortress base is destroyed. The airfield could also have the potential for terrorism/sabotage and is being looked at under that category.

Nuclear weapons are explosive devices that manipulate atoms to release enormous amounts of energy. Compared to normal chemical explosives such as TNT or gunpowder, nuclear weapons are far more powerful and create harmful effects not seen with conventional bombs. A single nuclear weapon is able to devastate an area several miles across and inflict thousands of casualties. Although nuclear attack is an unlikely threat, the severe damage that would be caused by even one weapon requires the danger to be taken seriously.

The threat of nuclear attack has primarily been associated with the Cold War between the United States and the Soviet Union in the last half of the 20th Century. Although the Cold War is over, there remains a threat of nuclear attack. More nations have developed nuclear weapons and there is also the possibility that terrorists could use a nuclear weapon against the United States.

Hazard Analysis Understanding Nuclear Weapons

The following information about nuclear weapons is important for understanding the threat of nuclear attack: (1) types of nuclear weapons, (2) measures of weapon power, (3) forms of attack, and (4) types of delivery systems.

Nuclear weapons have been built in a wide variety of types for several different purposes. The first weapons relied on nuclear fission, or the splitting of heavy atoms to release energy and create an explosion. Later, new weapons were invented that used a combination of fission and fusion, which involves the creation of heavier atoms from lighter ones. Fusion bombs are also referred to as hydrogen bombs or H-bombs. For emergency planning purposes, the important differences are that (1) fusion bombs are more difficult to build and (2) that they can be much more powerful. Otherwise, all types of nuclear weapons create the same types of effects.

The power of nuclear weapons is measured by comparing the energy released by the weapon to the energy released by large amounts of conventional high explosive. The strengths of smaller weapons are measured in kilotons (or thousands of tons) of TNT explosive. A twenty-kiloton bomb produces as much energy as twenty thousand tons of TNT exploded all at once. The strength of larger weapons is measured in megatons, or millions of tons of TNT. A two-megaton bomb produces as much energy as two million tons of high explosive.

Smaller nuclear weapons are generally designed to be used against military targets on the battlefield. These are called tactical nuclear weapons. Larger devices designed to attack cities, infrastructure, and military bases are called strategic nuclear weapons.

Bombs can be set off at varying heights above the target. If the bomb is set off high in the air, its effects are spread out over a wider area and generally more damage is done. This is called an air burst. A bomb that is set off at or near the Earth's surface level wastes much of its energy against the ground. This is called a ground burst. Ground bursts have some specific military uses and terrorists may use ground bursts because they are unable to lift their weapons high enough to create an air burst.

Like any weapon, a nuclear device must be carried to its target by a delivery system. The first nuclear weapons were bombs dropped out of aircraft. Later, tactical weapons were made small enough to fire out of cannons or carry in large backpacks. Intercontinental ballistic missiles (ICBMs) are rockets that can carry one or more nuclear weapons across thousands of miles in less than an hour. Terrorists may lack sophisticated missiles, but they could create effective delivery systems by transporting a nuclear weapon in the back of a truck, aboard a cargo plane, or within a shipping container.

Effects of Nuclear Weapons

The effects of nuclear weapons are more complicated than those of conventional explosives. Nuclear devices cause damage through six major effects: (1) thermal pulse, (2) blast, (3) prompt radiation, (4) electromagnetic effects, (5) mass fire, and (6) residual radiation.

THERMAL PULSE is an intense flash of light and heat released within the first few seconds of a nuclear explosion. The damage from thermal pulse is almost instantaneous and covers a wide area. People and animals exposed to the pulse can be badly burned. Flammable objects such as buildings, vehicles, and trees may be set on fire. The flash is strongest close to the bomb and becomes weaker with distance. Even people located far away from the explosion may still be blinded by the intense light of the pulse.

BLAST is a powerful wave of force that moves out from the center of the explosion through the air and the ground. The farther the blast travels, the weaker it becomes. Very close to the bomb, the blast will destroy even the most strongly built buildings and will kill everyone not hidden deep underground. Farther away, buildings may survive, but with severe damage, and people will be injured by being picked up and smashed against objects. At still greater ranges, buildings will be less damaged and injuries will largely result from shattered glass and thrown debris. At all distances, a powerful wind follows the initial blast wave and adds to the destruction. The blast from a ground burst will dig a large crater into the ground, but this cratering will not occur with an air burst.

PROMPT RADIATION is the harmful blast of high energy radiation given off at the same time as the thermal pulse. Prompt radiation includes gamma rays and neutron radiation. This radiation is capable of killing or injuring living beings by damaging tissues and organs. Prompt radiation is quickly absorbed by the atmosphere and does not impact as wide an area as other nuclear weapons effects. In most instances, a person close enough to receive a harmful dose of prompt radiation is also close enough to be immediately killed by the explosion's thermal pulse or blast. However in unusual cases, some people who survive the immediate effects of the bomb may sicken or die days later, from radiation poisoning.

ELECTROMAGNETIC EFFECTS occur immediately after a nuclear explosion and may damage communications equipment, computers, and electronics. Radios, cell phones, and power lines are especially vulnerable. In most cases, the effects are limited to an area near to the explosion. Some equipment may recover after a period of time, while other devices will need to be replaced. One special type of nuclear attack might cause more widespread electromagnetic effects: a very large nuclear weapon carried high into the atmosphere by a missile is capable of damaging communications and electronics over a very large area.

MASS FIRE results from the ignition of thousands of individual fires by a bomb's thermal pulse, combined with widespread destruction from its blast. Over a period of hours, small fires merge and feed on damaged buildings and debris. Controlling these fires would be very difficult, due to damaged water mains, destroyed fire-fighting equipment, and blocked roads. The result is an extremely intense fire that can

spread quickly and reach very high temperatures. Mass fire may significantly expand the area devastated by a bomb, destroying areas that might otherwise be only lightly damaged by other types of effects.

RESIDUAL RADIATION is unlike prompt radiation in that it lasts well after the nuclear explosion has ended. The ground immediately underneath the center of the explosion will be dangerously radioactive for several days due to "induced radiation." There will also be some radioactive dust and debris that will drift downwind of the explosion. This radioactive dust is called "fallout." Fallout will be a minor problem in the case of an air burst explosion, but will be very intense in the case of a ground burst attack. Regardless of the type of attack, the danger from fallout will tend to be greatest close to the site of the attack. The cloud of fallout will weaken the longer it lasts and the farther it travels.

Note that the effects of a nuclear attack will depend on the size of the weapon. A larger bomb will cause damage over a wider area. The importance of different types of damage will also vary with the weapon. Large strategic nuclear weapons will create most of their damage though thermal pulse and mass fires, while with small tactical bombs the blast effect and prompt radiation will be relatively more important.

Nuclear Attack Overview

Nuclear attack is an unlikely hazard, but even a single weapon could cause death and destruction on a massive scale. Nuclear weapons inflict damage over a wide area and through a variety of effects, including thermal pulse, blast, fire, and radiation. Despite the end of the Cold War, nuclear attack by foreign nations remains a real possibility, and this danger has been joined by the threat of terrorist nuclear attack. It makes sense to continue to prepare for the nuclear attack hazard as part of an overall emergency management strategy.

Hazard Mitigation Alternatives for Nuclear Attack

Designated fallout shelters and public warning systems.
Construction of concrete safe rooms (or shelters) in houses, trailer parks, community facilities, and business districts.
Using laminated glass, metal shutters, structural bracing, and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
Increased coverage and use of NOAA Weather Radio (which can provide notification to the **c**ommunity during any period of emergency, including enemy attack).
(Note: Should a nuclear attack occur, the emergency management will be taken over by the Department of Homeland Security.)

SABOTAGE (TERRORISM)

An intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives.

Hazard Description

Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical, radiological, and biological weapons;
5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrowing the U.S. Government; 8) eco-extremism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations. Because sabotage/terrorism objectives are so widely varied, so

too are the potential targets of such actions. Virtually any public facility or infrastructure, or place of public assembly, can be considered a potential target. In addition, certain types of businesses engaged in controversial activities are also potential targets, as are large computer systems operated by government agencies, banks, financial institutions, large businesses, health care facilities, and colleges/universities.

One of the first acts of domestic sabotage/terrorism ever carried out occurred in Michigan on May 18, 1927, in Bath. A disgruntled taxpayer and farmer detonated 1,000 pounds of explosives under the newly constructed Bath Consolidated School killing 38 students and 3 teachers and injuring 58 others. The perpetrator then blew himself up, along with the school superintendent. As tragic as that event was, it could have been worse were it not for the fact that half of the explosives failed to detonate as planned, which certainly would have killed many more students and teachers. Concentrated activities to prevent terrorist activities have become even more vital with the passage of time and in the wake of the 9/11 events of destruction in New York City and Washington D.C. Many more resources may anticipate to be mobilized to prevent terrorist activities in the near future.

Although at first it might appear Isabella County is an unlikely target for terrorism, it cannot be totally discounted. Potential targets include the dams, the water treatment plant, the runways at the airports, and all industrial sites in the area. Furthermore, any government building, school, or individual can become a target of domestic terrorism.

Sabotage and Terrorism include a broad range of potential hazards that affect a community from a variety of perspectives. This hazard is defined as an intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives. Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical, radiological, and biological weapons; 5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrowing the U.S. Government; 8) eco-extremism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations.

Sabotage Overview

Even though there have not been any recently recorded sabotage/terrorism events occurring recently in Isabella County, the Emergency Management staff has regularly scheduled training events to address these circumstances. With the ever-growing threat of local acts, the County is working to prepare their personnel should an event occur.

Public Health Emergencies

PUBLIC HEALTH EMERGENCIES

Location: This hazard effects every community in Isabella County. Although the entire county is susceptible to this hazard, areas with higher concentrations of populations 65 and older tend to be the more susceptible to this hazard. The percentage of population within the county of 65 and older is 13.7%, most of this at risk demographic are dispersed throughout the county; however there are nine identified long term care facilities and retirement communities identified within the county, seven of the facilities are located in or near the City of Mt Pleasant.

A widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and well-being of the public.

Hazard Description

Public health emergencies can take many forms: 1) disease epidemics; 2) large-scale incidents of food or water contamination; 3) extended periods without adequate water and sewer services; 4) harmful exposure to chemical, radiological, or biological agents; 5) large scale infestations of disease-carrying insects or rodents. Public health emergencies can occur as primary events by themselves, or they may be secondary events another disaster or emergency, such as flood, tornado, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

Perhaps the greatest emerging public health threat would be the intentional release of a radiological, chemical, or biological agent with the potential to adversely impact a large number of people. Such a release would most likely be an act of sabotage aimed at the government or at a specific organization or segment of the population. Fortunately, Michigan has not yet experienced such a release aimed at mass destruction.

Public Health Emergencies in Isabella County

The most common type of public health emergency involves influenza that spreads through educational institutions, the workplace and other entities that experience a large volume of public traffic. Influenza typically kills between 200 and 500 individuals in Michigan alone and has the potential to change its structure and rapidly affect large populations.

Occurrences of influenza and disease are common to residents, students and visitors to Isabella County and typically impact only a small portion of the population. Although most of public health related events occur in schools and are quickly managed, the potential does exist for these events to rapidly spread to adjacent populations.

Most public health emergencies in Isabella County impact only a small number of individuals and occur more than once annually. The potential for these events to continue is high and can be effectively managed. However, increased public awareness to potential outbreaks of influenza or other disease has also raised the real possibility that a large scale event could occur. For this reason, development and testing of surveillance systems and integrated planning between local, state and federal sources continues to receive much needed attention.

Coronavirus (COVID-19)

The global public health emergency caused by the coronavirus unfolded rapidly and dramatically. The virus, which causes the COVID-19 disease, emerged in Wuhan, China, in late 2019. Since then, it spread to more than 200 countries and territories, including Michigan in the spring of 2020. COVID-19 is a new virus in humans causing respiratory illness which can be spread from person-to-person and people can be asymptomatic. Genetic variants of SARS-CoV-2 have been emerging and circulating around the world throughout the COVID-19 pandemic and have been associated with changes to receptor binding, reduced neutralization by antibodies generated against previous infection or vaccination, reduced efficacy of treatments, potential diagnostic impact, or predicted increase in transmissibility or disease severity. COVID-19 impacted the entire County, and the first case in Michigan was identified in March of 2020. In an effort to limit the spread of the virus, health officials issued stay-at-home orders requiring residents to halt many nonessential activities, and multiple reservation-wide shutdowns. Since early spring of 2020, limited PPE was available for health care and emergency services agencies. Public health capabilities were challenged to keep pace with the community transmission as restrictions were relaxed. Every public health and medical organization, business, and residents in the County have been impacted. A few considerations

specific to the region include, but are not limited to: the ability of the virus to transfer; lack of testing availability; delay of medical care due to the pandemic overwhelming hospital systems and people being fearful of seeking care; increased reporting and evidence of the negative impacts on residents' mental health and well-being; the need for

increased public information and education to garner greater confidence in the COVID-19 vaccine; and mass vaccination efforts, especially ensuring priority and at-risk groups receive the vaccine and ensuring an equitable process.
The global pandemic required many communities to address the need for extensive situational awareness and coordinated planning; increased coordination across all disciplines, including the philanthropic, business and schools community at an unprecedented scale; public information and warning; reopening strategies; public health orders; resource support; addressing essential staff limitations/shortages across key health and medical sectors during various phases of the pandemic; limited public health laboratory testing early in the pandemic; contact tracing and investigation; fatality management; medical countermeasure dispensing and administration, specifically vaccine planning and distribution; medical surge; ongoing resupply of PPE; and community and economic recovery.
COVID-19 has resulted in incredible disruptions to the County.

Public Health Emergency Overview

Michigan has had several large-scale public health emergencies in recent history, prior to the COVID -19 Pandemic no events caused widespread severe injury or death. One of Michigan's most serious emergencies to hit Michigan occurred in 1973 when a local farmer fed polybrominated biphenyls (PBB) laced feed to his dairy herd. Michigan Chemical Corporation had accidentally supplied the Michigan Farm Bureau Services with sacks of fire-proofing chemical PBB, which is known to cause cancer, genetic mutation, and birth defects, and the PBB was inadvertently substituted for magnesium oxide (commonly used in antacid tablets used for human consumption) in a custom dairy feed # 402. During the crucial eight-month period between the farmer's first observations and the discovery of the accident, serious contamination had already occurred. By 1975 the state had quarantined more than 500 farms. Condemned for slaughter were more than 17,000 cattle; 3,415 hogs; 1.5 million chickens and 4.8 million eggs. The 1973 PBB contamination incident is unprecedented in U.S. history, but the long-term implications of contamination may be less than was feared.

In the 1980s, the state health department confirmed that 95 percent of Michigan's population had PBB in their bodies from eating beef, drinking milk or consuming other products from contaminated farms. A cancer epidemic was feared. Although one has not occurred, so far anyway, studies do show the most exposed families have increased breast and digestive cancer, and lymphoma. Among the effects observed in the exposed populations the daughters of the most highly exposed women began menstruation, on average, before they reached their twelfth birthdays.

Similarly, the northern Michigan water and sewer infrastructure disaster of 1994 is also unprecedented in scope, magnitude, and public health and safety implications for the affected communities. These events, though unusual, have heightened awareness of the broad nature of threats that can result in a public health emergency. Such emergencies no longer simply involve the spread of disease, but rather can arise out of a variety of situations and circumstances.

In 2001, Michigan health officials were introduced to the emerging health threats posed by foot-and- mouth disease and the West Nile encephalitis virus. Although foot-and-mouth disease is a highly contagious disease that only affects animals, a widespread outbreak such as that which occurred in parts of the United Kingdom in the spring of 2001 could have significant public health implications for humans as well, due to the potentially large numbers of dead animal carcasses that would have to be disposed of to prevent disease outbreaks. The Michigan Department of Agriculture and Rural Development, in conjunction with numerous other federal, state and local agencies and the agriculture industry, continues to monitor the foot-and-mouth disease situation and take the necessary steps to prevent the introduction and spread of the disease in the United States.

Geological Hazards

EARTHQUAKES

Location: This hazard has an equal chance of affecting all jurisdictions within Isabella County.

A shaking or trembling of the crust of the earth caused by the breaking and shifting of rock beneath the surface.

Hazard Description

Earthquakes range in intensity from slight tremors to great shocks. They may last from a few seconds to several minutes, or come as a series of tremors over a period of several days. The energy of an earthquake is released in seismic waves. Earthquakes usually occur without warning. In some instances, advance warnings of unusual geophysical events may be issued. However, scientists cannot yet predict exactly when or where an earthquake will occur. Earthquakes tend to strike repeatedly along fault lines, which are formed where large plates of the earth's crust below the surface constantly push and move against one another. Risk maps have been produced which show areas where an earthquake is more likely to occur. Earthquake monitoring is conducted by the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, and universities throughout the country.

The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Most casualties result from falling objects and debris. Disruption of communications systems, electric power lines, gas, sewer and water mains can be expected. Water supplies can become contaminated by seepage around water mains. Damage to roadways and other transportation systems may create food and other resource shortages if transportation is interrupted. In addition, earthquakes may trigger other emergencies such as fires and hazardous material spills, thereby compounding the situation.

Earthquake Overview

No severely destructive earthquake has ever been documented in Michigan. However, several mildly damaging earthquakes have been felt since the early 1800s. The exact number is difficult to determine, as scientific opinion on the matter varies. With most of these earthquakes, damage (if any) was limited to cracked plaster, broken dishes, damaged chimneys, and broken windows. (Biggest Michigan threats would be to pipelines, buildings that are poorly designed and constructed, and shelving, furniture, mirrors, gas cylinders, etc. within structures that could fall and cause injury or personal property damage)

The greatest impact on Isabella County would probably come from damage to natural gas and petroleum pipelines. If the earthquake occurs in the winter, areas of the state could be severely impacted by fuel shortages - which could translate into temporary shortages Isabella County. Being just on the I-127 corridor, the City of Mt. Pleasant is in a good position to receive shipments from major suppliers to the South.

Damage would probably be negligible in well-designed and constructed buildings. However, poorly designed and constructed buildings could suffer considerable damage under the right circumstances.

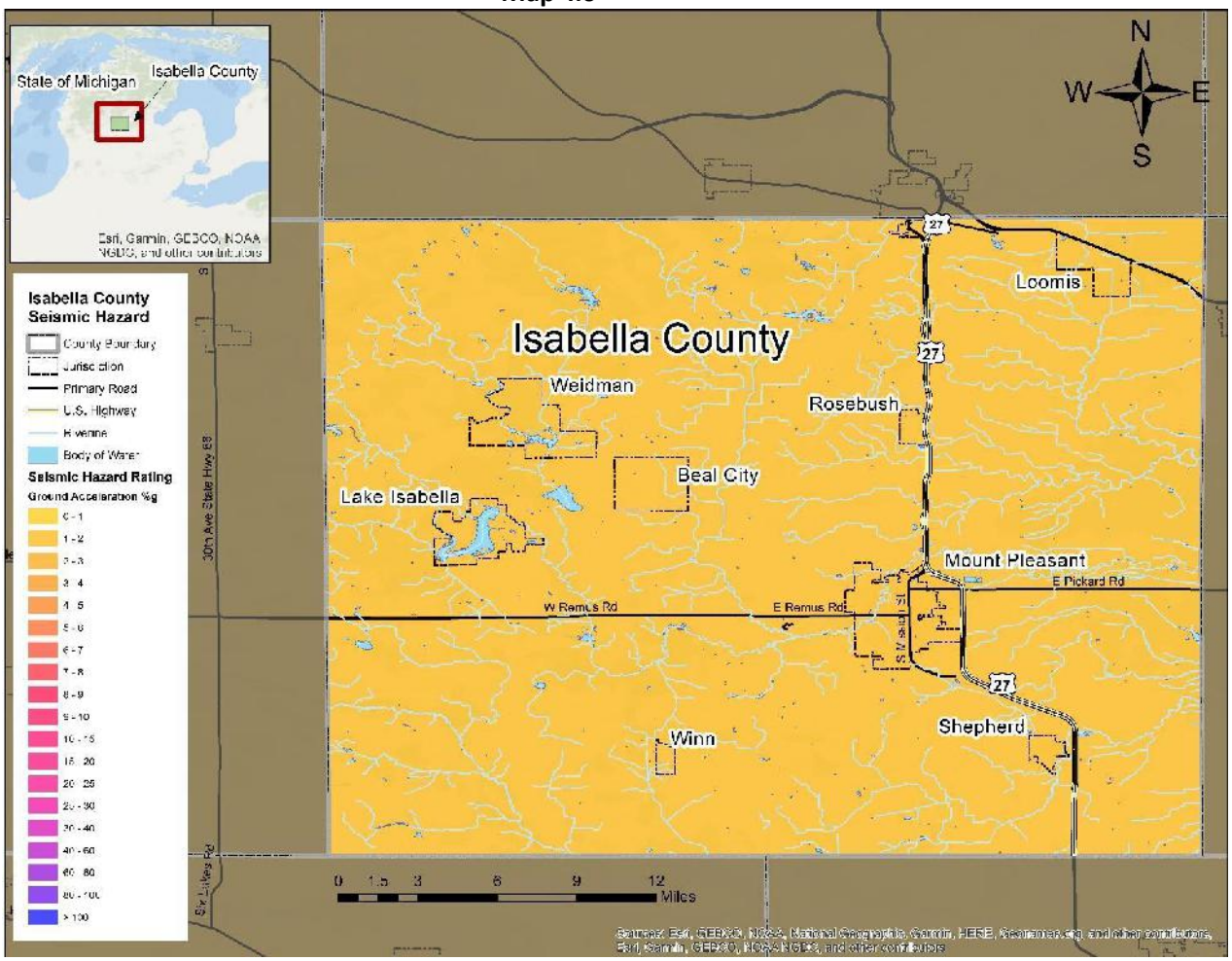
In January 1990, Executive Order (EO) 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, was signed into law. This EO requires that appropriate seismic design and construction standards and practices be adopted for any new construction or replacement of a federal building or federally building during or after an earthquake.

Isabella County is not in an area designated as high risk to ground movement; yet by encouraging awareness of the hazards of poor construction practices and/or routine evaluations of existing structures for deficiencies, vulnerabilities can be identified and repaired before loss is sustained.

There is some chance of a moderate earthquake over the next few decades, which might be strong enough to damage some property and underground infrastructure. An analysis was conducted utilizing ArcGIS Desktop to identify areas of potential ground motion. The below map identifies the entire county falling with the 1% Ground Acceleration area.

Isabella County Seismic Hazard Rating

Map 4.6



SUBSIDENCE

The lowering or collapse of the land surface caused by natural or human-induced activities that erode or remove subsurface support.

Hazard Description

Subsidence is the lowering or collapse of the land surface due to loss of subsurface support. It can be caused by a variety

of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities produced by the solution of limestone or other soluble materials by groundwater. Human- induced subsidence is caused principally by groundwater withdrawal, drainage of organic soils, and underground mining. In the United States, these activities have caused nearly 17,000 square miles of surface subsidence, with groundwater withdrawal (10,000 square miles of subsidence) being the primary culprit. In addition, approximately 18% of the United States land surface is underlain by cavernous limestone, gypsum, salt, or marble, making the surface of these areas susceptible to collapse into sinkholes. Generally, subsidence poses a greater risk to property than to life. Nationally, the average annual damage from all types of subsidence is conservatively estimated to be at least $125 million.

Mine Subsidence

In Michigan, the primary cause of subsidence is underground mining. Although mine subsidence is not as significant a hazard in Michigan as in other parts of the country, many areas in Michigan are potentially vulnerable to mine subsidence hazards. Mine subsidence is a geologic hazard that can strike with little or no warning and can result in very costly damage. Mine subsidence occurs when the ground surface collapses into underground mined areas. In addition, the collapse of improperly stabilized mine openings is also a form of subsidence. About the only good thing about mine subsidence is that it generally affects very few people, unlike other natural hazards that may impact a large number of people. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life. In extreme cases, mine subsidence can literally swallow whole buildings or sections of ground into sinkholes, endangering anyone that may be present at that site. Mine subsidence may take years to manifest.
Examples of collapses occurring decades after mines were abandoned have been documented in several areas of the country.

Michigan's Mining Experience

Michigan's rich mining heritage has played a significant role in the State's development into a world economic power. Due to its diverse geology, Michigan has a wide variety of mineral resources, most notable of which are copper ore, iron ore, coal, sand, gravel, gypsum, salt, oil and gas. It is not surprising then that underground mining has occurred on a significant scale throughout Michigan's history. The principal types of underground mining that occurs, or has occurred in Michigan, include coal mining, metallic mineral mining, salt mining, gypsum mining, and solution mining.

Copper Mining

Copper mining, in particular, put Michigan on the map as a major mining area. Although native copper ore occurs in other parts of the world, at one time the quantity of Michigan's native ore was unsurpassed. From the mid to late 1800s, Michigan's Keweenaw Peninsula mines produced more native copper ore than any other mining area in North America. As those resources became depleted, copper mining began near White Pine in Ontonagon County. The target strata in the White Pine mining operations were on an anticline that was mined both at depths as shallow as 100 feet and as deep as 2900 feet. Over-mining of pillars in shallow parts of the mine caused collapse and subsidence at the surface, on mine property, during the 1980s. The "Copper County" area generally crosses Ontonagon, Houghton, and Keweenaw Counties.

Iron Ore Mining

Michigan's Lake Superior region has been home to significant iron ore mining operations since the mid1800s. The iron producing areas are referred to as ranges, since the iron deposits generally occur on the slopes or at the base of remnants of ancient mountain ranges. Michigan has three ranges: 1) Gogebic Range, which extends from Gogebic County into Wisconsin; 2) Marquette Range, in Marquette County; and 3) Menominee Range, in Dickinson and Iron Counties. Most near-surface iron deposits in these three ranges have been exhausted, so underground mining has become the primary extraction technique. Nearly two billion tons of iron ore have been extracted from these areas. Unfortunately, economics have forced the closure of many of the underground iron mining operations, although one

five counties of Baraga, Dickinson, Gogebic, Iron, and Marquette.

Salt/Solution Mining

Michigan also has one of the world's largest underground salt accumulations. The thickest salt beds lie under most of the Lower Peninsula. These formations are, in some places, over 3,000 feet thick and composed of layers of salt and other minerals. Michigan ranked first or second in national salt production from 1880 to the late 1920s. The bulk of the salt production was from natural brines pumped from six salt formations. Salt was also produced from artificial brines that were derived by injecting freshwater into salt formations and retrieving the resulting brines (called solution mining). The old Detroit salt mine produced rock salt using the "room and pillar" method until 1983. (The room and pillar method involves creating large underground expanses [rooms] in which to mine, supported by pillars [natural or artificial structural members] that held in place the roofs of these rooms.) The Detroit salt mine was approximately 1,100 feet below ground, and encompassed approximately 1,100 acres of subsurface land. The room and pillar method is being used only in the single salt mine that is still operating in Michigan, by the Detroit Salt Company, which has an excellent safety record. Salt is also being produced from brines extracted at various locations within the state.

Gypsum Mining

Gypsum has been mined in Michigan since 1841. In the Grand Rapids area, gypsum is mined by the "room and pillar" method. Open pit mining is used in the Alabaster region (Iosco County). In both of these areas, gypsum beds directly underlie thin layers of glacial drift. Closed topographic lows observed in both areas are believed to be due to groundwater solution of the gypsum and subsequent collapse of the overlying material.

Coal Mining

Michigan also once supported a thriving coal mining industry. Records indicate that over 165 different coal mines operated in Michigan's coal-bearing region, which includes 31 counties in the south-central portion of the lower Peninsula. Over 100 of the 165 known coal mines in the state were located in the Saginaw Bay area. Coal was first discovered in Michigan in 1835 in Jackson County. From that discovery, several small underground and surface coal mines were opened in that area of the state. In 1861, coal was discovered near Bay City, and in 1897 commercial coal mining began in Bay County. That led to the establishment of numerous additional mines in Saginaw, Tuscola and Genesee counties, which tended to be larger, deeper and more extensive mines. That was the start of Michigan's coal mining industry.

The state's underground coal mines were an average of 110 feet deep, and were worked by the "room and pillar" method. Michigan had continuous coal mining from 1897 to 1952, when the last underground coal mine near St. Charles, Saginaw County, closed. From 1860 (the year mine records were first kept) until 1975 (the year the last surface coal mine closed), the 165 commercial coal mines produced a total output of over 46 million tons of coal. The maximum coal output was achieved in 1907, when Michigan's 37 operating coal mines produced two million tons per year - enough to supply 16% of Michigan's total demand for coal.

Mine Subsidence Problem in Michigan

The legacy of underground mining can be felt in numerous locations across the state. Many of the underground mining areas, whether active or abandoned, are vulnerable to subsidence in some form. The map on the previous page indicates the areas in the state that are potentially vulnerable to mine subsidence. Unfortunately, records of abandoned mines are often sketchy and sometimes non-existent. Therefore, it is often difficult to determine exactly where the mines were located. Many areas of Michigan

may have developed over abandoned mines and may not even be aware of it. Oftentimes, the only way a community or home / business owner becomes aware of a potential hazard is when subsidence actually occurs and damage or destruction results.

Subsidence Overview

Isabella County has not experienced any cases of subsidence on record. However, with the number of mines that exist and have been abandoned, it could be possible for a future occurrence(s) of subsidence to occur in the County. This was identified as a low priority.

CHAPTER 5: ANALYSIS OF ALTERNATIVE ACTIONS

Prior to the development of the mitigation strategies, goals and objectives were developed. Upon the development of the goals and objectives, mitigation actions were then determined, based on the six categories of mitigation actions. Below are the goals and objectives, and the mitigation action categories as determined for the 2016 Hazard Mitigation Plan. The planning team reviewed the goals and objectives from the 2016 Plan and determined that all remained valid for the 2022 update. As part of the plan update process the alternate action list in chapter 5 was updated to remove the actions identified as completed in the 2016 update. In total four action items were removed from the list, all new actions identified n the 2022 plan update are included in chapter 6 of the plan update.

Goals are general guidelines that explain what a community wants to accomplish. Goals are often long term and represent broad visions. **Objectives** define strategies or implementation steps to attain the identified goals. They are specific, measurable and may have completion dates.

ISABELLA COUNTY GOALS AND OBJECTIVES

Goal 1: Increase the county's ability to provide assistance to special needs populations (elderly, disabled, impoverished) in preparing for severe weather (summer & winter) events

Objectives

Coordinate with Red Cross and other community organizations in the county

Educate special needs facilities on how to prepare for and respond to potential hazards, especially private establishments

Goal 2: Identify gaps in community wide emergency response to hazards

Objectives

Conduct multi agency exercises for potential hazards to identify gaps and develop solutions

Goal 3: Provide protective measures from severe wind, hail, and tornadoes

Objectives

Construct shelters and raise awareness to safe rooms and other construction methods that provide protective measures from wind events

Maintain the utilization of audible warning system based on density measures computed from local address data and census data

Raise public awareness of severe weather events and preventative actions

Create local legislation for mobile home safety measures

Goal 4: Decrease vulnerability of county to infrastructure failures caused by natural and human induced events

Objectives

Include policies developed in Comprehensive Plan that promote growth in areas that have existing infrastructure in hazard mitigation plan

Rehabilitate infrastructure where applicable (stormwater, water, sewerage, underground utilities etc.)

Identify and inventory generators in county that could be used during emergencies as additional resource

Raise awareness to urban forestry issues in areas adjacent to utilities, especially critical facilities
Utilize utilities from other agencies in times of emergency

Goal 5: Reduce the impacts of riverine/urban flooding

Objectives

To preserve and improve water quality of the County's water resources, such as the Chippewa and Salt Rivers, their tributaries, lakes and wetlands

To preserve the natural character of adjacent lands along the Chippewa, Salt, and North Branch

Goal 6: Increase the ability of the County to respond to public health emergencies

Objectives

Maintain local/regional surveillance and monitoring programs

The next steps in the 2007 hazard mitigation planning process were to identify mitigation strategies suitable to the community, evaluate the effect the action will have on the specified mitigation objective and prioritize actions to decide what sequence or order these actions should be pursued. This step will also be utilized in the 2015 Plan and will be located in Chapter 5: Action Plan.

Mitigation Strategies

Prevention-government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

Property Protection-actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from a hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.

Public Education and Awareness-actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, Fire-Wise Program, real estate disclosure, hazard information centers, and school-age and adult education programs.

Natural Resource Protection-actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

Emergency Services-actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.

Structural Projects-actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

ISABELLA COUNTY IMPLEMENTATION STRATEGY TABLE: 2016-2022			
Mitigation	**Priority**	**Status**	**Outcomes**
Promote Red Cross's information for special needs populations regarding preparedness for severe weather events through brochure distribution and educational meetings.	High	Ongoing	Started in 2007, the information is provided to other agencies.
Coordinate Consumer Energy's program with the Red Cross to identify special needs populations in the County and then distribute educational materials to those populations.	High	Ongoing	Began after grant was received.
Develop and promote contact list for local disaster planning and assistance organizations (Listening Ear, Family Independence Agency (FIA), Commission on Aging, Red Cross) to be promoted to special needs populations.	High	Ongoing	Project was initiated in 2006.
Hold public seminar(s) on disaster planning and preparedness for special needs populations, caretakers, planning officials, and facilities caring for special needs populations.	Medium	Ongoing	Initiated in 2013. Seminars are scheduled, based on requests.
Give disaster kits to caretakers of special needs populations, including hospice patients, and facilities caring for special needs populations.	Medium	Not Started	Project is grant fund dependent. Grant funds have not been secured to fund the project.
Mass mail all special needs facilities a brochure on facility disaster preparedness.	Medium	Ongoing	Program began in 2007, as the brochures became available. The brochure is also available online.
Encourage each facility to conduct annual disaster drills.	Medium	Ongoing	Being done at local hospitals and schools.
Encourage each facility to purchase KNOX Box (Fire Dept. Emergency Access to master keys).	Medium	Ongoing	Facilities that have not yet provide the Knox Box, are required to do so when building improvements are made as part of the building permit process.
Develop internal facility emergency/disaster warning systems.	Medium	Ongoing	Working with schools and businesses to encourage systems are in place.
Develop and enact local legislation to require new special needs facilities to have emergency equipment (generators, NOAA radios, etc.) on site.	Medium	Not started	Local ordinances pertaining to new construction requirements are preempted by the State Construction Code.

ISABELLA COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**

Conduct annual orientations with each response agency regarding the County Disaster Plan.	High	Ongoing	Began in 2007 and has continued with multiple exercises completed annually (10 +).
Conduct disaster drills with each response agency to exercise County Disaster Plan.	Medium	Ongoing	Drills are conducted annually.
Conduct a full scale disaster drill every third year with as many agencies as possible.	Low	Ongoing	The last full scale drill was an active shooter scenario in 2013.
Encourage the construction of shelters at City and County Parks.	Low	Ongoing	Meetings with directors of city and county parks.
Encourage the construction of shelters at mobile home/ manufactured housing communities.	Low	Ongoing	Encourage and educate residents on threats resulted in resident purchasing hurricane steps. Working with Michigan Emergency Management to promote and encourage legislature for shelters in parks.
Increase public awareness of safe rooms and enhanced construction methods in newly constructed homes through brochures, internet, and other literature to be made available from County and private entities.	Medium	Ongoing	Brochures available at the Emergency Operations Center (EOC) upon request.
Put on safe room seminars for local builders at annual home show.	Low	In Process	Currently participating at County Fair and working on securing the funding to participate in the annual home show.
Suggest local governments find sources of funding (Michigan Hazard Mitigation funding, Local Budgets, Local grantors, etc.…) to purchase additional sirens for higher density populations that exist beyond siren range.	Medium	Ongoing	Looking into other programs that would provide same notification at a lower cost (Code Red).
Ensure that large population facilities like the hotels, arenas, and casino have indoor warning alert and notification capabilities.	Low	Ongoing	County still working with the hotels on this matter. Other facilities have the capabilities.

ISABELLA COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Increase attendance at National Weather Service Spotter classes through media (local weather stations, internet, newspapers, etc.).	High	Ongoing	Classes offered on a regular basis. (The next set of classes are scheduled for April 2015.) Central Michigan University (CMU) and Isabella County are Storm Ready Communities.

Create public service announcements regarding severe weather events.	High	Ongoing	This is done using radio public service announcements (PSAs) and through Code Red.
Create volunteer public education committees to promote weather awareness issues.	Medium	Ongoing	The EOC staff and CERT members have volunteered for this item.
Discourage unplanned sprawl conditions in areas without existing infrastructure.	Medium	Ongoing	This is done through the County Master Plan and regulated by the County Planning Commission.
County bonding authority for public utility projects should only be used for those projects that are consistent with the county master plan's goals and policies.	Low	N/A	N/A
Identify infrastructure that needs rehabilitation.	High	Ongoing	This is addressed by the County's Capital Improvement Plan.
Suggest local governments find sources of funding (Michigan Hazard Mitigation funding, local budgets, local grantors, etc.…) to fund rehabilitation projects.	Medium	Ongoing	Local governments continue to seek funding for projects.
Create a database of all generator locations in the County that includes information regarding owner, type, generating capacity, etc.	Medium	Not started	N/A
Create a digital GIS layer displaying locations of generators throughout the County.	Low	Not started	N/A
Develop public awareness program regarding urban forestry issues that includes contact information to help mitigate potential conflicts with infrastructure.	Medium	Not Started	Program needed, must be coordinated.
Create an overlay zoning district which can be applied to lands abutting water resources to manage growth and development, ensure sufficient setback distances, and preserve natural features.	Low	Not started	An overlay district not required, can be done with existing zoning districts.
Coordinate the County efforts with the US Natural Resources Conservation Service.	Medium	Ongoing	Michigan State University (MSU) Extension is the agency that is doing this.

ISABELLA COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	**Priority**	**Status**	**Outcomes**
Work with the Department of Environmental Quality to enforce water quality regulations.	Medium	Ongoing	Mt. Pleasant, Union Township, and SCT water departments met with DEQ officials.

Consider the potential impacts of stormwater runoff on water quality.	Low	Ongoing	This is a joint effort with the Saginaw Chippewa Tribe, MSU Extension, and the Isabella Drain Commission.
Provide incentives to preserve frontage and vegetation along the river banks.	Low	Ongoing	This is being done through the National Flood Insurance Program (NFIP) and the Chippewa River Water Conservation District.
Create an overlay zoning district which can be applied to the lands along the river banks.	Medium	Not started	NFIP prohibits the construction within the flood area.
Encourage cooperative and coordinated planning efforts among neighboring communities.	High	Ongoing	Accomplished through County Community Development Department.
Hold public seminars on disaster planning and preparedness for transportation events.	Medium	Ongoing	MDOT/Emergency Management
Contact Michigan Department of Transportation (MDOT) and local law enforcement authorities to review where the most hazardous locations are in the county.	High	Ongoing	The Sheriff's Department keeps this information.
Review traffic control devices and their impact on hazardous material transportation.	Medium	Ongoing	MDOT
Develop local surveillance and monitoring capabilities using GIS and health department/health care facilities databases.	Low	Ongoing	There is a state-wide system in place that is shared within the regional health departments.
Coordinate local surveillance and monitoring program with the state and regional health department/health care facilities.	Medium	Ongoing	This is being done through the district Health Care Department.
Engage participation of CMU and tribal health officials regarding surveillance and monitoring programs.	High	Ongoing	This is being done through the district health departments.

CHAPTER 6: ACTION PLAN

Table 6.1: Plans/Ordinances Authorities and Capabilities

Community Capabilities	Planning/Ordinances					Funding Sources				Administrative Capability					
	Comprehensive Plan (Jurisdiction Specific)	Zoning Ordinance (Jurisdiction Specific)	Emergency Operations Plan	Floodplain Ordinances	Building Codes/Ordinances	Capital Improvement Project funding	Authority to levy taxes for specific purposes	Fees for water sewer gas or other services	Community Development Block Grant	Planning Commission	Community Planner	GIS Coordinator	Civil Engineer	Warning Systems/Services Reverse 911/Outdoor Warning Sirens	Grant Writing
Isabella County	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Mt. Pleasant, City of	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clare, City of	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Lake Isabella, Village of	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes
Shepherd, Village of	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Yes
Rosebush, Village of	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Yes	Yes
Broomfield, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Chippewa, Township	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes
Coe, Township	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes
Coldwater, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes
Deerfield, Township	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes
Denver, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Freemont, Township	Yes	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes
Gilmore, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Isabella, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Lincoln, Township	No	No	No	No	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Nottawa, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Rolland, Township	No	No	No	No	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Sherman, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Union, Township	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Vernon, Township	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes
Wise, Township	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Nov	Yes	Yes

Through a systematic process, that included the review of all action items identified in the Isabella County 2016 Hazard Mitigation Plan (2016 Plan) and the possible mitigation strategies as identified in the 2016 Local Hazard Mitigation Planning Workbook (Workbook), the Isabella County Local Planning Team (ICLPT) was able to identify the following strategies to be the most effective strategies for hazard mitigation for 2022Hazard Mitigation Plan for Isabella County. The strategies include mitigation actions identified in the 2016 Plan that have not been completed and are still

considered to be relevant, as well as new strategies that have been identified by the ICLPT.

The ICLPT initiated the selection process with a review of the goals and objectives as identified in the 2016 Plan and modified them to fit the needs of Isabella County in 2022 and beyond. They are identified below.

Goal 1: Increase the county's ability to provide assistance to special needs populations (elderly, disabled, impoverished) in preparing for severe weather (summer & winter) events Objectives
Coordinate with Red Cross and other community organizations in the county
Educate special needs facilities on how to prepare for and respond to potential hazards, especially private establishments

Goal 2: Identify gaps in community wide emergency response to hazards
Objectives
Conduct multi agency exercises for potential hazards to identify gaps and develop solutions

Goal 3: Provide protective measures from severe wind, hail, and tornadoes
Objectives
Construct shelters and raise awareness to safe rooms and other construction methods that provide protective measures from wind events
Maintain the utilization of audible warning system based on density measures computed from local address data and census data
Raise public awareness of severe weather events and preventative actions
Create local legislation for mobile home safety measures

Goal 4: Decrease vulnerability of county to infrastructure failures caused by natural and human induced events
Objectives
Include policies developed in Comprehensive Plan that promote growth in areas that have existing infrastructure in hazard mitigation plan
Rehabilitate infrastructure where applicable (stormwater, water, sewerage, underground utilities etc.)
Identify and inventory generators in county that could be used during emergencies as additional resource
Raise awareness to urban forestry issues in areas adjacent to utilities, especially critical facilities
Utilize utilities from other agencies in times of emergency

Goal 5: Reduce the impacts of riverine/urban flooding
Objectives
To preserve and improve water quality of the County's water resources, such as the Chippewa and Salt Rivers, their tributaries, lakes and wetlands
To preserve the natural character of adjacent lands along the Chippewa, Salt, and North Branch

Goal 6: Increase the ability of the County to respond to public health emergencies
Objectives
Maintain local/regional surveillance and monitoring programs

The action plan items from the 2007 Plan were then evaluated and those items that were deemed complete or no longer applicable were eliminated from this plan (see review of all 2007 items in Chapter 5). The ICLPT then began

review of the possible mitigation strategies as identified in the Workbook. After identifying and reviewing over 100 possible mitigation strategies (many of them duplicate strategies for multiple hazards) the Isabella County Emergency Management staff and Regional Planner from EMCOG were able to combine and/or eliminate duplicate strategies to reduce the number of possible strategies to 32. The final list of strategies is found in Appendix C. The original list of possible strategies is found in Appendix D.

At the July 27, 2022 workshop, members of the Isabella County planning committee were asked to identify hazard mitigation projects/ processes that address the strategies. This list was later approved by the ICLPT. The list of projects would be identified as the Action List for the update. Action items that have an immediate impact have been given a high priority. Acton items that represent a continuation/enhancement of existing services were identified has having a lesser importance and have been identified as a medium priority. Possible mitigation strategies that were identified, but not included in the 2016 Plan are considered moderate in importance and have not been identified as an action item. All projects that were identified as possible projects are included in Appendix E. It should be noted that those projects that met the high or medium priority criteria, but were identified as not being as cost effective as other projects, were ranked lower in the priority or were given a lower priority.

The list of 21 action items (projects) from the 2016 HMP was reviewed, and the schedules were updated to reflect the current project status as of 2022. The prioritization process was based on the likelihood of projects being implemented. While cost /benefit was included in the analysis, those projects that were not anticipated to be funded were either not identified in the plan or were given a low priority. The prioritization of the proposed action list is based on impact to the community as well as their cost effectiveness.

The following activities have been identified high priority action items. Items identified as "New" action items were added to both the High Priority list as well as the Medium/Low Priority list.

HIGH PRIORITY HAZARD MITIGATION ACTIONS

Action Item 1

Renew RAVE/Smart 911 mass notification system contract and expand to integrate with the Integrated Public Alert and Warning System (IPAWS).

Action: Renew contract with CodeRED for mass notification of residents in the county. Integrate RAVE/Smart 911 with I-PAWS and encourage Vernon Township (only municipality in the county not participating) to fund and provide CodeRED service for their township.

Location: County-wide

Lead Agency: Isabella County Emergency Management.

Hazards Addressed: Severe weather events, hazardous materials incidents, fires, terrorist events, evacuations, road closures, infrastructure failures and more.

Potential Funding Source(s): Operating budgets of Isabella County and all participating cities, village and townships.

Project Cost: $27,000 annual cost

Participating Agencies: City of Clare, City of Mt. Pleasant, Village of Shepherd, Village of Lake Isabella, and all townships except Vernon Township Schedule:

Schedule: As of February of 2022 Isabella County has transitioned from the CodeRED System to RAVE/Smart911

Priority: High

Benefit(s): Ability to notify residents of the entire county, or any portion thereof based on polygon drawing capability of

the system. The system automatically transmits weather alerts from the national weather service and is compatible to integrate with I-PAWS.

Action Item 2

Erosion control along the Chippewa River.

Action: City and County to continue to identify areas of erosion along the Chippewa River especially near city streets, county roads and other infrastructure and take necessary erosion control measure as funding allows.

Location: County-wide

Lead Agency: Isabella County

Hazards Addressed: Flooding

Potential Funding Source(s): Operating budgets and grants.

Project Cost: $500,000 (estimated)

Participating Agencies: City of Mt. Pleasant, Road Commission, Drain Commission, Chippewa Tribe

Schedule: On-going

Priority: High

Benefit(s): Mitigation of damage to infrastructure including roads, sidewalks, bridges, city municipal well, and parks from Chippewa River bank erosion caused by flood waters.

Action Item 3

Install additional river gauges, markers and flow meter along the Chippewa River in a joint effort with the Saginaw Chippewa Indian Tribe.

Action: Install additional gauges and meter to monitor water level and flow rate of the river. Also install markers along the river to identify specific locations.

Location: County-wide

Lead Agency: Isabella County Emergency Management

Hazards Addressed: Flooding, hazardous materials, persons in need of emergency service.

Potential Funding Source(s): Chippewa Tribe 2 % Grant

Project Cost: $25,000

Participating Agencies: Chippewa Tribe Schedule: 2017 for completion.

Schedule: Completed

Priority: High

Benefit(s): River gauges will aid in determining water level for estimating flood stage of the river. Flow meter will indicate the flow rate of the river which is important in the case of hazardous material incidents so that responders can estimate the distance and rate of speed a material will flow down the river to aid in the setup of river booms and other diversion devices. River markers will allow persons in need of service as well as responders to determine their location of the river to facilitate assistance.

Action Item 4

Tree trimming.

Action: Consumer's Energy and Tri-County Electric have ongoing tree trimming initiatives along the power line ROW. The City of Mt. Pleasant has a tree trimming initiative on city property and along city street ROW.

Location: County-wide

Lead Agency: Consumers Energy

Hazards Addressed: Summer and winter storm events, high winds.

Potential Funding Source(s): Operating budgets
Project Cost: In annual budgets
Participating Agencies: Tri-County Electric, City of Mt. Pleasant
Schedule: On-going
Priority: High
Benefit(s): Trimming trees along power lines, roads and streets mitigates damage that occurs from summer and winter storm events. Fallen trees and limbs can obstruct passage on streets and roads disrupting emergency vehicles. Fallen trees and limbs that damage power lines can leave vulnerable populations, particularly the elderly and disabled, without heat, air conditioning, and electrical power for home medical devices, and leave residents with residential wells without a source of water. Critical facilities such as urgent care clinics, pharmacies and gas stations can be shut down from a loss of electrical power.

Action Item 5
Install additional LED street lighting in M2 district (City of Mt. Pleasant)
Action: Install additional LED street lighting in M2 district in the student housing area at the north end of the Central Michigan University (CMU) campus to monitor crowds during major events and to deter crime and nuisance behavior.
Location: City of Mt. Pleasant
Lead Agency: Mt. Pleasant Public Safety
Hazards Addressed: Civil disturbances
Potential Funding Source(s): Capital budget, CDBG Program
Project Cost: TBD
Participating Agencies: Central Michigan University
Schedule: Completed
Priority: High
Benefit(s): Additional street lighting will improve the safety and welfare of neighborhood residents, deter crime and other nuisance behavior, and provide public safety personnel with a safer environment in which to work and enforce laws and ordinances.

Action Item 6
Install video surveillance cameras in M2 district (City of Mt. Pleasant)
Action: Install video surveillance cameras in the student housing area at the north end of the CMU campus to monitor crowds during major events. Police and fire to continue to preplan major events and develop incident action plans.
Location: City of Mt. Pleasant
Lead Agency: Mt. Pleasant Public Safety
Hazards Addressed: Civil disturbances
Potential Funding Source(s): CDBG Program
Project Cost: $50,000
Participating Agencies: Central Michigan University
Schedule: On-going
Priority: High
Benefit(s): Surveillance video will provide real-time information for public safety agencies dealing with crowd control and potential civil disturbances. Video data can also be used to enhance future planning for major events, and can provide evidentiary value to investigators

Action Item 7

Removal of blighted buildings.

Action: City of Mt. Pleasant to continue seeking funding for the demolition of blighted buildings and remediation of related hazardous materials at the site of the previous Mount Pleasant Center.

Location: City of Mt. Pleasant

Lead Agency: City of Mt. Pleasant

Hazards Addressed: Structural fires, public health emergencies, civil disturbances

Potential Funding Source(s): Michigan TARP funds

Project Cost: $7,000,000

Participating Agencies: NA

Schedule: On-going

Priority: High

Benefit(s): Mitigate and remediate potential contamination of soil, remove hazards that vacant and unstable structures present to the community. Removal of blighted properties has many benefits including the reduction of fires (arson), crime, vagrancy, and health & safety risks while improving property values and the local tax base.

Action Item 8

Increase the number of citizens registered on RAVE/Smart 911.

Action: Through attendance at community events such as the Shepherd Maple Syrup Festival, National Night Out, County Fair and the Home Builders Show the office of Emergency Management will promote RAVE/Smart 911 by the distribution of literature, answer questions and encourage residents to register for RAVE/Smart 911.

Location: County-wide

Lead Agency: Isabella County Emergency Management

Hazards Addressed: Severe weather events, hazardous materials incidents, fires, terrorist events, evacuations, road closures, infrastructure failures and more.

Potential Funding Source(s): Operating budget.

Project Cost: Included as part of operating budget

Participating Agencies: NA

Schedule: On-going.

Priority: High

Benefit(s): Ability to notify residents of the entire county, or any portion thereof based on polygon drawing capability of the system. The system automatically transmits weather alerts from the national weather service and is compatible to integrate with I-PAWS.

Action Item 9

Monitor for gaps in weather radio coverage and replace broken or missing weather alert radios as funding allows.

Action: Will monitor proper operation of weather radios at schools, extended care facilities, medical care facilities and governmental buildings, during participation in drills and emergency response planning activities. Will remind school officials during School Safety Alliance meeting to regularly test their radios and report problems.

Location: County-wide

Lead Agency: Isabella County Emergency Management

Hazards Addressed: Severe weather.

Potential Funding Source(s): Homeland Security Grants

Project Cost: $500/annually

Participating Agencies: NA
Schedule: Awaiting funding source
Priority: High
Benefit(s): Alert residents and at risk populations of severe weather events requiring action.

Action Item 10
Planting of live snow fence along US 127 between Village of Shepherd and City of Mt. Pleasant. (Distance is approximately four miles.)
Action: Plant evergreens along the west side of US 127 between the Village of Shepherd and the City of Mt. Pleasant to serve as a wind break during winter storms to minimize drifting and icing of the highway.
Location: A four-mile stretch of highway, between Shepherd and Mt. Pleasant
Lead Agency: Michigan Department of Transportation
Hazards Addressed: Severe Winter Weather, Transportation Accidents
Potential Funding Source(s): MDOT Operating budget
Project Cost: TBD
Participating Agencies: NA
Schedule: Completed 2019
Priority: High
Benefit(s): The planting of a live snow fence (pine trees) would assist in the mitigation efforts by reducing auto crashes and road run-offs, due to icy roads, drifting, and white out conditions. This would also provide better accessibility for public safety personnel on this stretch of road. Historically there have been multiple vehicle collisions along this stretch of highway the most recent being two years ago involving over 40 vehicles. This caused a complete closure of US 127 for about six hours with re-routing resulting in additional crashes and traffic congestion particularly in the Village of Shepherd.

Action Item 11 (NEW)
Drainage Improvements
Action: Continue improvements to the Upton Drain system, improving storm water management.

Location: Central Michigan University
Lead Agency: Facilities Management (and Emergency Management/Police)
Hazards Addressed: Severe Summer Weather, Severe Winter Weather, Dam Failure and Riverine Flooding
Potential Funding Source(s): Internal or Grant
Project Cost: $180,000
Participating Agencies: City of Mt. Pleasant
Schedule: On-going
Priority: High
Benefit(s): Avoid loss of property and ground in low-lying areas.
Goals Addressed: 4 and 5

Action Item 12 (NEW)
Training and Public Education
Action: Domestic terrorism, AVI events, K-12, Higher ED and business preparation and training for AVI
AVI training and equipment for first responders to respond and mitigate said emergencies.

Location: Isabella County
Lead Agency: Isabella County Sheriff's Office
Hazards Addressed: All Hazards
Potential Funding Source(s): Operational Budgets and Grants
Project Cost: TBD
Participating Agencies: All Jurisdictions
Schedule: On-going
Priority: High
Benefit(s): Enhance public awareness and provide more training for first responders.
Goals Addressed: 2,3 and 4

Action Item 13 (NEW)
River Gauges
Action: install river gauges and markers along the Chippewa River
Location: Isabella County
Lead Agency: Isabella County
Hazards Addressed: Dam Failure and Riverine Flooding
Potential Funding Source(s): FEMA/other Fed agency grants, collaborative grants with SCIT; 2% SCIT community funding
Project Cost: $25,000
Participating Agencies: Saginaw Chippewa Indian Tribe of MI
Schedule: 2024
Priority: High
Benefit(s): Assists Emergency Response efforts of all varieties on the river (HazMat, EMS, etc.); flood warning capabilities
Goals Addressed: 2, 4, 5 and 6

The following activities have been identified medium priority activities. New items not identified in the 2022 Plan have been labeled as "NEW" in their descriptions.

MEDIUM AND LOW PRIORITY HAZARD MITIGATION ACTIONS

Action Item 1
Encourage the inclusion of hazard mitigation into other planning documents
Action: Encourage municipal agencies to include hazard mitigation into master plans/comprehensive land use plans and other planning documents.
Location: County-wide
Lead Agency: OEM
Participating Agencies: Isabella County, all townships as appropriate
Hazards Addressed: all hazards
Potential Funding Source(s): NA
Project Cost: NA
Schedule: On-going
Priority: Medium

Benefit(s): Hazard Mitigation is identified in the local municipal planning documents, thereby increasing community awareness of hazard mitigation and increasing the opportunity for community resiliency.

Action Item 2

Municipalities to continue to adopt and enforce the most recent edition of the State Construction Code.

Action: Adopt by local resolution the most current edition of the State of Michigan Construction Code. Review construction plans for new construction and remodels to ensure compliance with the code.
Follow-up with inspections during various phases of construction to ensure compliance with the approved construction documents and code requirements.

Location: County-wide

Lead Agency: Isabella County,

Hazards Addressed: Tornados, straight line winds, winter weather, earthquakes, fire Safety and hazardous material storage and processing.

Potential Funding Source(s): Operating budgets of participating agencies

Project Cost: NA

Participating Agencies: City of Mt. Pleasant, Union Township

Schedule: Completed and On-going

Priority: Medium

Benefit(s): Safe buildings for occupants and fire fighters, resistance to wind, tornados, earthquakes, snow loads and similar events resulting in less structural damage minimizing injury, cost, and displaced occupants and businesses.

Action Item 3

Review and enforce zoning and land use regulations.

Action: County, City and Township planning departments to work together in a collaborative effort to review zoning and land use regulations for needed revisions and actively enforce the regulations. Regulations to be reviewed based on changing demographics and conditions with necessary changes recommended to the governing bodies with particular attention to flood plains and prohibiting construction of structures in flood plains. The City to add an additional code enforcement officer (see action item 4 below) to facilitate enforcement of site plans and special use permits.

Location: County-wide

Lead Agency: Isabella County

Hazards Addressed: Flooding, structural fires, major population changes

Potential Funding Source(s): Operating budgets

Project Cost: NA

Participating Agencies: City of Mt. Pleasant, Union Township

Schedule: Union Twp-Complete, Mt Pleasant-ongoing"

Priority: Medium

Benefit(s): Reduce property damage from flood events by prohibiting construction in flood plains and removing structures currently in the flood plain. Control density in residential housing, and plans for buffers between residential and commercial/industrial properties. Regulate proliferation of rental properties.

Action Item 4

Encourage the City of Mt. Pleasant and Union Twp. to continue adopting the most recent edition of the International Property Maintenance Code.

Action: Encourage the City of Mt. Pleasant and Union Twp. to continue adopting the most recent edition of the

International Property Maintenance Code for use in inspection rental properties within their respective jurisdictions. Continue proactive enforcement of the housing licensing codes and the State of Michigan smoke detector law.

Location: City of Mt. Pleasant, Union Township

Lead Agency: City of Mt. Pleasant

Hazards Addressed: Public health, structure fires

Potential Funding Source(s): Operating budgets

Project Cost: NA

Participating Agencies: Union Township

Schedule: On-going

Priority: Medium

Benefit(s): Fewer structure fires result in fewer injuries and deaths, less loss of property and property tax revenue. Smoke detectors give early warning reducing injuries and deaths. Regular inspections reduce the potential for health issue for residents as well as the public.

Action Item 5

Mt. Pleasant Neighborhood Resource Unit (NRU) hiring of one additional ordinance enforcement officer.

Action: The City to expand the NRU by adding an additional ordinance enforcement officer. The NRU will continue to identify blighted properties and take necessary action to bring those properties into compliance with state and local regulations. The NRU will also target declining and blighted neighborhoods including improvement of public lighting in selected areas, work to minimize trash accumulation and enforcing local ordinances and zoning laws, including the proper licensure of rental properties.

Location: City of Mt. Pleasant

Lead Agency: City of Mt. Pleasant

Hazards Addressed: Public health, structural fires, civil disturbances

Potential Funding Source(s): Operating budget

Project Cost:$50,000/annual cost

Participating Agencies: NA

Schedule: Completed

Priority: Medium

Benefit(s): Provide safe and clean neighborhoods, remove hazards that vacant and unstable structures present to the community. Removal or remediation of blighted properties has many benefits including the reduction of crime, vagrancy, and health & safety risks while improving property values and the tax base. Improved public lighting reduces the risk of crime and vandalism making city streets safer.

Action Item 6

Encourage communities to adopt and enforce the most recent edition of the International Fire Code. Action: Adopt by local resolution the most current edition of the International Fire Code. Review plans for new construction and remodels to ensure fire protection systems and storage and handling of hazardous materials are in compliance with the code. Follow-up with inspections during various phases of construction to ensure compliance with the approved construction documents and code requirements. Perform routine inspections to ensure that fire protections systems are properly maintained and processes for handling materials are in compliance with the code.

Location: City of Mt. Pleasant, Union Township

Lead Agency: Mt. Pleasant Fire Department

Hazards Addressed: Structural fires, hazardous materials

Potential Funding Source(s): Operating budgets

Project Cost: NA

Participating Agencies: Union Township
Schedule: On-going
Priority: Medium
Benefit(s): Safe buildings for occupants and fire fighters, minimizing property damage, environmental damage and injuries do to fires and hazardous material incidents.

Action Item 7

Continue to work with businesses and public facilities in the development and implementation of internal warning and response plans.

Action: Work with businesses and other public and private organizations in developing response plans that include early warning systems for notification of their facilities.
Location: County-wide
Lead Agency: Isabella County Emergency Management
Hazards Addressed: Severe weather, terrorism, hazardous materials
Potential Funding Source(s): Homeland Security Grant Program
Project Cost: $25,000/annually
Participating Agencies: local businesses
Schedule: On-going
Priority: Medium
Benefit(s): Improved safety for facility Employees/occupants by being prepared to respond appropriately to hazards such as weather, hazardous materials, and active violence.

Action Item 8

Encourage EOC staff and first responders to participate with the Michigan Health Alert Network (MIHAN) for medical surveillance, monitoring and alerting.

Action: Educate EOC staff and other community partners on MIHAN and encourage partners to register and participate in regular tests of the system.
Location: County-wide
Lead Agency: Central Michigan District Health Department
Hazards Addressed: Public health
Potential Funding Source(s): Operating budgets
Project Cost: NA
Participating Agencies: Isabella County Staff, Isabella County Local Emergency Planning Committee
Schedule: On-going
Priority: Medium
Benefit(s): EOC staff and other partners will be kept abreast of emerging public health issues across the state as they are reported allowing agencies to take appropriate action.

Action Item 9 Lightning protection.

Action: Protect essential public equipment with lightning protection including lightning rods and ground protection for infrastructure and surge protection for computers and other smaller equipment.
Location: County-wide
Lead Agency: Isabella County Emergency Management
Hazards Addressed: Structure fires, lightning, safety

Potential Funding Source(s): Contingent on availability of grant funding
Project Cost: NA
Participating Agencies: Mt. Pleasant, Isabella County, and other municipalities (based on funding availability)
Schedule: I sabella -In progress/scheduled to be complete by summer of 2022 Union Twp-Complete"
Priority: Medium
Benefit(s): Life safety, reduce property damage, continuity of operations

Action Item 10
Protect municipal and other critical buildings from severe cold weather.
Action: Encourage insulating walls and attics of older building to meet current residential insulation requirements, during remodels increase snow load capacity to improve structural stability.
Location: County-wide
Lead Agency: Isabella County Emergency Management
Hazards Addressed: Public health and safety
Potential Funding Source(s): Contingent on availability of grant funding.
Project Cost: NA
Participating Agencies: Isabella County Building Department, Mt. Pleasant Building Department, and Union Township Building Department
Schedule: On-going
Priority: Medium
Benefit(s): Protect critical structures/facilities from impact of winter weather allowing them to remain available for operation.

Action Item 11
Encourage the construction of safe rooms for sheltering during tornados.
Action: Encourage the construction of safe rooms in mobile home parks, municipal parks, athletic fields and fair grounds.
Location: County-wide
Lead Agency: Isabella County Emergency Management
Hazards Addressed: Public health and safety
Potential Funding Source(s): Contingent on availability of grant funding.
Project Cost: NA
Participating Agencies: Red Cross, Isabella County, and Mt. Pleasant
Schedule: On-going
Priority: Medium
Benefit(s): Provide a safe environment during periods of extreme weather conditions for persons who otherwise would not have shelter.

Action Item 12 (NEW)
Bellows Street Storm Sewer Relief to Lincoln Street Sub-Basin along Kinney Avenue.
Action: Relieve downstream Bellows Street sewer capacity issues and those in the East Side Storm Sewer and Onion Creek area sewers.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant / DPW
Hazards Addressed: Severe Summer Weather, Flood and Infrastructure Failure
Potential Funding Source(s): Capital Improvement Millage
Project Cost: $1,500,000
Participating Agencies: Mt. Pleasant
Schedule: TBD
Priority: Medium
Benefit(s): Increases flow capacity and protects structures downstream.
Goals Addressed: 4 and 5

Action Item 13 (NEW)
Michigan Street and Cemetery Storm Sewer Upgrades
Action: Provide relief flow path to eliminate capacity concerns in main pipe; eliminate connections to the East Side Storm Sewer; reduce capacity issues in on-campus sewers and potentially intercept Bellows Street flow.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: Severe Summer Weather and Flood
Potential Funding Source(s): Capital Improvement Millage
Project Cost: $3,200,000
Participating Agencies: CMU
Schedule: TBD
Priority: Medium
Benefit(s): Increases flow capacity and protects structures downstream.
Goals Addressed: 4 and 5

Action Item 14 (NEW)
East Side Storm Sewer Relief to Onion Creek along Preston Street
Action: Provide upstream relief to East Side Storm Sewer to expand capacity in downstream areas.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: Severe Summer Weather and Flood
Potential Funding Source(s): Capital Improvement Millage
Project Cost: $3,500,000
Participating Agencies: NA
Schedule: TBD
Priority: Medium
Benefit(s): Increases flow capacity and protects structures downstream.
Goals Addressed: 4 and 5

Action Item 15 (NEW)
Industrial Drive Reroute (disconnect from ESSS)
Action: Reroute flow north to natural area; free up storm surge pond for more East Side Storm Sewer equalization.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: Severe Summer Weather and Flood
Potential Funding Source(s): Capital Improvement Millage
Project Cost: $400,000
Participating Agencies: NA
Schedule: TBD
Priority: Medium
Benefit(s): Increases storage capacity and protects structures downstream.
Goals Addressed: 4 and 5

Action Item 16 (NEW)
Michigan Street and Cemetery Storm Sewer Upgrades
Action: Provides relief drainage path for numerous over capacity northwest area sewers and connect to the upstream end of the Bradley Street Storm Sewer (at the Beltnick Drain) to alleviate current concerns.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: Severe Summer Weather and Flood
Potential Funding Source(s): Capital Improvement Millage
Project Cost: $3,600,000
Participating Agencies: NA
Schedule: TBD
Priority: Medium
Benefit(s): Alleviate upstream drainage capacity issues.
Goals Addressed: 4 and 5

Action Item 17 (NEW)
Oxford Row and Onion Creek Headwaters Flood Mitigation
Action: Replaces or provides additional drainage route through and upstream of the Oxford Row area to alleviate local flooding concerns.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: Severe Summer Weather and Flood
Potential Funding Source(s): Capital Improvement Millage
Project Cost: $2,100,000
Participating Agencies: NA
Schedule: TBD

Priority: Medium
Benefit(s): Alleviate local flooding concerns
Goals Addressed: 4 and 5

Action Item 18 (NEW)
CHP Generation at the Water Resource Recovery Facility
Action: Add Combined Heat and Power capabilities at the Water Resource Recovery Facility. This would serve to extend backup energy capacity substantially at the facility.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: Severe Summer Weather and Infrastructure Failure
Potential Funding Source(s): Sewer User Fees
Project Cost: $2,500,000
Participating Agencies: NA
Schedule: TBD
Priority: Medium
Benefit(s): Alleviate local flooding concerns
Goals Addressed: 4

Action Item 19 (NEW)
WRRF Outfall Armor Along the Chippewa River
Action: Backfill and Rip-rap the outfall at the Water Resource Recovery Facility (WRRF)

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: Severe Summer Weather, Riverine Flooding and Subsidence
Potential Funding Source(s): WRRF User Fees
Project Cost: $375,000
Participating Agencies: NA
Schedule: TBD
Priority: Medium
Benefit(s): Strengthen the resiliency of the outfall to save potentially millions of dollars in future damages.
Goals Addressed: 4 and 5

Action Item 20 (NEW)
Generator for the Water System Ground Storage and Well Facility
Action: Backup generator at the ground storage and raw water production facility for the water system. Replace and elevate transformer

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: All Hazards

Potential Funding Source(s): Water User Fees
Project Cost: $375,000
Participating Agencies: NA
Schedule: TBD
Priority: Medium
Benefit(s): Provide backup power supply for critical assets.
Goals Addressed: 4

Action Item 21 (NEW)
Source Water Wells
Action: Backup source water wells outside flood areas.

Location: City of Mt Pleasant
Lead Agency: City of Mt Pleasant
Hazards Addressed: All Hazards
Potential Funding Source(s): Water User Fees
Project Cost: $180,000
Participating Agencies: NA
Schedule: TBD
Priority: Medium
Benefit(s): Provide redundant systems for water resources.
Goals Addressed: 4

Action Item 22 (NEW)
Point of Distribution Sites
Action: Identify new point of distribution sites throughout the county, taking into account traffic flow, social distancing and other factors.

Location: Isabella County
Lead Agency: CMDHD
Hazards Addressed: All Hazards
Potential Funding Source(s): Operating Budgets
Project Cost: $180,000
Participating Agencies: Isabella County Office of Emergency Management
Schedule: On-going
Priority: Low
Benefit(s): Provide additional POD locations for greater public accessibility
Goals Addressed: 1 and 6

CHAPTER 7: PLAN MAINTENANCE

The follow-up for Isabella County is an important part of the planning process. Plan maintenance is the process in which the plan will be monitored, evaluated, and updated within a five-year cycle. When updated, the plan will be reviewed,

revised, and resubmitted to the Michigan State Police, Emergency Management and Homeland Security Division for approval by the Federal Emergency Management Agency (FEMA). As appropriate, the plan will also be evaluated after a disaster, or after unexpected changes in land use or demographics in or near hazard areas. The Isabella County Local Planning Team (ICLPT) will also be kept apprised of a change in federal regulations, programs and policies, such as a change in the allocation of FEMA's funding for mitigation grant programs. These evaluations will be addressed in the plan and may affect the action items for mitigation goals and activities. The hazard mitigation plan should be considered by community planners within Isabella County, when future updates of their comprehensive plans are taking place.

The ICLPT will continue to monitor the status and track the progress of the plan elements on an annual basis. The ICLPT will oversee the progress made on the implementation of the identified action items and update the plan as needed to reflect changing conditions. Representatives will also meet annually to evaluate plan progress and recommend updates. The Isabella County Emergency Management Coordinator will facilitate the meetings.

Annual evaluation of the plan will not only include checking the implementation status of mitigation action items, but also assessing their degree of effectiveness and assessing whether other natural hazards need to be addressed and added to the plan. This will be accomplished by reviewing the benefits (or avoided losses) of the mitigation activities that were in place within each jurisdiction and the County. These will be compared to the goals the Plan has set to achieve. The ICLPT will also evaluate whether mitigation action items need to be discontinued or modified in light of new developments or changes within the County. During the annual review process the ICLPT will make all efforts to review, implement, prioritize and align action items to all applicable local planning mechanisms. The review and incorporation of data includes but is not limited to county and jurisdictional master, stormwater management, capital improvement and emergency operations plans. The hazard mitigation plan will also be consulted when updating building ordinances and development plans are updated for the county and participating jurisdictions.

As required, this plan will be updated within five (5) years of the date of FEMA's approval of the plan. The plan may be updated earlier, at the discretion of the ICLPT and its jurisdictions. The ICLPT's ability to update the mitigation process by adding new data and incorporating it into the mitigation plan will allow for the efficient use of available resources, staff, and programs. They will meet to discuss the plan and document data collected including hazard events, completed mitigation activities, new mitigation activities, and FEMA grant application efforts. The information will be used for the five (5) year update. The Isabella County Emergency Management Coordinator will coordinate the annual meeting and keep records of the participants and information received.

In order to have continued public support/involvement of the mitigation planning process, it is important that the public be involved not only in the preparation of the initial plan, but also in any modifications or updates to the plan. The public is invited to attend quarterly meetings and provide feedback in person or via email through the county website, in compliance with the Public Meetings Act.

To ensure that public support is maintained, the following actions may be taken by ICLPT: Updates to the plan.
Post the Plan on the County Web Page along with contact information that allows any citizen to read it and provide feedback. Develop informational mailings to be distributed to the public about mitigation efforts in the county and updates made to the plan. Develop mitigation flyers or mailings that contain mitigation activities and action items that promote reducing damages and risks of natural hazards. All plan maintenance activities will be led by the Isabella County Emergency Management Coordinator

APPENDIX A – ISABELLA COUNTY LOCAL PLANNING TEAM SIGN-IN SHEETS AND PUBLIC PARTICIPATION

MEETING SIGN-IN SHEET

Project:	EOC Meeting/Steering Committee	**Meeting Date:**	4/6/2022
Facilitator:	Marc Griffis	**Place/Room:**	Isabella County EOC/911 Training

Name	Organization	Email
Lorey Curtis	EGLE	Curtisl@michigan.gov
Carl Bryans	MMR	CBryans@Mob.MedicaL.org
Toni Prabucki	MDHHS	Prabuckia@michigan.gov
Kathy Tarrant	CRT	Kathy.Tarrant@outlook.com
Kim Fox	Citizen	EFOXKJ1@AOL.COM
Steve Hall	CMDHD	shall@cmdhd.org
Nick Goike	Listening Ear	ngoike@listeningear.com
Caren Kosal	McLaren Central	caren.kosal@mclaren.org
David Johnson	MSP	JOHNSOND56@MICHIGAN.GOV
Troy Techlin	SCIT	TTechlin@sagchip.org
Harry Ambs	Tribal Police	hambs@sagchip.org
Bernie Schafer	ICHT	Bernieschafer@mt-pleasant.org
Josh Lator	MSP - MT PLEASANT	LATORJ@MICHIGAN.GOV
Cameron Wassman	CMU	wassm1cd@cmich.edu
Rick Beltinck	MPFD	rbeltinck@mt-pleasant.org
Mark Stuhldreher	Union Township	mstuhldreher@uniontownshipmi.com
Vickie Puorro	MyMichigan Health NJTP [illegible]	vickie.puorro@mymichigan.org
Paul Spata	American Red Cross Mid Michigan Chapter	paul.spata@redcross.org
Ryan Martin	Central Dispatch 911	rmartin@isabellacounty.org

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MEETING SIGN-IN SHEET

Project:	EOC Meeting/Steering Committee	**Meeting Date:**	4/6/2022
Facilitator:	Marc Griffis	**Place/Room:**	Isabella County EOC/911 Training

Name	Organization	Email
Julie Adams	IC Emergency Mgt	jadams@isabellacounty.org
Marc Griffis	IC 911/EM	mgriffis@isabellacounty.org
Nicole F. Frost	Isabella County	nfrost@isabellacounty.org

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MEETING SIGN-IN SHEET

Project:	Hazard Mitigation Planning Meeting	**Meeting Date:**	7/27/2022
Facilitator:	Marc Griffis	**Place/Room:**	Isabella County EOC/911 Training

Name	Organization	Email
Christy Mathewson		Chrisautobody@yahoo.com
Jackie Verbeke	Broomfield Twp.	broomfieldtwptreas@gmail.com
Breanna Knudsen	SCIT	BKnudsen@sagchip.org
Mary Kay Mees	Coe Twp	coetwpsupervisor@gmail.com
Kathy Tarrant	C.R.T.	kathy.tarrant@outlook.com
Doris Methner	Wise Twp	dmethner@gmail.com
Loren Curtis	EGLE	curtisl@michigan.gov
Jeremy Howard	City of Clare	jhoward@cityofclare.org
Luke Potter	City of Clare	lpotter@cityofclare.org
Brett Hansen	MMR	
Tim Middleton	City of Mt Pleasant	tmiddleton@mt-pleasant.org
Rick Beltinck	City of Mt Pleasant	rbeltinck@mt-pleasant.org
Gary Silker	Gilmore TWP	silke1gl@gmail.com
Orville Theaker	MSP EMHSD	TheakerO@michigan.gov
Kim Smith	Union Township	ksmith@uniontownshipmi.com
Vickie Pisano	MMCH - ED	vickie.pisano@mymidhealth.org
Melissa DeRoche	CMDHD	mderoche@cmdhd.org
Andy Latham	City of MP	alatham@mt-pleasant.org
Cameron Wassman	CMU	wassm1cd@cmich.edu
Jeff Bean	Vernon	jeff@jeffbean

1 of 2

MEETING SIGN-IN SHEET

Project:	Hazard Mitigation Planning Meeting	**Meeting Date:**	7/27/2022
Facilitator:	Marc Griffis	**Place/Room:**	Isabella County EOC/911 Training

Name	Organization	Email
Kathy VanDeRolk	Chippewa Twp	treasurer@chippewatownship.com
Luke Sawyer	Shepherd Police Dept.	LSawyer@villageofshepherd.org
Julie Adams	IC EM	
Marc Griffis	IC 911/EM	

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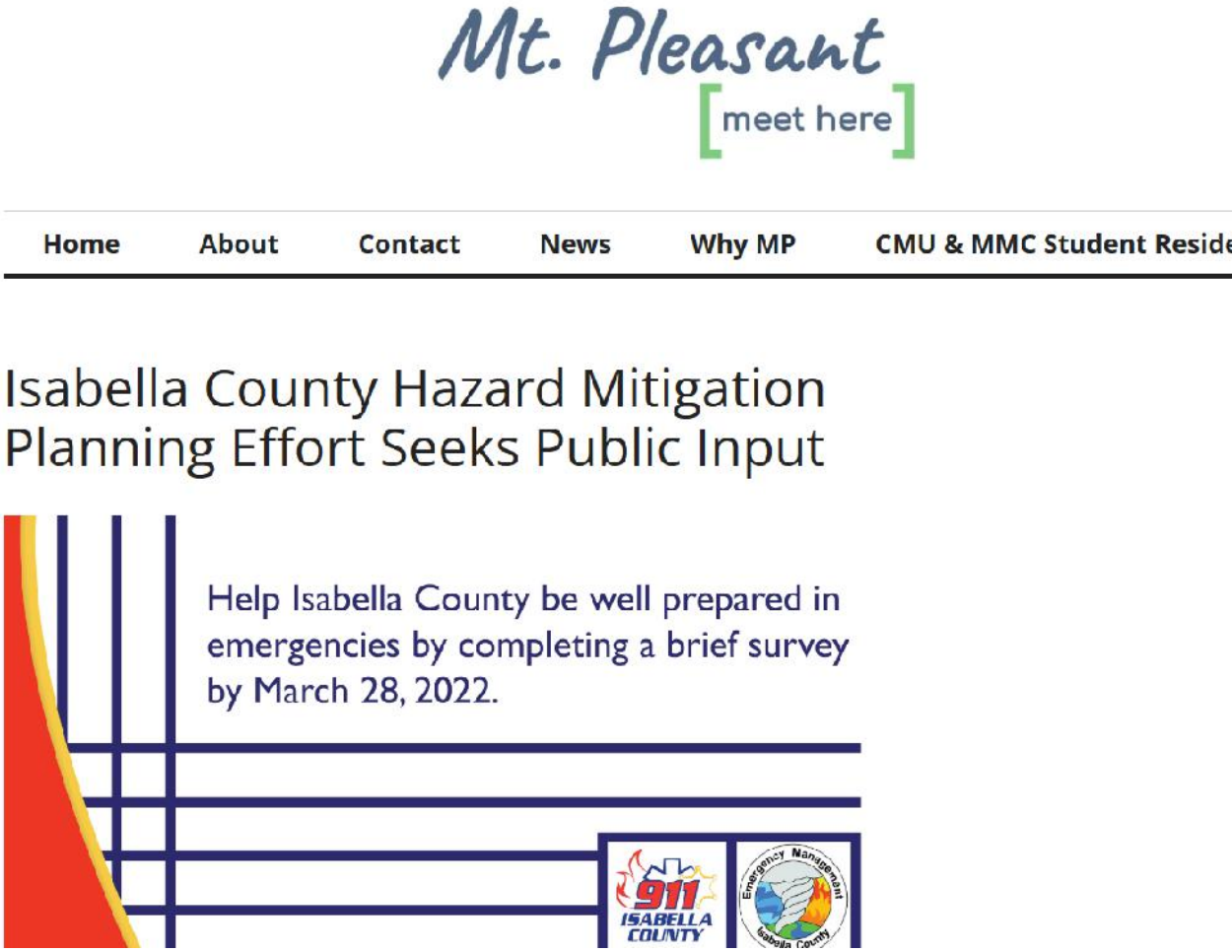
Public Participation: Opportunities for public participation throughout the planning process included invitations to planning committee meetings as well as a community Mitigation presentation following the planning team workshop. The final opportunity for public participation was provided via the public comment/review period, which was advertised through social media and Isabella County websites. Screen captures of these inventions are provided below. The results of the community preparedness surveys were reviewed by the planning team during the second planning team meeting and the jurisdictional workshop to aid in both the hazard rankings by jurisdiction and considered in the development of new mitigation action items.



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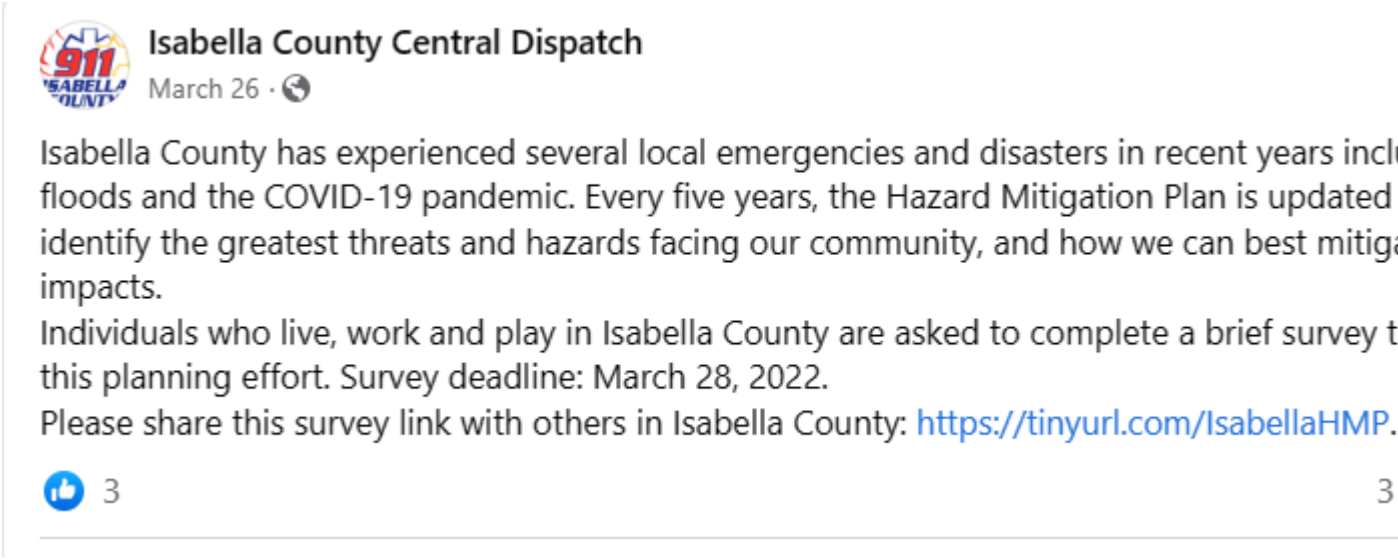
[Isabella County Hazard Mitigation Planning Effort Seeks Public Input – City of Mt.Pleasant (mpcityblog.com)]



-**March Staff eNewsletter Article**: Distributed 3/4

-**MAC TV Slide**: Running 3/4 to 3/28

-**City of Mt. Pleasant Community eNewsletter Article**: To be distributed 3/18

-Social Media Posting Schedule:

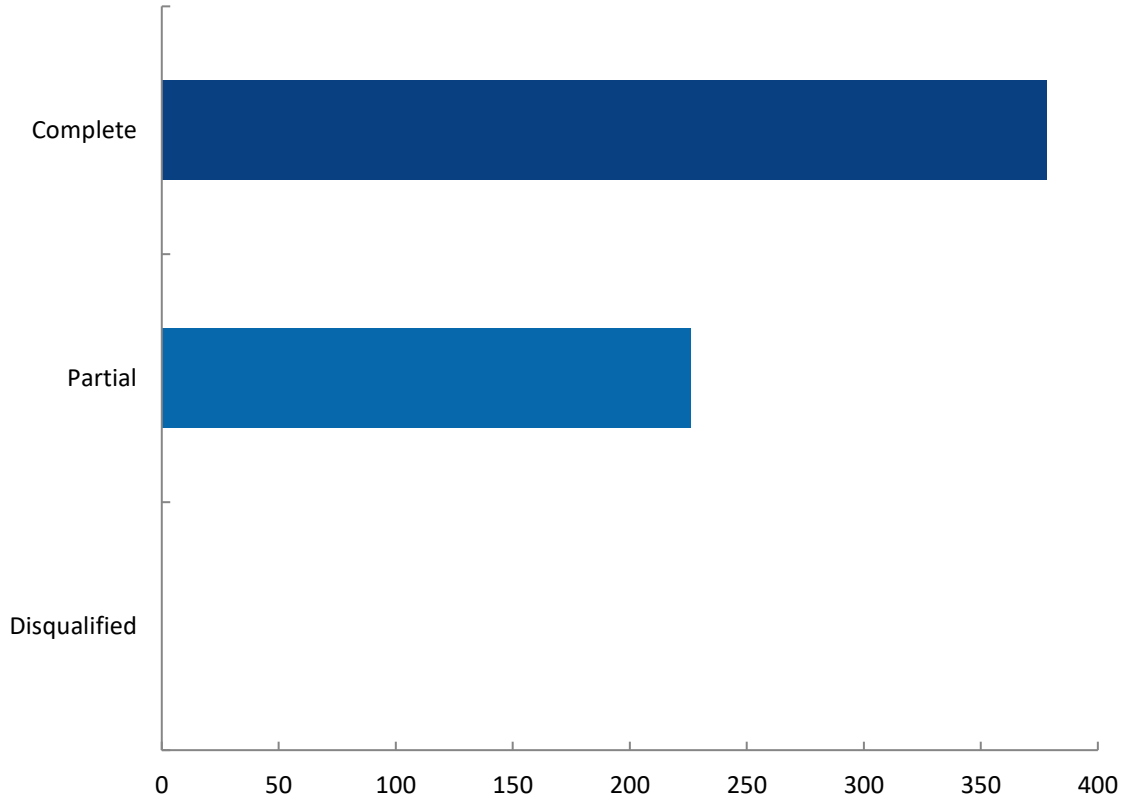
DPS Facebook and Twitter:
3/4 9 a.m.
3/6 4 p.m.
3/10 9 a.m.
3/15 7 p.m.
3/23 12 p.m.
3/27 4 p.m.

City Facebook and Twitter:
3/4 9 a.m.
3/6 7 p.m.
3/12 12 p.m.
3/18 12 p.m.
3/24 7 p.m.

Report for 2022 Isabella County, MI: Disaster Preparedness and Mitigation Questionnaire

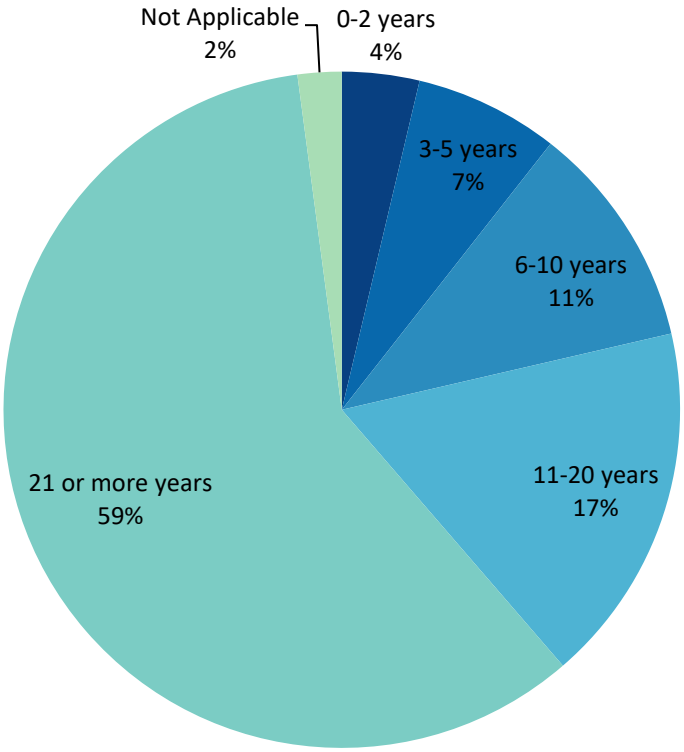
2022 Isabella County, MI: Disaster Preparedness and Mitigation Questionnaire

Response Statistics



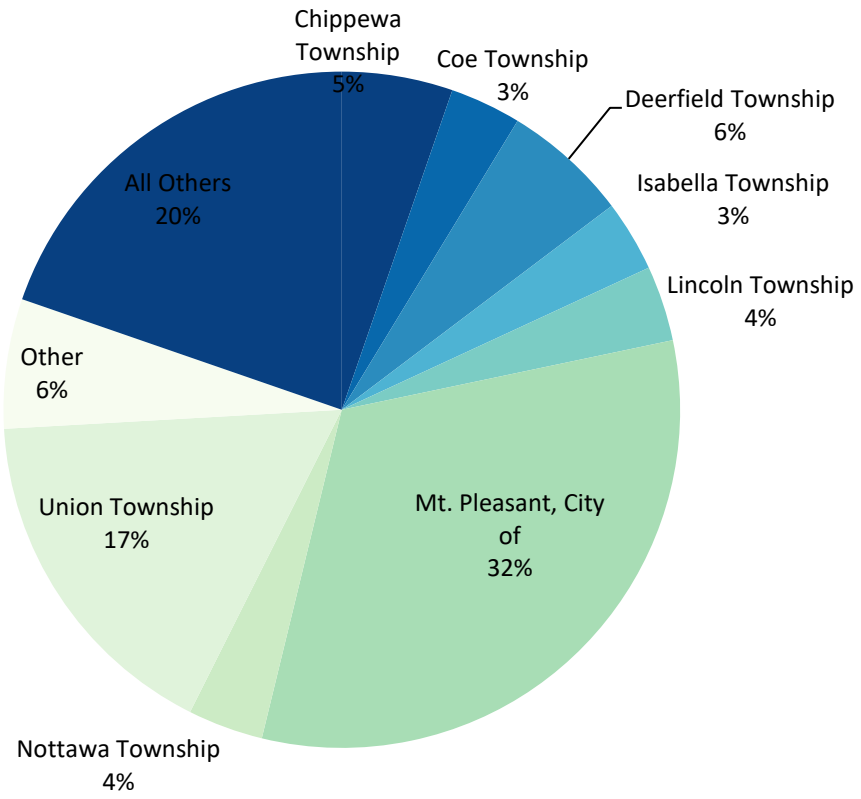
	Count	Percent
Complete	378	62.6
Partial	226	37.4
Disqualified	0	0
Total	604	

1.Approximately how many years have you lived or worked (if you are not a resident) in Isabella County, Michigan?



Value	Percent	Count
0-2 years	3.7%	21
3-5 years	6.9%	39
6-10 years	10.8%	61
11-20 years	17.3%	98
21 or more years	59.3%	336
Not Applicable	2.1%	12
	Total	567

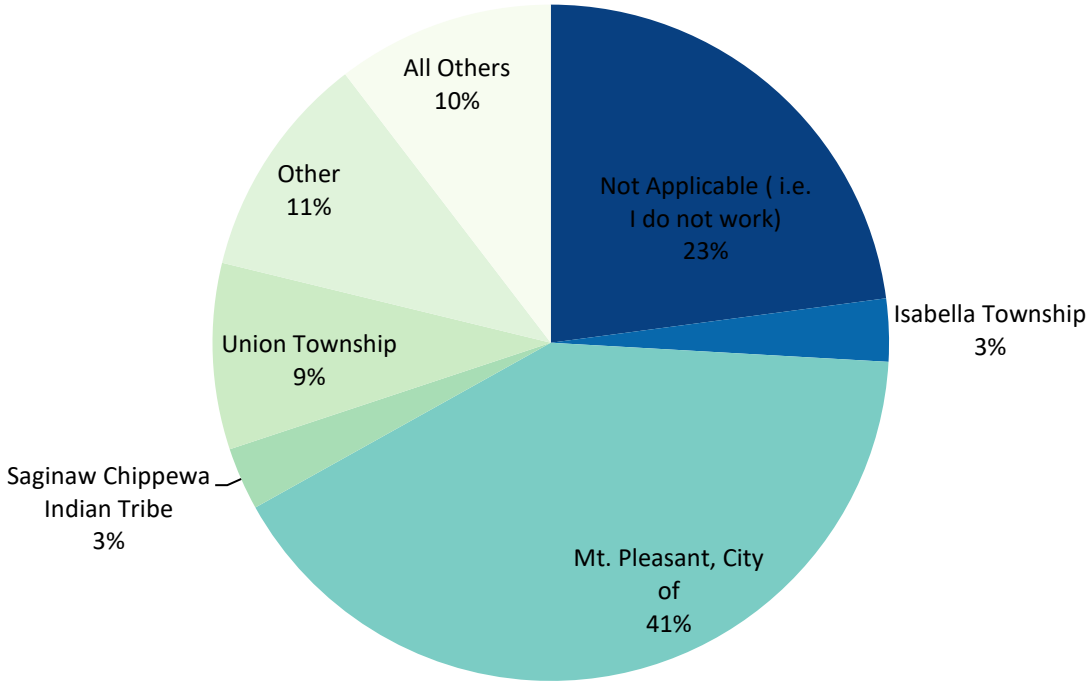
2.Please indicate the jurisdiction that best represents the location of your home address/place of residence.



Value	Percent	Count
Broomfield Township	2.3%	13
Chippewa Township	5.3%	30
Clare, City of	0.5%	3
Coe Township	3.4%	19
Coldwater Township	0.7%	4
Deerfield Township	6.0%	34
Denver Township	1.4%	8
Fremont Township	2.7%	15
Gilmore Township	1.6%	9

Isabella Township	3.4%	19
Lake Isabella, Village of	2.1%	12
Lincoln Township	3.6%	20
Mt. Pleasant, City of	32.1%	181
Nottawa Township	3.6%	20
Rolland Township	2.1%	12
Rosebush, Village of	0.4%	2
Saginaw Chippewa Indian Tribe	0.5%	3
Shepherd, Village of	1.6%	9
Sherman Township	2.7%	15
Union Township	16.7%	94
Vernon Township	0.7%	4
Wise Township	0.4%	2
Other	6.2%	35
	Total	563

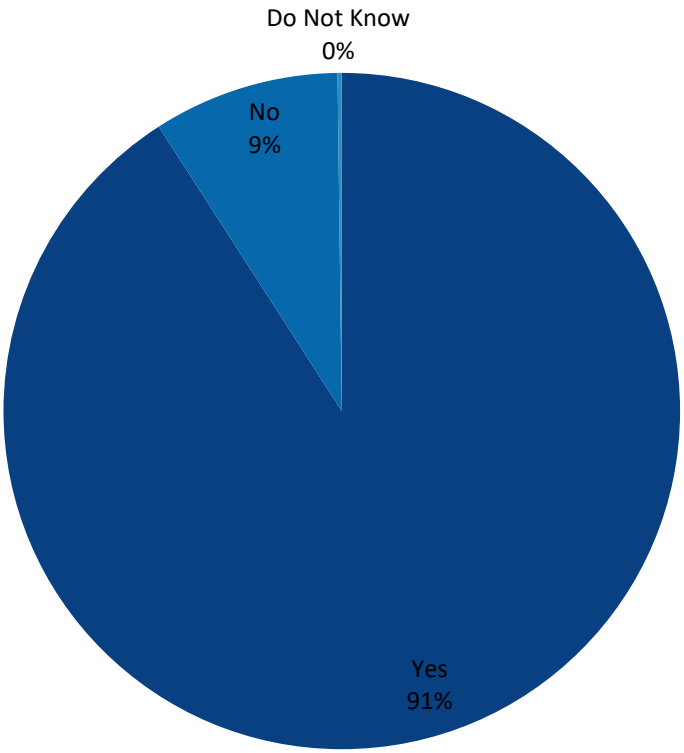
3.Please indicate the jurisdiction that best represents the location where you work (i.e. place of business).



Value	Percent	Count
Not Applicable (i.e. I do not work)	22.9%	129
Broomfield Township	0.4%	2
Chippewa Township	1.1%	6
Clare, City of	1.4%	8
Coe Township	0.5%	3
Coldwater Township	0.2%	1
Deerfield Township	1.1%	6
Denver Township	0.5%	3
Fremont Township	0.9%	5

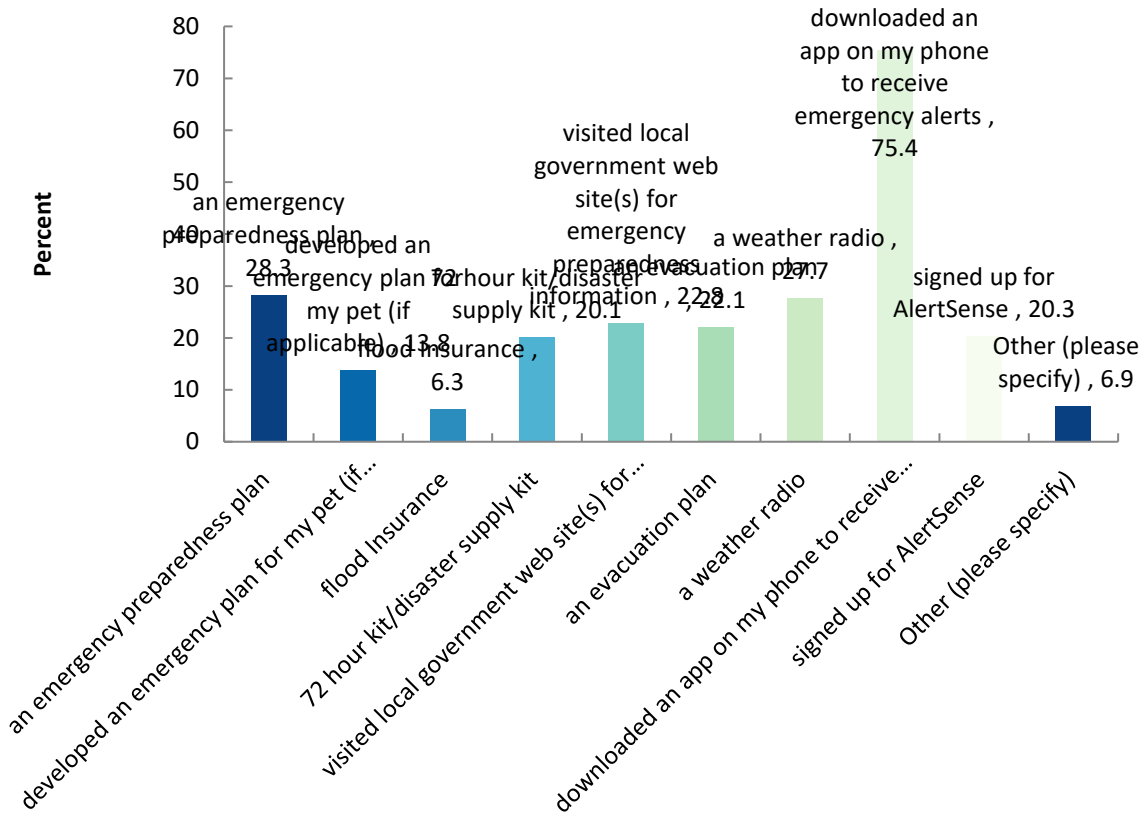
Gilmore Township	0.7%	4
Isabella Township	3.0%	17
Lake Isabella, Village of	1.1%	6
Mt. Pleasant, City of	41.0%	231
Nottawa Township	0.5%	3
Rolland Township	0.2%	1
Saginaw Chippewa Indian Tribe	3.0%	17
Shepherd, Village of	1.2%	7
Sherman Township	0.2%	1
Union Township	8.9%	50
Vernon Township	0.2%	1
Wise Township	0.2%	1
Other	10.8%	61
	Total	563

4.Do you have consistent, and stable internet access?



Value	Percent	Count
Yes	90.9%	440
No	8.9%	43
Do Not Know	0.2%	1
	Total	484

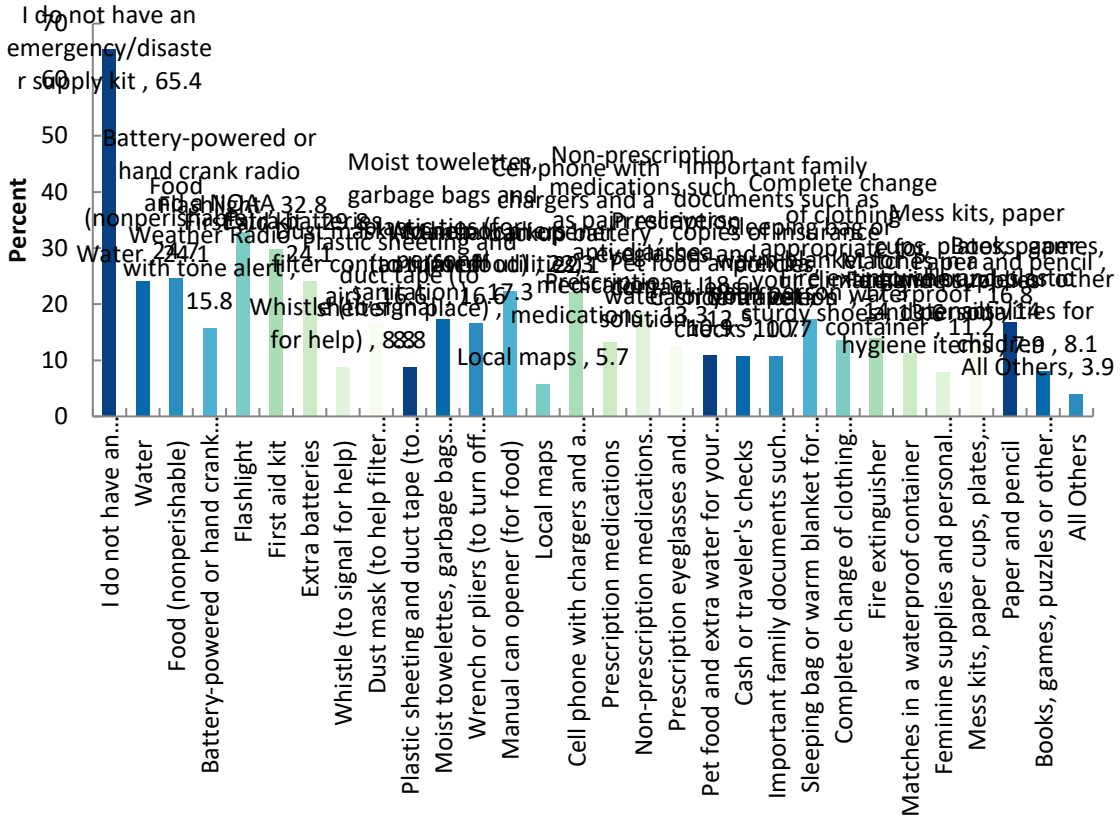
5.Please indicate those activities you have done to prepare for emergencies and disasters. Please select ALL that apply. I have…



Value	Percent	Count
an emergency preparedness plan	28.3%	127
developed an emergency plan for my pet (if applicable)	13.8%	62
flood Insurance	6.3%	28
72 hour kit/disaster supply kit	20.1%	90
visited local government web site(s) for emergency preparedness information	22.8%	102
an evacuation plan	22.1%	99
a weather radio	27.7%	124

downloaded an app on my phone to receive emergency alerts	75.4%	338
signed up for AlertSense	20.3%	91
Other (please specify)	6.9%	31

6.If you have an emergency supply kit, what items do you have in your kit? Please select ALL that apply.

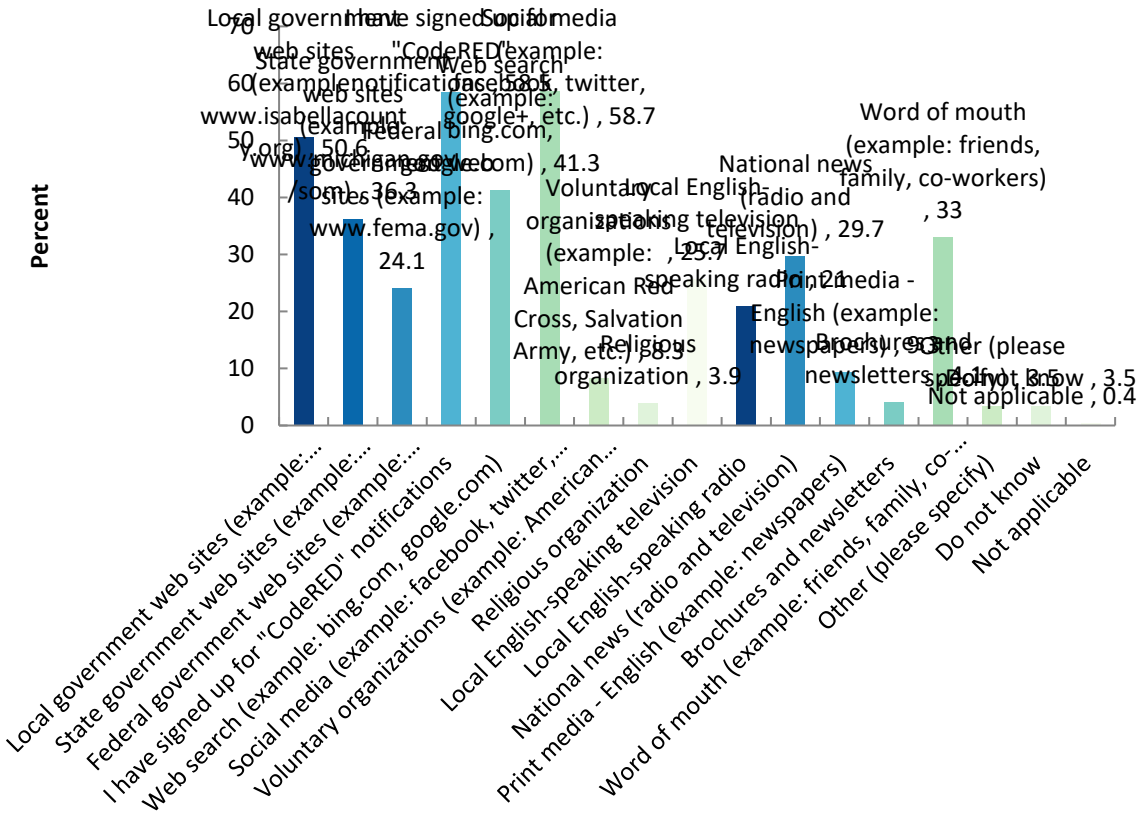


Value	Percent	Count
I do not have an emergency/disaster supply kit	65.4%	299
Water	24.1%	110
Food (nonperishable)	24.7%	113

Battery-powered or hand crank radio and a NOAA Weather Radio with tone alert	15.8%	72
Flashlight	32.8%	150
First aid kit	29.8%	136
Extra batteries	24.1%	110
Whistle (to signal for help)	8.8%	40
Dust mask (to help filter contaminated air)	16.6%	76
Plastic sheeting and duct tape (to shelter in place)	8.8%	40
Moist towelettes, garbage bags and plastic ties (for personal sanitation)	17.3%	79
Wrench or pliers (to turn off utilities)	16.6%	76
Manual can opener (for food)	22.3%	102
Local maps	5.7%	26
Cell phone with chargers and a backup battery	22.1%	101
Prescription medications	13.3%	61
Non-prescription medications such as pain relievers, anti-diarrhea medication, antacids or laxatives	18.6%	85
Prescription eyeglasses and contact lens solution	12.5%	57
Infant formula, bottles, diapers, wipes and diaper rash cream	1.3%	6

Pet food and extra water for your pet	10.9%	50
Cash or traveler's checks	10.7%	49
Important family documents such as copies of insurance policies, identification and bank account records saved electronically or in a waterproof, portable container	10.7%	49
Sleeping bag or warm blanket for each person	17.3%	79
Complete change of clothing appropriate for your climate and sturdy shoes	13.6%	62
Fire extinguisher	14.0%	64
Matches in a waterproof container	11.2%	51
Feminine supplies and personal hygiene items	7.9%	36
Mess kits, paper cups, plates, paper towels and plastic utensils	14.0%	64
Paper and pencil	16.8%	77
Books, games, puzzles or other activities for children	8.1%	37
Other (please specify)	2.6%	12

7.Please indicate where you go to obtain emergency and disaster related information? Please select ALL that apply.



Value	Percent	Count
Local government web sites (example: www.isabellacounty.org)	50.6%	244
State government web sites (example: www.michigan.gov/som)	36.3%	175
Federal government web sites (example: www.fema.gov)	24.1%	116
I have signed up for "CodeRED" notifications	58.5%	282
Web search (example: bing.com, google.com)	41.3%	199
Social media (example: facebook, twitter, google+, etc.)	58.7%	283

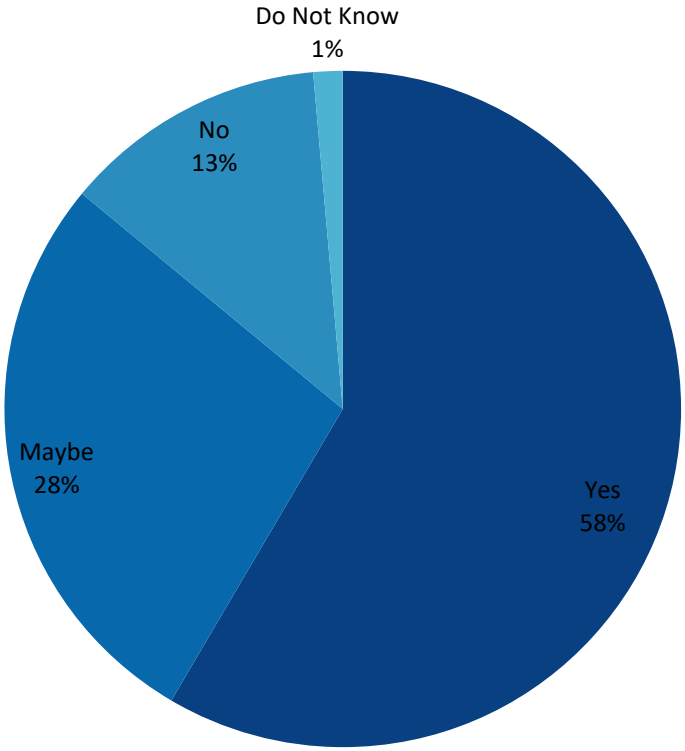
Voluntary organizations (example: American Red Cross, Salvation Army, etc.)	8.3%	40
Religious organization	3.9%	19
Local English-speaking television	25.7%	124
Local English-speaking radio	21.0%	101
National news (radio and television)	29.7%	143
Print media - English (example: newspapers)	9.3%	45
Brochures and newsletters	4.1%	20
Word of mouth (example: friends, family, co-workers)	33.0%	159
Other (please specify)	3.5%	17
Do not know	3.5%	17
Not applicable	0.4%	2

8.Would you agree or disagree with the following statements?

	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Do Not Know		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Isabella County is providing the services necessary to prepare me for a disaster.	45	9.3%	170	35.2%	162	33.5%	28	5.8%	5	1.0%	73	15.1%	483
I am familiar with Isabella County's web site (www.isabellacounty.org) and can easily obtain information about emergencies and disasters.	68	14.1%	186	38.7%	114	23.7%	58	12.1%	19	4.0%	36	7.5%	481
During times of emergency, information is provided in a format I can understand.	83	17.3%	256	53.3%	71	14.8%	21	4.4%	5	1.0%	44	9.2%	480
I can easily obtain emergency information in times of crisis.	77	16.0%	225	46.8%	109	22.7%	35	7.3%	6	1.2%	29	6.0%	481

9.Please indicate how Isabella County can better assist you in preparing for emergencies and disasters (example: provide preparedness materials in my language).

10.If a disaster (i.e. snow storm) impacted Isabella County, knocking out electricity and running water, would your household be able to manage on its own for at least three (3) days?



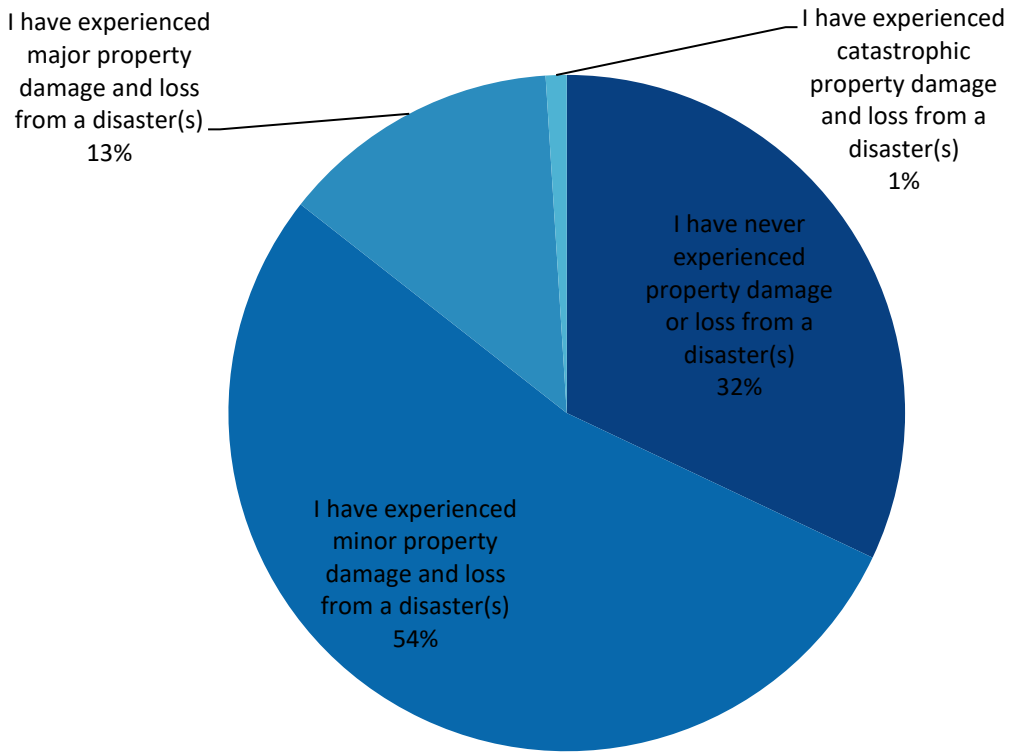
Value	Percent	Count
Yes	58.4%	282
Maybe	27.5%	133
No	12.6%	61
Do Not Know	1.4%	7
	Total	483

11.Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what hazards present the greatest risk.Low Risk = Low impact on threat to life and property damage Medium Risk = Medium impact on threat to life and property damage High Risk = High impact on threat to life and property damage

	Low Risk		Medium Risk		High Risk		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Infrastructure Failure	192	50.9 %	141	37.4 %	42	11.1 %	2	0.5%	377
Severe Winter Weather	96	25.1 %	185	48.4 %	100	26.2 %	1	0.3%	382
Severe Summer Weather	118	30.9 %	194	50.8 %	70	18.3 %	0	%	382
Public Health Emergencies	128	33.7 %	176	46.3 %	73	19.2 %	3	0.8%	380
Riverine Flooding	212	56.2 %	107	28.4 %	47	12.5 %	11	2.9%	377
Transportation/Hazmat Incident	228	60.5 %	111	29.4 %	32	8.5%	6	1.6%	377
Civil Disturbances	193	51.2 %	142	37.7 %	39	10.3 %	3	0.8%	377
Scrap Tire and Structural Fires	276	73.6 %	75	20.0 %	14	3.7%	10	2.7%	375
Terrorism/Sabotage	266	70.7 %	84	22.3 %	21	5.6%	5	1.3%	376
Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	253	67.6 %	83	22.2 %	20	5.3%	18	4.8%	374
Wildfires	247	65.0 %	101	26.6 %	18	4.7%	14	3.7%	380

Dam Failures	276	73.0 %	58	15.3 %	11	2.9%	33	8.7%	378
Drought	217	57.1 %	130	34.2 %	22	5.8%	11	2.9%	380
Major Population Changes	270	71.8 %	79	21.0 %	14	3.7%	13	3.5%	376
Nuclear Attack	254	67.7 %	75	20.0 %	32	8.5%	14	3.7%	375
Nuclear Power Plant Accident	286	76.1 %	31	8.2%	12	3.2%	47	12.5 %	376
Subsidence	255	69.3 %	50	13.6 %	12	3.3%	51	13.9 %	368
Earthquakes	322	85.9 %	22	5.9%	3	0.8%	28	7.5%	375

12.Please select the answer that best describes your experience.



Value	Percent	Count
I have never experienced property damage or loss from a disaster(s)	32.0%	122
I have experienced minor property damage and loss from a disaster(s)	53.5%	204
I have experienced major property damage and loss from a disaster(s)	13.4%	51
I have experienced catastrophic property damage and loss from a disaster(s)	1.0%	4
	Total	381

13.If you have experienced any damage(s) or injury(ies) from a disaster, please list the hazard(s) that caused the damages/losses and/or injuries (Example: flooding, wind, winter storm)

14.If you have experienced any damage(s) or injury(ies) from a disaster, please indicate where this occurred (Example: my home, on a roadway or intersection, at work, on vacation, etc.)

15.If you have experienced any damage(s) or injury(ies) from a disaster, please describe the damages and/or injuries. (Example: basement flooded, roof was damaged, vehicle was damaged, broken bones, lacerations, etc.)

16. Based on YOUR PERCEPTION of your jurisdiction's hazards, to what degree of emphasis would you expect your jurisdiction to mitigate the following hazards? Mitigation definition: The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation forms the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. No Mitigation Needed = No mitigation on this hazard is expected or needed Low Priority = This hazard should be mitigated, but is not a high priority compared to other hazards Medium Priority = It is important to mitigate this hazard High Priority = It is a high priority to emphasize mitigation for this hazard

	No Mitigation Needed		Low Priority		Medium Priority		High Priority		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Infrastructure Failure	50	13.4 %	109	29.3 %	134	36.0 %	79	21.2 %	372
Severe Winter Weather	32	8.5%	99	26.4 %	141	37.6 %	103	27.5 %	375
Severe Summer Weather	39	10.4 %	122	32.6 %	147	39.3 %	66	17.6 %	374
Public Health Emergencies	26	7.0%	70	18.8 %	147	39.4 %	130	34.9 %	373
Riverine Flooding	43	11.6 %	100	27.0 %	132	35.6 %	96	25.9 %	371

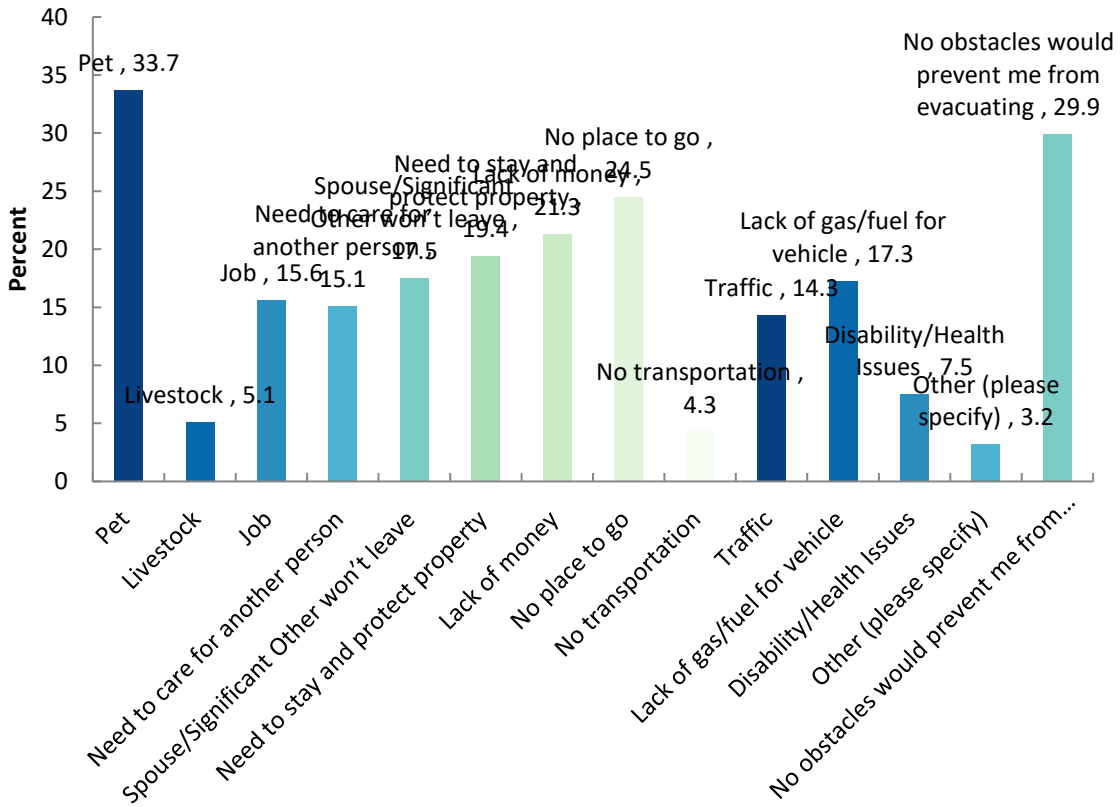
Transportation/Hazmat Incident	49	13.1%	156	41.8%	104	27.9%	64	17.2%	373
Civil Disturbances	46	12.4%	153	41.1%	108	29.0%	65	17.5%	372
Scrap Tire and Structural Fires	80	21.4%	179	47.9%	82	21.9%	33	8.8%	374
Terrorism/Sabotage	67	18.1%	155	41.8%	73	19.7%	76	20.5%	371
Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	84	22.6%	134	36.0%	96	25.8%	58	15.6%	372
Wildfires	75	20.2%	142	38.2%	97	26.1%	58	15.6%	372
Dam Failures	86	23.1%	130	34.9%	89	23.9%	68	18.2%	373
Drought	75	20.1%	186	49.9%	90	24.1%	22	5.9%	373
Major Population Changes	136	36.4%	153	40.9%	68	18.2%	17	4.5%	374
Nuclear Attack	105	28.3%	117	31.5%	71	19.1%	78	21.0%	371
Nuclear Power Plant Accident	154	41.5%	114	30.7%	43	11.6%	60	16.2%	371
Subsidence	110	30.0%	162	44.1%	69	18.8%	26	7.1%	367
Earthquakes	185	49.6%	135	36.2%	24	6.4%	29	7.8%	373

17.If an evacuation was ordered for your area, please indicate how likely you would be to do the following.

	Very Likely		Somewhat Likely		Not Very Likely		Not Likely at All		Do Not Know		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Immediately evacuate as instructed.	184	48.8 %	138	36.6 %	19	5.0 %	14	3.7 %	20	5.3 %	2	0.5 %	377
I would first consult with family and friends outside my household before making a decision to evacuate.	138	37.0 %	127	34.0 %	55	14.7 %	46	12.3 %	6	1.6 %	1	0.3 %	373
Wait and see how bad the situation is going to be before deciding to evacuate.	52	13.9 %	144	38.4 %	91	24.3 %	76	20.3 %	10	2.7 %	2	0.5 %	375

Refuse to evacuate no matter what.	5	1.3 %	19	5.1 %	66	17.7 %	252	67.6 %	22	5.9 %	9	2.4 %	373

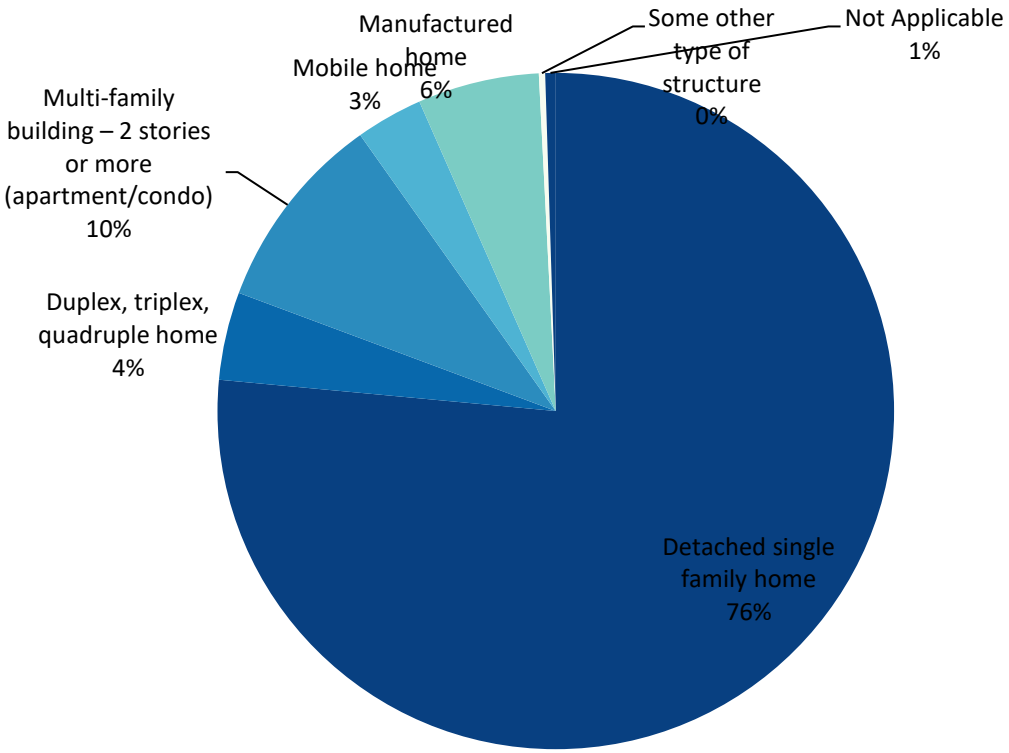
18.What might prevent you from leaving your place of residence if there was an evacuation order? Please select ALL that apply.



Value	Percent	Count
Pet	33.7%	125
Livestock	5.1%	19
Job	15.6%	58
Need to care for another person	15.1%	56
Spouse/Significant Other won't leave	17.5%	65

Need to stay and protect property	19.4%	72
Lack of money	21.3%	79
No place to go	24.5%	91
No transportation	4.3%	16
Traffic	14.3%	53
Lack of gas/fuel for vehicle	17.3%	64
Disability/Health Issues	7.5%	28
Other (please specify)	3.2%	12
No obstacles would prevent me from evacuating	29.9%	111

19.What type of structure do you live in?

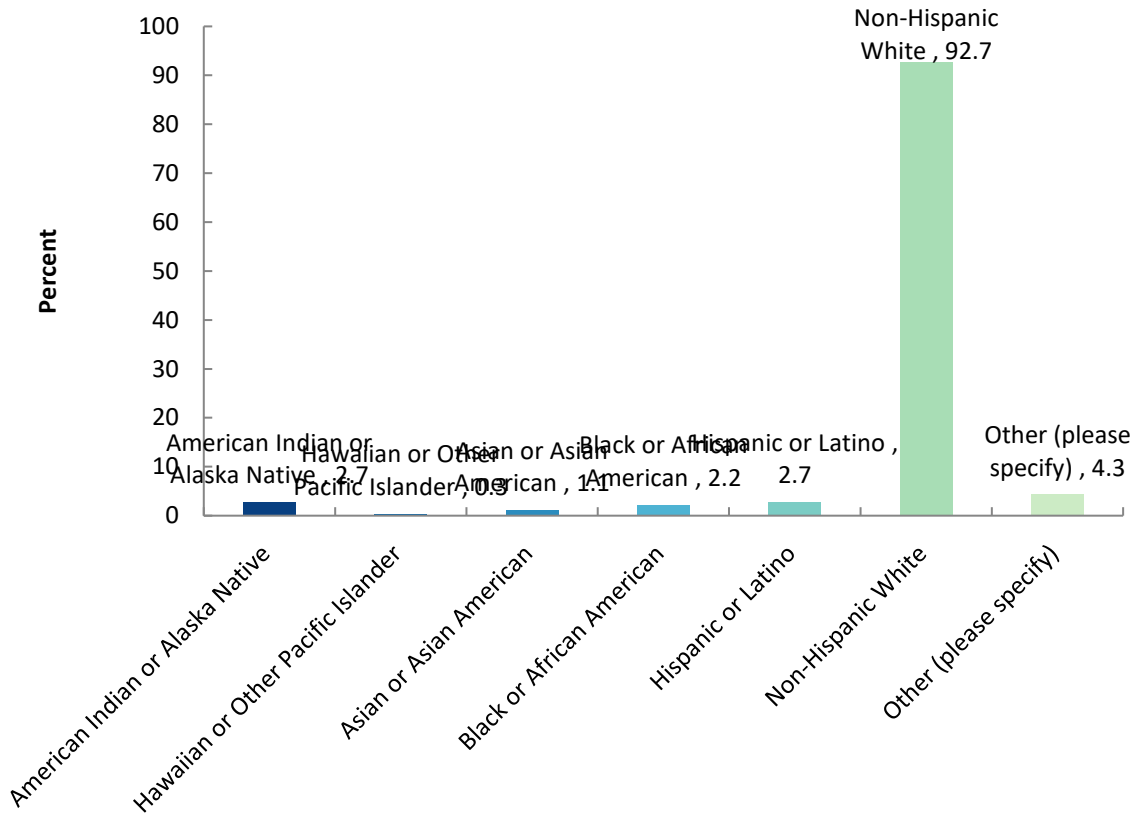


Value	Percent	Count
Detached single family home	76.4%	288
Duplex, triplex, quadruple home	4.2%	16
Multi-family building – 2 stories or more (apartment/condo)	9.5%	36
Mobile home	3.2%	12
Manufactured home	5.8%	22
Some other type of structure	0.3%	1
Not Applicable	0.5%	2
	Total	377

20.How many persons, including yourself, are currently living in your household?

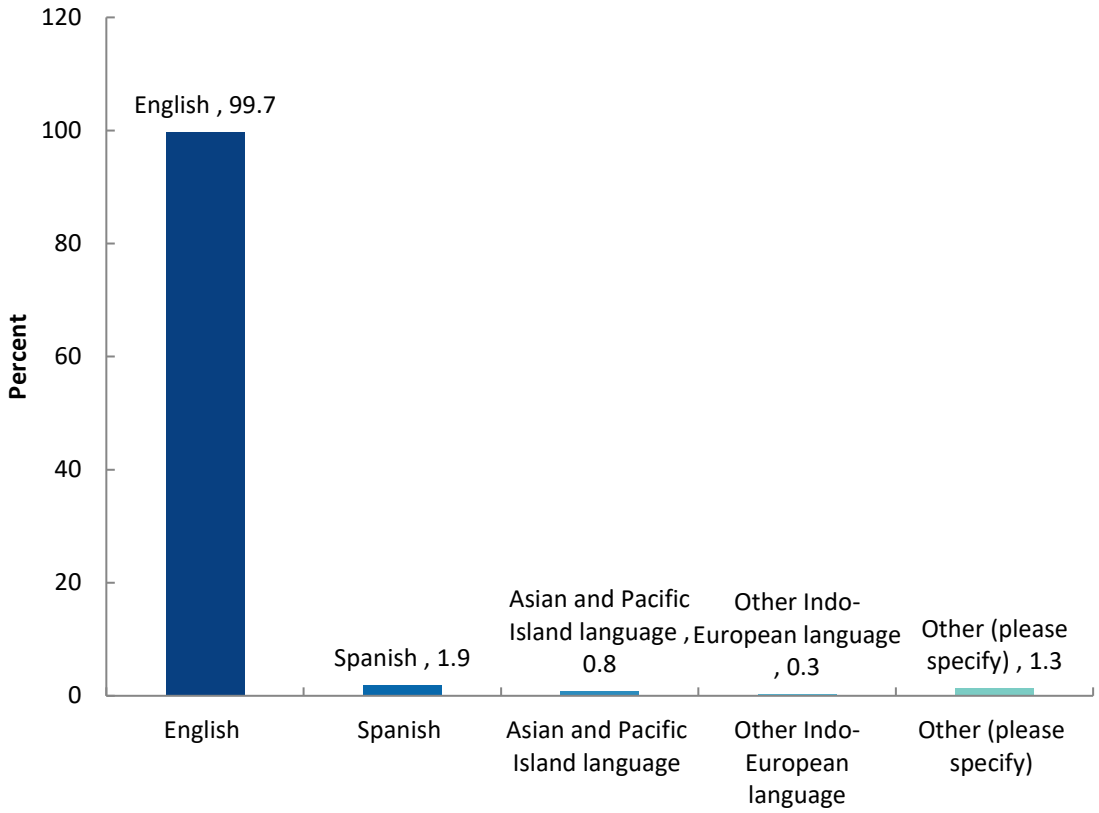
	Number of people in household		Responses
	Row %	Count	
Under age 5:	100.0%	267	267
Ages 6-10:	100.0%	266	266
Ages 11-19:	100.0%	281	281
Ages 20-44:	100.0%	302	302
Ages 45-64:	100.0%	314	314
Ages 65-79:	100.0%	288	288
Ages 80+	100.0%	256	256

21.Which of the following best describes your race/ethnicity? Please select ALL that apply.



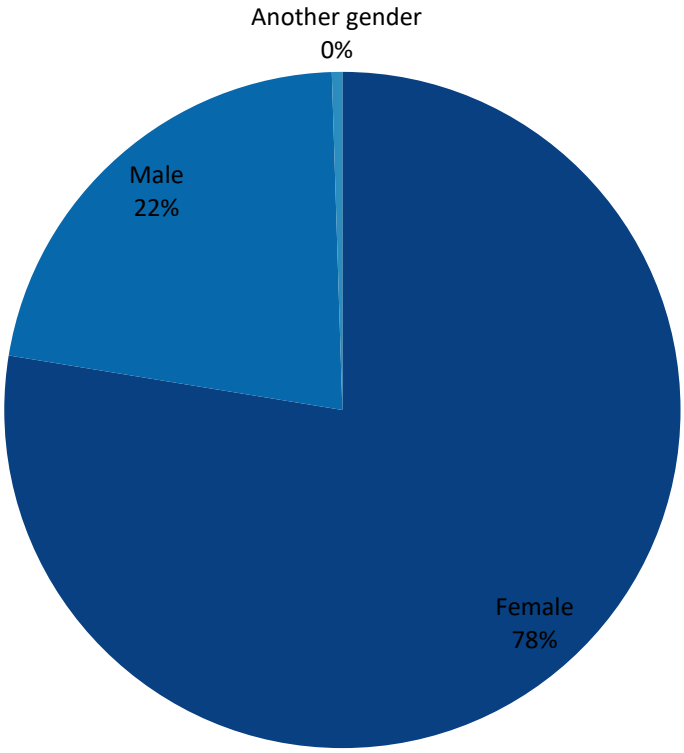
Value	Percent	Count
American Indian or Alaska Native	2.7%	10
Hawaiian or Other Pacific Islander	0.3%	1
Asian or Asian American	1.1%	4
Black or African American	2.2%	8
Hispanic or Latino	2.7%	10
Non-Hispanic White	92.7%	345
Other (please specify)	4.3%	16

22.Please indicate the language(s) spoken in your household. Please select ALL that apply.



Value	Percent	Count
English	99.7%	374
Spanish	1.9%	7
Asian and Pacific Island language	0.8%	3
Other Indo-European language	0.3%	1
Other (please specify)	1.3%	5

23.Please indicate your gender.



Value	Percent	Count
Female	77.5%	290
Male	21.9%	82
Another gender	0.5%	2
	Total	374

24.(OPTIONAL): If you would like someone to contact you regarding emergency preparedness in Isabella County, please leave your contact information below, and a representative will contact you. We will ensure your information is kept confidential.

APPENDIX B – ISABELLA COUNTY LOCAL COMMUNITY SUBSECTIONS

All local communities were encouraged to participate in the update of the Hazard Mitigation Plan ("Plan") update. Their input was requested on two different levels, participation in the Plan itself, and the submittal of a survey that addressed the issues of that particular community.

Participation in the Plan update included attending any of a number of meetings of the Isabella County Local Planning Team (ICLPT), which was used in advisory capacity for the Isabella County data. The ICLPT meets on a monthly basis and included the Plan update as part of the monthly meeting agenda in order to complete the Plan in a timely manner. The second means to participate was the completion of a community survey. The results of the survey are found below and provide feedback on the issues facing each community. As a follow-up to the survey, the Emergency Management Director (EMD), the Emergency Management Coordinator (EMC), and the East Michigan Council of Governments (EMCOG) staff met with the survey participants to secure supplemental information not included in the survey.

Below is a list of the participating communities and their local representatives.
City of Clare: Jeremy Howard, City Manager
City of Mount Pleasant: Rick Beltinck, Fire Chief, Jason Moore, Director Public Works
Village of Lake Isabella: Tim Wolff
Village of Rosebush: Matt Kampf,
Village of Shepherd: Terry Starr, Superintendent
Broomfield Township: Christy Mathewson, Supervisor ,
Marc Griffis, EM Director
Chippewa Township: Robert Smith, Supervisor
Coe Township: Mary Kay
Maas,Supervisor
Coldwater Township: James Dague
Deerfield Township: Ryan Martin Fire
Chief
Denver Township: John Pedjac
Fremont Township: John
Schimmelmann, Clerk
Gilmore Township: Steve Lasher,
Supervisor
Isabella Township: Cara Lynch
Lincoln Township: Thomas L Ramon
Nottawa Township: Heather Curtiss
,Clerk
Rolland Township: Daniel L. Shaw,
Supervisor
Sherman Township: Jeff Grey, Board
of Trustees and Denise
LivermoreClerk
Union Township: Mark Stuhldreher, Township Manager Kimberly E Smith, Public Service DIrector

Vernon Township: Survey completed by Jeffrey R Bean
Wise Township: Doris Methner
Saginaw Chippewa Indian Tribe: Troy Techlin, Environmental Manager
Central Michigan University: Cameron Wassman, Police Leuitenant

Jurisdiction Hazard Ranking Survey Results:

Ranking Methodology:
Impacts – *N/A* ***(0)*** = Jurisdiction considers hazard threat negligible. *Very Low Risk* ***(1)*** = An event with minimal impacts to people, property, no outside assistance required *Low Risk* ***(2)*** = An event with minor impact on people, property, local assistance may be required *Moderate Risk* ***(3)*** = An event that will impact people, property and/or community operations such that people need community assistance. A moderate amount of time will be needed for recovery. State or federal assistance may be required *High Risk* ***(4)*** = An event that will severely impact people, property and/or community operations. Significant amount of time will be needed for recovery. State and federal assistance will be required.
Likelihood of Occurrence- *Very Low* ***(1)*** = Occurs every 100-199 years. *Low* ***(2)*** = Occurs every 30-99 years. *Moderate* ***(3)*** = Occurs every 10-29 years. *High* ***(4)*** = Occurs every 3-9 years. *Very High* ***(5)*** = Occurs every 1-2 years.
Vulnerability- *Very Low* **(1)** = Minimal localized event
Low **(2)** = Specific neighborhoods more vulnerable to the hazard (example: Cross streets or cul-de-sac where frequent flooding occurs) . *Moderate* ***(3)*** = Widespread, approximately 25% of planning area vulnerable *High* ***(4)*** = Widespread, approximately 50% of planning area vulnerable *Very High* ***(5)*** = Substantial, entire planning area vulnerable
Overall Hazard Ranking Score – *Low =0-4, Moderate = 5-9, High=10-14*

Jurisdiction	Hazard	Impact	Occurrence	Vulnerability	Score	Ranking
Lake Isabella, Village of	Infrastructure Failure	4	5	5	14	High
	Severe Winter Weather	3	5	3	11	High
	Severe Summer Weather	3	5	3	11	High
	Public Health Emergencies	3	4	4	11	High
	Riverine Flooding	3	3	3	9	Moderate
	Transportation/Hazmat Incident	2	4	2	8	Moderate
	Civil Disturbances	2	3	2	7	Moderate
	Scrap Tire and Structural Fires	1	5	1	7	Moderate
	Terrorism/Sabotage	3	3	5	11	High

	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	2	3	2	7	Mode rate
	Wildfires	1	4	2	7	Mode rate
	Dam Failures	3	4	4	11	High
	Drought	3	4	2	9	Mode rate
	Major Population Changes	1	2	1	4	Low
	Nuclear Attack	2	2	5	9	Mode rate
	Nuclear Power Plant Accident	2	1	1	4	Low
	Subsidence	1	2	1	4	Low
	Earthquakes	1	2	1	4	Low
Broomfield	Infrastructure	4	5	5	14	High

Township	Failure					
	Severe Winter Weather	3	5	3	11	High
	Severe Summer Weather	3	5	3	11	High
	Public Health Emergencies	3	4	4	11	High
	Riverine Flooding	3	3	3	9	Mode rate
	Transportation/Haz mat Incident	2	4	2	8	Mode rate
	Civil Disturbances	2	3	2	7	Mode rate
	Scrap Tire and Structural Fires	1	5	1	7	Mode rate
	Terrorism/Sabotag e	3	3	5	11	High
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	2	3	2	7	Mode rate
	Wildfires	1	4	2	7	Mode rate
	Dam Failures	3	4	4	11	High
	Drought	3	4	2	9	Mode rate

	Major Population Changes	1	2	1	4	Low
	Nuclear Attack	2	2	5	9	Moderate
	Nuclear Power Plant Accident	2	1	1	4	Low
	Subsidence	1	2	1	4	Low
	Earthquakes	1	2	1	4	Low
Shepherd, Village of	Infrastructure Failure	3	2	2	7	Moderate
	Severe Winter Weather	3	5	3	11	High
	Severe Summer Weather	2	4	2	8	Moderate
	Public Health Emergencies	4	3	3	10	High
	Riverine Flooding	2	2	2	6	Moderate
	Transportation/Hazmat Incident	4	4	2	10	High

	Civil Disturbances	3	4	3	10	High
	Scrap Tire and Structural Fires	2	2	2	6	Moderate
	Terrorism/Sabotage	2	3	2	7	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	4	3	10	High
	Wildfires	2	4	2	8	Moderate
	Dam Failures	1	3	2	6	Moderate
	Drought	2	3	2	7	Moderate
	Major Population Changes	2	3	2	7	Moderate
	Nuclear Attack	2	2	2	6	Moderate
	Nuclear Power Plant Accident	2	2	2	6	Moderate
	Subsidence	2	3	2	7	Moderate
	Earthquakes	1	2	2	5	Moderate

Union Township	Infrastructure Failure	4	3	3	10	High
	Severe Winter Weather	3	4	5	12	High
	Severe Summer Weather	3	4	5	12	High
	Public Health Emergencies	3	3	5	11	High
	Riverine Flooding	4	4	3	11	High
	Transportation/Hazmat Incident	3	3	3	9	Moderate
	Civil Disturbances	2	2	3	7	Moderate
	Scrap Tire and Structural Fires	3	2	3	8	Moderate
	Terrorism/Sabotage	2	2	5	9	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	2	3	8	Moderate

	Wildfires	2	2	3	7	Moderate
	Dam Failures	2	2	3	7	Moderate
	Drought	2	2	5	9	Moderate
	Major Population Changes	2	2	5	9	Moderate
	Nuclear Attack	2	1	5	8	Moderate
	Nuclear Power Plant Accident	1	1	5	7	Moderate
	Subsidence	2	1	5	8	Moderate
	Earthquakes	1	1	5	7	Moderate
Mt. Pleasant, City of	Infrastructure Failure	2	5	1	8	Moderate
	Severe Winter Weather	2	4	5	11	High
	Severe Summer Weather	2	4	5	11	High
	Public Health Emergencies	3	2	5	10	High

	Riverine Flooding	3	3	3	9	Moderate
	Transportation/Hazmat Incident	2	4	5	11	High
	Civil Disturbances	2	4	3	9	Moderate
	Scrap Tire and Structural Fires	2	5	5	12	High
	Terrorism/Sabotage	3	2	3	8	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	2	3	8	Moderate
	Wildfires	2	2	3	7	Moderate
	Dam Failures	1	1	1	3	Low
	Drought	2	3	3	8	Moderate
	Major Population Changes	3	2	5	10	High
	Nuclear Attack	4	1	5	10	High

	Nuclear Power Plant Accident	2	1	5	8	Moderate
	Subsidence	3	2	5	10	High
	Earthquakes	4	2	5	11	High
Rolland Township	Infrastructure Failure	1	1	1	3	Low
	Severe Winter Weather	3	5	5	13	High
	Severe Summer Weather	3	4	4	11	High
	Public Health Emergencies	2	1	3	6	Moderate
	Riverine Flooding	3	2	3	8	Moderate
	Transportation/Hazmat Incident	1	1	1	3	Low
	Civil Disturbances	1	1	1	3	Low
	Scrap Tire and Structural Fires	1	1	1	3	Low
	Terrorism/Sabotage	1	1	1	3	Low

	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	1	1	1	3	Low
	Wildfires	3	3	2	8	Moderate
	Dam Failures	3	3	3	9	Moderate
	Drought	3	3	3	9	Moderate
	Major Population Changes	1	1	1	3	Low
	Nuclear Attack	1	1	1	3	Low
	Nuclear Power Plant Accident	1	1	1	3	Low
	Subsidence	1	1	1	3	Low
	Earthquakes	1	1	1	3	Low
Deerfield Township	Infrastructure Failure	3	1	1	5	Moderate
	Severe Winter Weather	2	4	1	7	Moderate
	Severe Summer Weather	2	3	1	6	Moderate
	Public Health Emergencies	2	5	1	8	Moderate

	Riverine Flooding	4	3	3	10	High
	Transportation/Hazmat Incident	4	3	1	8	Moderate
	Civil Disturbances	4	2	1	7	Moderate
	Scrap Tire and Structural Fires	3	5	1	9	Moderate
	Terrorism/Sabotage	4	2	1	7	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	4	2	1	7	Moderate
	Wildfires	3	5	1	9	Moderate
	Dam Failures	4	2	1	7	Moderate
	Drought	2	2	1	5	Moderate

	Major Population Changes	2	2	1	5	Moderate
	Nuclear Attack	4	1	1	6	Moderate
	Nuclear Power Plant Accident	4	1	1	6	Moderate
	Subsidence	3	1	1	5	Moderate
	Earthquakes	4	1	1	6	Moderate
Claire, City of	Infrastructure Failure	4	4	5	13	High
	Severe Winter Weather	4	5	5	14	High
	Severe Summer Weather	4	5	5	14	High
	Public Health Emergencies	3	4	4	11	High
	Riverine Flooding	4	5	4	13	High
	Transportation/Hazmat Incident	3	3	3	9	Moderate
	Civil Disturbances	3	3	3	9	Moderate
	Scrap Tire and Structural Fires	3	5	3	11	High
	Terrorism/Sabotage	2	2	3	7	Moderate

	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	2	2	3	7	Moderate
	Wildfires	3	5	3	11	High
	Dam Failures	4	3	4	11	High
	Drought	3	4	3	10	High
	Major Population Changes	2	3	3	8	Moderate
	Nuclear Attack	1	1	5	7	Moderate
	Nuclear Power Plant Accident	1	1	5	7	Moderate
	Subsidence	2	2	3	7	Moderate
	Earthquakes	2	2	5	9	Moderate

Vernon, Township	Infrastructure Failure	4	4	4	12	High
	Severe Winter Weather	2	3	3	8	Moderate
	Severe Summer Weather	3	3	3	9	Moderate
	Public Health Emergencies	4	3	3	10	High
	Riverine Flooding	3	2	2	7	Moderate
	Transportation/Hazmat Incident	2	3	2	7	Moderate
	Civil Disturbances	2	2	2	6	Moderate
	Scrap Tire and Structural Fires	2	4	2	8	Moderate
	Terrorism/Sabotage	2	2	2	6	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	4	3	2	9	Moderate
	Wildfires	2	2	2	6	Moderate
	Dam Failures	2	2	2	6	Moderate
	Drought	2	3	3	8	Moderate
	Major Population Changes	2	2	2	6	Moderate
	Nuclear Attack	4	2	1	7	Moderate
	Nuclear Power Plant Accident	4	2	1	7	Moderate
	Subsidence	4	4	3	11	High
	Earthquakes	3	2	3	8	Moderate
Denver, Township	Infrastructure Failure	4	3	4	11	High
	Severe Winter Weather	3	2	3	8	Moderate
	Severe Summer Weather	3	2	3	8	Moderate
	Public Health Emergencies	3	2	4	9	Moderate

	Riverine Flooding	4	4	1	9	Moderate
	Transportation/Hazmat Incident	0	2	1	3	Low
	Civil Disturbances	0	2	1	3	Low
	Scrap Tire and Structural Fires	2	2	1	5	Moderate
	Terrorism/Sabotage	2	2	3	7	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	2	3	3	8	Moderate
	Wildfires	3	3	1	7	Moderate
	Dam Failures	0	1	1	2	Low
	Drought	3	2	1	6	Moderate
	Major Population Changes	0	1	1	2	Low
	Nuclear Attack	0	1	1	2	Low
	Nuclear Power Plant Accident	0	1	1	2	Low
	Subsidence	2	1	1	4	Low
	Earthquakes	0	1	1	2	Low
Sherman, Township	Infrastructure Failure	3	2	2	7	Moderate
	Severe Winter Weather	2	4	4	10	High
	Severe Summer Weather	2	3	4	9	Moderate
	Public Health Emergencies	3	2	4	9	Moderate
	Riverine Flooding	3	4	4	11	High
	Transportation/Hazmat Incident	2	3	2	7	Moderate
	Civil Disturbances	3	3	1	7	Moderate
	Scrap Tire and Structural Fires	2	4	2	8	Moderate
	Terrorism/Sabotage	3	2	3	8	Moderate

	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	2	2	7	Moderate
	Wildfires	2	2	1	5	Moderate
	Dam Failures	3	2	2	7	Moderate
	Drought	2	3	4	9	Moderate
	Major Population Changes	2	2	1	5	Moderate
	Nuclear Attack	4	1	5	10	High
	Nuclear Power Plant Accident	4	2	1	7	Moderate
	Subsidence	0	2	3	5	Moderate
	Earthquakes	4	2	5	11	High
Coldwater, Township	Infrastructure Failure	3	4	1	8	Moderate
	Severe Winter Weather	2	4	1	7	Moderate
	Severe Summer Weather	2	3	1	6	Moderate
	Public Health Emergencies	2	3	1	6	Moderate
	Riverine Flooding	2	3	1	6	Moderate
	Transportation/Hazmat Incident	2	3	1	6	Moderate
	Civil Disturbances	2	3	1	6	Moderate
	Scrap Tire and Structural Fires	3	3	1	7	Moderate

	Terrorism/Sabotage	3	3	1	7	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	3	1	7	Moderate
	Wildfires	3	3	1	7	Moderate
	Dam Failures	1	3	1	5	Moderate

	Drought	2	3	1	6	Moderate
	Major Population Changes	1	3	1	5	Moderate
	Nuclear Attack	1	1	1	3	Low
	Nuclear Power Plant Accident	1	1	1	3	Low
	Subsidence	2	3	1	6	Moderate
	Earthquakes	1	3	1	5	Moderate
Nottawa, Township	Infrastructure Failure	2	2	2	6	Moderate
	Severe Winter Weather	3	3	2	8	Moderate
	Severe Summer Weather	3	3	2	8	Moderate
	Public Health Emergencies	3	3	2	8	Moderate
	Riverine Flooding	3	4	3	10	High
	Transportation/Hazmat Incident	3	3	2	8	Moderate
	Civil Disturbances	2	1	1	4	Low
	Scrap Tire and Structural Fires	3	3	2	8	Moderate
	Terrorism/Sabotage	1	1	1	3	Low
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	2	2	7	Moderate
	Wildfires	2	1	1	4	Low
	Dam Failures	3	2	2	7	Moderate
	Drought	3	3	2	8	Moderate

	Major Population Changes	2	1	1	4	Low
	Nuclear Attack	1	1	1	3	Low
	Nuclear Power Plant Accident	1	1	1	3	Low
	Subsidence	1	1	1	3	Low
	Earthquakes	1	1	1	3	Low
Coe Township	Infrastructure Failure	3	4	5	12	High

	Severe Winter Weather	2	5	5	12	High
	Severe Summer Weather	4	5	5	14	High
	Public Health Emergencies	4	3	5	12	High
	Riverine Flooding	4	2	5	11	High
	Transportation/Hazmat Incident	3	4	3	10	High
	Civil Disturbances	2	5	1	8	Moderate
	Scrap Tire and Structural Fires	2	5	1	8	Moderate
	Terrorism/Sabotage	4	3	5	12	High
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	2	3	1	6	Moderate
	Wildfires	2	2	1	5	Moderate
	Dam Failures	4	2	1	7	Moderate
	Drought	4	2	5	11	High
	Major Population Changes	1	3	5	9	Moderate
	Nuclear Attack	4	1	5	10	High
	Nuclear Power Plant Accident	4	3	5	12	High
	Subsidence	2	5	1	8	Moderate
	Earthquakes	4	2	5	11	High
Gilmore Township	Infrastructure Failure	1	2	1	4	Low
	Severe Winter Weather	2	3	2	7	Moderate
	Severe Summer Weather	2	2	2	6	Moderate
	Public Health Emergencies	3	3	2	8	Moderate
	Riverine Flooding	1	1	1	3	Low
	Transportation/Hazmat Incident	1	1	1	3	Low
	Civil Disturbances	1	1	1	3	Low

	Scrap Tire and Structural Fires	2	2	2	6	Moderate
	Terrorism/Sabotage	1	1	1	3	Low
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	1	1	1	3	Low
	Wildfires	3	2	3	8	Moderate
	Dam Failures	1	1	1	3	Low
	Drought	2	2	2	6	Moderate
	Major Population Changes	4	5	4	13	High
	Nuclear Attack	1	1	1	3	Low
	Nuclear Power Plant Accident	1	1	1	3	Low
	Subsidence	2	2	2	6	Moderate
	Earthquakes	1	1	1	3	Low
Chippewa Township	Infrastructure Failure	3	1	1	5	Moderate
	Severe Winter Weather	2	2	1	5	Moderate
	Severe Summer Weather	2	2	1	5	Moderate
	Public Health Emergencies	2	1	1	4	Low
	Riverine Flooding	4	3	1	8	Moderate
	Transportation/Hazmat Incident	3	1	1	5	Moderate
	Civil Disturbances	2	1	1	4	Low
	Scrap Tire and Structural Fires	1	1	1	3	Low
	Terrorism/Sabotage	2	1	1	4	Low

	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	2	1	6	Moderate
	Wildfires	2	1	1	4	Low
	Dam Failures	2	1	1	4	Low
	Drought	2	1	1	4	Low

	Major Population Changes	1	1	1	3	Low
	Nuclear Attack	2	1	1	4	Low
	Nuclear Power Plant Accident	1	1	1	3	Low
	Subsidence	1	1	1	3	Low
	Earthquakes	1	1	1	3	Low
Fremont Township	Infrastructure Failure	1	1	2	4	Low
	Severe Winter Weather	4	3	3	10	High
	Severe Summer Weather	4	3	3	10	High
	Public Health Emergencies	3	3	3	9	Moderate
	Riverine Flooding	3	1	2	6	Moderate
	Transportation/Hazmat Incident	3	1	2	6	Moderate
	Civil Disturbances	2	2	2	6	Moderate
	Scrap Tire and Structural Fires	2	1	1	4	Low
	Terrorism/Sabotage	2	2	2	6	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	1	1	1	3	Low
	Wildfires	3	3	3	9	Moderate
	Dam Failures	1	1	1	3	Low
	Drought	2	3	3	8	Moderate
	Major Population Changes	1	1	1	3	Low
	Nuclear Attack	0	1	1	2	Low
	Nuclear Power Plant Accident	0	1	1	2	Low
	Subsidence	0	1	1	2	Low
	Earthquakes	2	2	3	7	Moderate
Wise Township	Infrastructure Failure	4	4	4	12	High

	Severe Winter Weather	3	3	2	8	Moderate
	Severe Summer Weather	3	4	3	10	High
	Public Health Emergencies	3	3	2	8	Moderate
	Riverine Flooding	3	3	2	8	Moderate
	Transportation/Hazmat Incident	3	3	3	9	Moderate
	Civil Disturbances	2	2	2	6	Moderate
	Scrap Tire and Structural Fires	3	3	2	8	Moderate
	Terrorism/Sabotage	3	3	3	9	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	4	3	3	10	High
	Wildfires	4	3	3	10	High
	Dam Failures	3	2	1	6	Moderate
	Drought	3	2	1	6	Moderate
	Major Population Changes	3	2	1	6	Moderate
	Nuclear Attack	3	2	1	6	Moderate
	Nuclear Power Plant Accident	3	2	1	6	Moderate
	Subsidence	3	2	1	6	Moderate
	Earthquakes	3	2	1	6	Moderate
Central Michigan University	Infrastructure Failure	2	2	5	9	Moderate
	Severe Winter Weather	2	3	4	9	Moderate
	Severe Summer Weather	2	3	4	9	Moderate

	Public Health Emergencies	4	4	5	13	High
	Riverine Flooding	4	3	3	10	High

	Transportation/Hazmat Incident	3	3	2	8	Moderate
	Civil Disturbances	4	2	3	9	Moderate
	Scrap Tire and Structural Fires	1	1	1	3	Low
	Terrorism/Sabotage	3	2	3	8	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	1	1	2	4	Low
	Wildfires	1	1	3	5	Moderate
	Dam Failures	1	1	3	5	Moderate
	Drought	1	1	3	5	Moderate
	Major Population Changes	1	1	3	5	Moderate
	Nuclear Attack	1	1	5	7	Moderate
	Nuclear Power Plant Accident	1	1	3	5	Moderate
	Subsidence	1	1	3	5	Moderate
	Earthquakes	1	1	3	5	Moderate
Isabella Township	Infrastructure Failure	3	2	3	8	Moderate
	Severe Winter Weather	4	3	3	10	High
	Severe Summer Weather	4	2	3	9	Moderate
	Public Health Emergencies	4	3	3	10	High
	Riverine Flooding	4	2	3	9	Moderate
	Transportation/Hazmat Incident	4	3	3	10	High
	Civil Disturbances	4	3	3	10	High
	Scrap Tire and Structural Fires	3	3	3	9	Moderate

	Terrorism/Sabotage	4	1	3	8	Moderate

	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	4	2	3	9	Moderate
	Wildfires	4	1	3	8	Moderate
	Dam Failures	3	1	3	7	Moderate
	Drought	4	1	3	8	Moderate
	Major Population Changes	3	1	3	7	Moderate
	Nuclear Attack	0	1	4	5	Moderate
	Nuclear Power Plant Accident	0	1	4	5	Moderate
	Subsidence	4	1	3	8	Moderate
	Earthquakes	3	1	3	7	Moderate
Lincoln Township	Infrastructure Failure	3	3	1	7	Moderate
	Severe Winter Weather	3	4	4	11	High
	Severe Summer Weather	3	4	4	11	High
	Public Health Emergencies	4	3	3	10	High
	Riverine Flooding	2	2	1	5	Moderate
	Transportation/Hazmat Incident	3	1	2	6	Moderate
	Civil Disturbances	3	1	2	6	Moderate
	Scrap Tire and Structural Fires	2	2	2	6	Moderate
	Terrorism/Sabotage	2	1	2	5	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	1	1	1	3	Low
	Wildfires	3	3	3	9	Moderate

	Dam Failures	1	1	1	3	Low

	Drought	3	3	4	10	High
	Major Population Changes	1	1	2	4	Low
	Nuclear Attack	3	1	3	7	Moderate
	Nuclear Power Plant Accident	1	1	1	3	Low
	Subsidence	3	3	3	9	Moderate
	Earthquakes	1	1	1	3	Low
Rosebush, Village of	Infrastructure Failure	3	3	5	11	High
	Severe Winter Weather	4	3	4	11	High
	Severe Summer Weather	3	2	3	8	Moderate
	Public Health Emergencies	2	2	3	7	Moderate
	Riverine Flooding	2	3	3	8	Moderate
	Transportation/Hazmat Incident	4	3	5	12	High
	Civil Disturbances	2	2	2	6	Moderate
	Scrap Tire and Structural Fires	3	4	3	10	High
	Terrorism/Sabotage	2	2	2	6	Moderate
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	4	3	3	10	High
	Wildfires	2	3	2	7	Moderate
	Dam Failures	0	2	2	4	Low
	Drought	2	2	3	7	Moderate
	Major Population Changes	2	2	2	6	Moderate
	Nuclear Attack	2	2	2	6	Moderate
	Nuclear Power Plant Accident	2	2	2	6	Moderate
	Subsidence	3	3	3	9	Moderate

	Earthquakes	2	1	2	5	Moderate
Saginaw Chippewa Indian Tribe	Infrastructure Failure	4	3	4	11	High
	Severe Winter Weather	4	4	4	12	High
	Severe Summer Weather	4	4	4	12	High
	Public Health Emergencies	4	3	4	11	High
	Riverine Flooding	4	3	3	10	High
	Transportation/Hazmat Incident	3	5	3	11	High
	Civil Disturbances	3	5	3	11	High
	Scrap Tire and Structural Fires	4	3	3	10	High
	Terrorism/Sabotage	3	4	3	10	High
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	3	3	3	9	Moderate
	Wildfires	3	3	3	9	Moderate
	Dam Failures	2	2	3	7	Moderate
	Drought	3	4	4	11	High
	Major Population Changes	3	5	4	12	High
	Nuclear Attack	1	1	1	3	Low
	Nuclear Power Plant Accident	1	1	1	3	Low
	Subsidence	3	1	1	5	Moderate
	Earthquakes	2	1	1	4	Low
Isabella County	Infrastructure Failure	4	5	5	14	High
	Severe Winter Weather	3	5	3	11	High
	Severe Summer Weather	3	5	3	11	High
	Public Health Emergencies	3	4	4	11	High
	Riverine Flooding	3	3	3	9	Moderate

	Transportation/Hazmat Incident	2	4	2	8	Moderate
	Civil Disturbances	2	3	2	7	Moderate
	Scrap Tire and Structural Fires	1	5	1	7	Moderate
	Terrorism/Sabotage	3	3	5	11	High
	Oil & Gas Well/Fixed Site Hazmat/Pipeline Incidents	2	3	2	7	Moderate
	Wildfires	1	4	2	7	Moderate
	Dam Failures	3	4	4	11	High
	Drought	3	4	2	9	Moderate
	Major Population Changes	1	2	1	4	Low
	Nuclear Attack	2	2	5	9	Moderate
	Nuclear Power Plant Accident	2	1	1	4	Low
	Subsidence	1	2	1	4	Low
	Earthquakes	1	2	1	4	Low

APPENDIX C - ISABELLA COUNTY FINAL MITIGATION STRATEGIES

1. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
2. Public early warning systems and networks.
3. Protect critical equipment/information with the use of surge protectors on critical electronic equipment, the use of generators, on critical equipment, and using proper back-up procedures.
4. Using appropriate wind engineering measures and construction techniques (e.g. structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced entry and garage doors, window shutters, waterproof adhesive sealing strips, and interlocking roof shingles) to strengthen public and private structures against severe wind damage.
5. Proper maintenance of property in or near wildland areas (including short grass; thinned trees and removal of low hanging branches; selection of fire-resistant vegetation; use of fire resistant roofing and building materials; use of functional shutters on windows; keeping flammables such as curtains securely away from windows or using heavy fire-resistant drapes; creating and maintaining a buffer zone (defensible space) between structures and adjacent wild lands; use of the fire department's home safety inspections; sweeping/ cleaning dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards; keeping woodpiles and other combustibles away from structures; use of boxed or enclosed eaves on house; thorough cleaning-up of spilled flammable fluids; and keeping garage areas protected from blowing embers).
6. Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and with any history of flammable substances stored, spilled, or dumped on them).
7. Accurate identification and mapping of flood-prone areas.
8. Flood plain management-planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
9. Elevation of flood-prone structures above the 100-year flood level.
10. Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.).
11. Protection (or restoration) of wetlands and natural water retention areas.
12. Monitoring of water levels with stream gauges and trained monitors.
13. Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
14. Brownfield cleanup activities.
15. Identification of radioactive soils and high-radon areas.
16. Enhanced security and anti-terrorist/sabotage/civil disturbance measures.
17. Improved design, routing, and traffic control at problem roadway areas.
18. Long-term planning that provides more connector roads for reduced congestion of arterial roads.
19. Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).
20. Use of ITS (intelligent transportation systems) technology.

21. Designs that include the use of firewalls and sprinkler systems (especially in tall buildings, dormitories, attached structures, and special facilities).
22. Landlords and families can install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each level of homes (to be tested monthly, with the batteries changed twice each year). Family members and residents should know how to use a fire extinguisher.
23. Incident anticipation and planning, and video documentation of events for later study and use.
24. Airport maintenance, security, and safety programs.
25. Seek funding for National Oceanic and Atmospheric Administration (NOAA) weather radios for facilities caring for special needs populations and special needs populations living separately.
26. Develop internal facility emergency/disaster warning systems.
27. Encourage the construction of shelters at city and county parks.
28. Encourage the construction of shelters at mobile home/manufactured housing communities.
29. Suggest local governments find sources of funding (Michigan Hazard Mitigation Funding, local budgets, local grants, etc…) to fund rehabilitation projects.
30. Create an overlay zoning district which can be applied to lands abutting water resources to manage growth and development, ensure sufficient setbacks, and preserve natural features.
31. Provide incentives to preserve frontage and vegetation along river banks.
32. Develop local surveillance and monitoring capabilities using GIS and health department /health care facilities' databases.

APPENDIX D - ISABELLA COUNTY POSSIBLE MITIGATION STRATEGIES

Summer Weather Hazards

1. Public education and awareness of thunderstorm dangers.
2. Training and increased use of weather spotters.
3. Public early warning systems and networks.
4. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
5. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
6. Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, objects from destroyed/damaged structures, vegetation or other items knocked down or blown by winds.)
7. Using surge protectors on critical electronic equipment.
8. Installing lightning protection devices on the community's communicationsinfrastructure.
9. Using appropriate wind engineering measures and construction techniques (e.g. structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced entry and garage doors, window shutters, waterproof adhesive sealing strips, and interlocking roof shingles) to strengthen public and private structures against severe winddamage.
10. Proper anchoring of manufactured homes and exterior structures such as carports and porches.

Winter Weather Hazards

11. Producing and distributing family emergency preparedness information relating to severe winter weather hazards.
12. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
13. Establishing heating centers/shelters for vulnerable populations.
14. Organizing outreach to isolated, vulnerable, or special-needs populations.
15. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
16. Pre-planning for debris management staging and storage areas. (Debris is usually the snow and ice itself, or vegetation such as tree branches that have fallen under the impact of winds or the weight of ice. Broken power or phone lines that had frozen or been weighted down by ice or fallen branches could be part of the problem. Some storage areas will definitely be needed for snow removal during blizzards.)
17. Proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.
18. Farmer preparedness to address livestock needs/problems.
19. Pre-arranging for shelters for stranded motorists/travelers, and others.

Extreme Temperatures

20. Organizing outreach to vulnerable populations during periods of extreme temperatures, including establishing and building awareness of accessible heating and/or cooling centers in the community, and other public information campaigns about this hazard.

Wildfires

21. Proper maintenance of property in or near wildland areas (including short grass; thinned trees and removal of low hanging branches; selection of fire-resistant vegetation; use of fire resistant roofing and building materials; use of functional shutters on windows; keeping flammables such as curtains securely away from windows or using heavy fire-resistant drapes; creating and maintaining a buffer zone (defensible space) between structures and adjacent wild lands; use of the fire department's home safety inspections; sweeping/ cleaning dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards; keeping woodpiles and other combustibles away from structures; use of boxed or enclosed eaves on house; thorough cleaning-up of spilled flammable fluids; and keeping garage areas protected from blowing embers).
22. Post fire emergency telephone numbers.
23. Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and with any history of flammable substances stored, spilled, or dumped on them).
24. Public education on smoking hazards and recreational fires.
25. Proper maintenance and separation of power lines. Ask the power company to clear branches from power lines.
26. Efficient response to fallen power lines.
27. Training and exercises for response personnel.
28. GIS mapping of vegetative coverage, for use in planning decisions and analyses through comparison with topography, zoning, developments, infrastructure, etc.
29. Media broadcasts of fire weather and fire warnings.
30. Create and enforce local ordinances that require burn permits and restrict campfires and outdoor burning.
31. Mutual aid pacts with neighboring communities.
32. Have adequate water supplies for emergency firefighting (in accordance with NFPA standards). For residents, identify and maintain an adequate outside water source such as a small pond, cistern, well, swimming pool or hydrant; have a garden hose that is long enough to reach any area of the home and other structures on the property; install freeze-proof exterior water outlets on at least two sides of the home and near other structures on the property. Install additional outlets at least 50 feet from the home; consider obtaining a portable gasoline powered pump in case electrical power is cut off.
33. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Dam Failures

34. Ensuring consistency of dam Emergency Action Plan (EAP) with the local Emergency Operations Plan (EOP).
35. Regulate development in the dam's hydraulic shadow (where flooding would occur if there was a severe dam failure).
36. Public awareness and warning systems.

37. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
38. Trained, equipped, and prepared search and rescue teams.
39. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Riverine and Urban, and Shoreline Flooding

40. Accurate identification and mapping of flood-prone areas.
41. Flood plain management – planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
42. Elevation of flood-prone structures above the 100-year flood level.
43. Public awareness of the need for permits (MDEQ Part 31) for building in floodplainareas.
44. Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.).
45. Protection (or restoration) of wetlands and natural water retention areas.
46. Enforcement of basic building code requirements related to flood mitigation.
47. Formation of a watershed council.
48. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
49. Joining the National Flood Insurance Program and Community Rating System.
50. Monitoring of water levels with stream gauges and trained monitors.
51. Road closures and traffic control in flooded areas.
52. Trained, equipped, and prepared search and rescue teams.
53. Back-up generators for pumping and lift stations in sanitary sewer systems, and other measures (alarms, meters, remote controls, switchgear upgrades) to ensure that drainage infrastructure is not impeded.
54. Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
55. Stormwater management ordinances or amendments.
56. Wetlands protection regulations and policies.
57. Use of check valves, sump pumps and backflow preventers in homes and buildings.
58. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Fixed Site Hazardous Material Incidents (including explosions and industrial accidents)

59. Maintaining an active and viable Local Emergency Planning Committee (LEPC).
60. Developing and exercising site emergency plans and community response plans as required under SARA Title III.
61. Development of Risk Management Plans for sites that manufacture, store, or handle hazardous materials, to comply with EPA regulations. (For guidance, see the EPA's CEPPO web site at http://www.epa.gov/swercepp/acc-pre.html .)
62. Trained, equipped, and prepared site and local hazardous material emergency responseteams.

63. Compliance with/enforcement of Resource Conservation and Recovery Act (RCRA)standards.
64. Elimination of clandestine methamphetamine laboratories through law enforcement and public education.
65. Brownfield cleanup activities.
66. Identification of radioactive soils and high-radon areas
67. Proper separation and buffering between industrial areas and other landuses.
68. Location of industrial areas away from schools, nursing homes, etc.
69. Evacuation plans and community awareness of them.
70. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
71. Public warning systems and networks for hazardous material releases.
72. Road closures and traffic control in accident areas.
73. Trained, equipped, and prepared search and rescue teams.
74. Compliance with all industrial, fire, and safety regulations.
75. Insurance coverage.
76. Enhanced security and anti-terrorist/sabotage/civil disturbance measures.
77. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Hazardous Material Transportation Incidents

78. Improved design, routing, and traffic control at problem roadway areas.
79. Long-term planning that provides more connector roads for reduced congestion of arterial roads.
80. Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).
81. Enforcement of weight and travel restrictions for truck traffic.
82. Training, planning, and preparedness for hazardous material incidents along roadways and railways (in addition to fixed site emergencies).
83. Public warning systems and networks.
84. Use of ITS (intelligent transportation systems) technology.
85. Compliance with and enforcement of USDOT and MDOT regulations regarding hazardous materials transport.
86. Locating schools, nursing homes, and other special facilities away from major hazardous material transportation routes.
87. Road closures and traffic control in accident areas.
88. Trained, equipped and prepared local hazardous materials emergency response teams.
89. Trained, equipped, and prepared search and rescue teams.
90. Evacuation plans and community awareness of them.
91. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Infrastructure Failures

92. Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).
93. Redundancies in utility and communications systems,especially "lifeline" systems.
94. Mutual aid assistance for failures in utility and communications systems (including 9-1-1).

95. Programs/networks for contacting elderly or homebound persons during periods of infrastructure failure, to assess whether they have unmet needs.
96. Use of generators for backup power at critical facilities.
97. Regular maintenance and equipment checks.
98. Protecting electrical and communications systems from lightning strikes.
99. Tree-trimming programs to protect utility wires from falling branches. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
100. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (1-800-482-7171).
101. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Oil and Natural Gas Well Accidents

102. Awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers.
103. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
104. Contingency plans for worker and public protection, including the inclusion of rescue and evacuation procedures for well hazard areas in the local emergency operationsplan.
105. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Public Health Emergencies

106. Encouraging residents to receive immunizations against communicablediseases.
107. Increasing public awareness of radon dangers and the prevention efforts that can be taken to reduce concentrations of radon in homes and buildings.
108. Maintaining community water and sewer infrastructure at acceptable operating standards.
109. Providing back-up generators for water and wastewater treatment facilities to maintain acceptable operating levels during power failures.
110. Demolition and clearance of vacant condemned structures to prevent rodentinfestations.
111. Maintaining a community public health system with sufficient disease monitoring and surveillance capabilities to adequately protect the population from large-scale outbreaks.
112. Increasing public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies.
113. Preventing public contact with contaminated sites or waters (including floodwaters).
114. Brownfield and urban blight clean-up activities.
115. Pollution control, enforcement, and cleanup; proper disposal of chemicals and scrapmaterials.

Sabotage/Terrorism/Weapons of Mass Destruction (WMD)

116. Development of a thorough community risk and threat assessment that identifies potential vulnerabilities and targets for a sabotage/terrorism/WMD attack.
117. Implementing school safety and violence prevention programs.
118. Heightening security at public gatherings, special events, and critical community facilities and industries.

119. Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
120. Greater awareness of, and provision for, mental health services in schools, workplaces, and institutional settings.
121. Training, planning, and preparedness by local law enforcement and other responders for terrorist/sabotage/WMD attacks.
122. The development and testing of internal emergency plans and procedures by businesses and organizations.
123. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
124. Consistent use of computer data back-up systems and anti-virus software.
125. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
126. Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, etc. that would get in the way or be left over following an attack or incident. The area may simultaneously need to be treated as a crime scene, site of urban search and rescue, area of hazardous materials, and/or a public health threat.)

Structural Fire

127. Code existence and enforcement.
128. Designs that include the use of firewalls and sprinkler systems (especially in tall buildings, dormitories, attached structures, and special facilities).
129. Public education and school programs (especially about the use of stoves, heaters, fireworks, matches/lighters, etc.)
130. Landlords and families can install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each level of homes (to be tested monthly, with the batteries changed twice each year). Family members and residents should know how to use a fireextinguisher.
131. Proper installation and maintenance of heating systems (especially those requiring regular cleaning, those using hand-loaded fuels such as wood, or using concentrated fuels such as liquid propane).
132. Safe and responsible use of electric and "space" heaters (placed at least 3 feet from objects, with space near hot elements free of combustibles).
133. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, and recreation areas, and other appropriate sites.
134. Safe use and maintenance/cleaning of fireplaces and chimneys (with the use of spark arresters and proper storage of flammable items). Residents should inspect chimneys at least twice a year and clean them at least once a year.
135. Safe installation, maintenance, and use of electrical outlets and wiring.
136. Education and practice of safe cigarette handling and disposal (also candles, fireworks, campfires, holiday lights).
137. Proper workplace procedures, training and exercising, and handling of explosive and flammable materials and substances.
138. Pre-planned escape routes and fire alert responses.
139. Improved and continuing training for emergency responders, and provision of equipment for them.
140. Proper maintenance of power lines, and efficient response to fallen power lines.

141. Enforce fireworks regulations.

Civil Disturbances (prison or institutional rebellions, disruptive political gatherings, violent labor disputes, urban protests or riots, or large-scale uncontrolled festivities) 142. Law enforcement training, staffing, and resource provisions.
143. Incident anticipation and planning, and video documentation of events for later study and use. 144. Local law enforcement mutual aid, and support from the Michigan State Police and National Guard.

145. It is possible that design, management, integration, and lowered density of poor or blightedareas may reduce vandalism, crime, and some types of riot events. Crime Prevention Through Environmental Design (CPTED) is a field of planning that deals with this.
146. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, and recreation areas, and other appropriate sites.
147. Design requirements for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, etc. that take into consideration emergency and security needs.

Earthquakes – (biggest Michigan threats would be to pipelines, buildings that are poorly designed and constructed, and shelving, furniture, mirrors, gas cylinders, etc. within structures that could fall and cause injury or personal property damage) 148. Adopt and enforce appropriate building codes.

149. Obtain insurance.
150. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Scrap Tire Fires

151. Policies for regulated disposal and management of scrap tires, and enforcement of regulations related to them (separation of stored scrap tires from other materials; limits on the size of each pile; minimum distances between piles and property lines; covering, chemically treating, or shredding tires to limit mosquito breeding; providing for fire vehicle access to scrap tire piles; training employees in emergency response operations; installation of earthen berms around storage areas; prevention of pools of standing water in the area; control of nearby vegetation; an emergency plan posted on the property; storing only the permitted volume of tires authorized for that site).
152. Proper siting of tire storage and processing facilities (land use planning that recognizes scrap tire sites as a real hazard and environmental threat).
153. Local awareness of scrap tire risk, training and preparedness of responders.
154. Law enforcement to prevent illegal dumping of tires at the site.

Nuclear Attack

155. Community awareness of designated fallout shelters and attack warning systems.
156. Developing and promoting workable population protection plans (evacuation and in-place sheltering plans, as appropriate).
157. Construction of concrete safe rooms (or shelters) in houses, trailer parks, community facilities, and business districts.
158. Using laminated glass, metal shutters, structural bracing, and other hazard-resistant, durable construction techniques in public buildings (especially schools) and critical facilities.

159. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, and recreation areas, and other appropriate sites.
160. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including enemy attack).

Nuclear Power Plant Accidents

161. Proper awareness of, training on, and implementation of radiological emergency procedures (to include both primary and secondary Emergency Planning Zones, as appropriate).
162. Community awareness of designated shelters and accident warning systems.
163. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including enemy attack).
164. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, and recreation areas, and other appropriate sites.

Pipeline Accidents (Petroleum and Natural Gas)

165. Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.
166. Increasing public awareness of pipeline locations and appropriate emergency procedures.
167. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, and recreation areas, and other appropriate sites.
168. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (800-482-7171).
169. Proper pipeline design, construction, maintenance and inspection.
170. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Transportation Accidents

171. Improvements in driver education, traffic law enforcement, and transportation planning that balance needs of public transportation conveyers with the safety of the generalpublic.
172. Improved design, routing, and traffic control at problem roadway areas.
173. Use of designated truck routes.
174. Airport maintenance, security, and safety programs.
175. Marine safety and general boater awareness programs.
176. Commercial operator training and skill enhancement programs.
177. Training, planning, and preparedness for mass-casualty incidents involving all modes of public transportation.
178. Trained, equipped, and prepared search and rescue teams

APPENDIX E - HAZUS Reports

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Michigan

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 578 square miles and contains 2,595 census blocks. The region contains over 26 thousand households and has a total population of 70,311 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 23,623 buildings in the region with a total building replacement value (excluding contents) of 7,037 million dollars. Approximately 90.34% of the buildings (and 75.46% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 23,623 buildings in the region which have an aggregate total replacement value of 7,037 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	5,310,210	75.5%
Commercial	1,032,048	14.7%
Industrial	311,414	4.4%
Agricultural	60,233	0.9%
Religion	107,437	1.5%
Government	36,680	0.5%
Education	179,406	2.5%
Total	**7,037,428**	**100%**

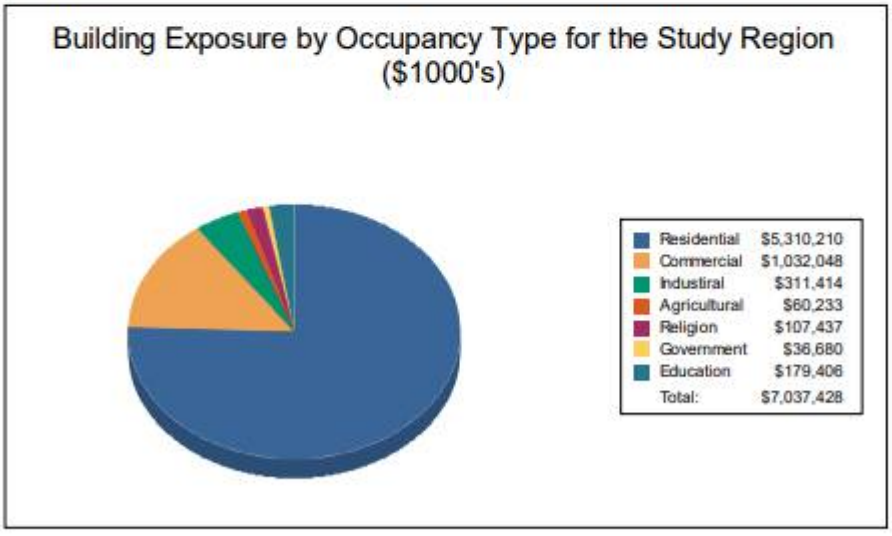
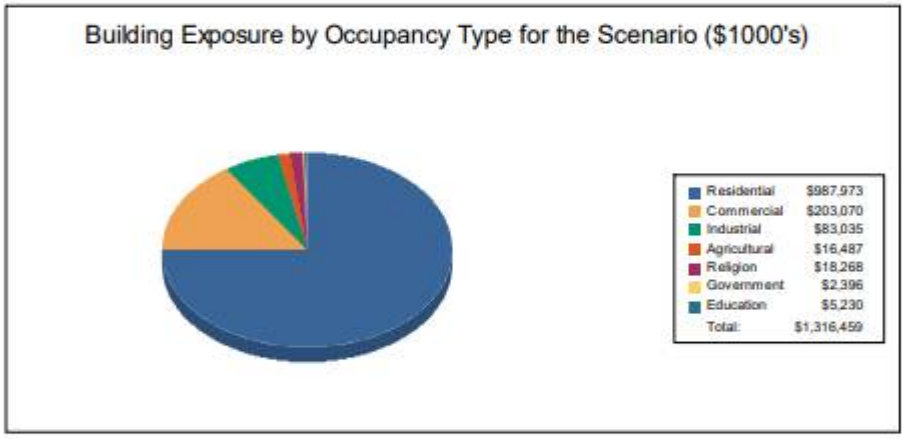


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	987,973	75.0%
Commercial	203,070	15.4%
Industrial	83,035	6.3%
Agricultural	16,487	1.3%
Religion	18,268	1.4%
Government	2,396	0.2%
Education	5,230	0.4%
Total	**1,316,459**	**100%**



Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 118 beds.
There are 36 schools, 10 fire stations, 7 police stations and 1 emergency operation center.

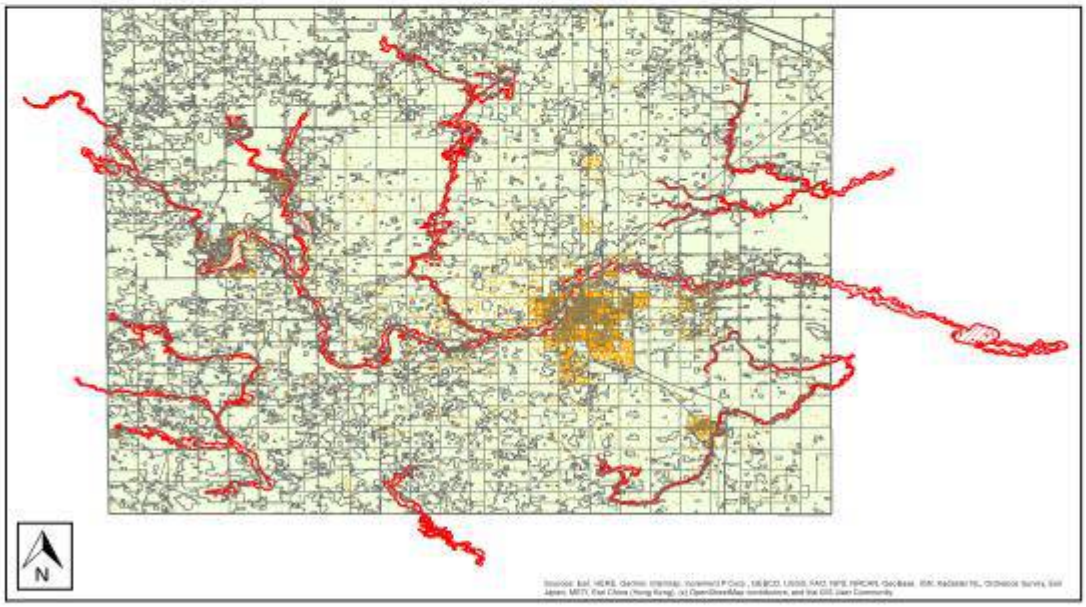
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Isabella_MI
Scenario Name:	1
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 71 buildings will be at least moderately damaged. This is over 49% of the total number of buildings in the scenario. There are an estimated 19 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

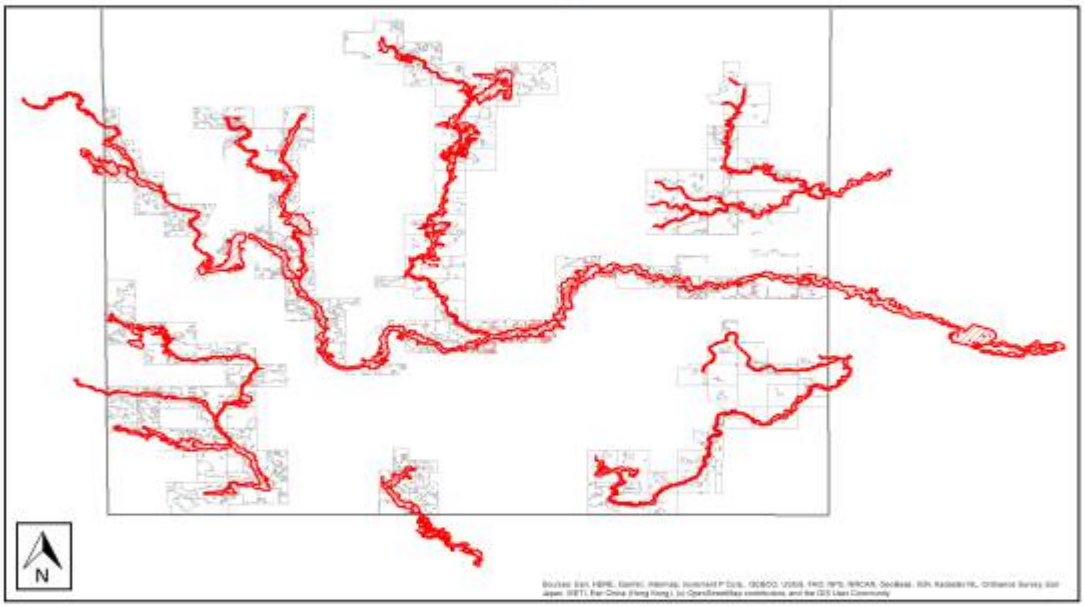


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	9	11	22	28	11	14	13	16	6	8	19	24
Total	**9**		**22**		**11**		**13**		**6**		**19**	

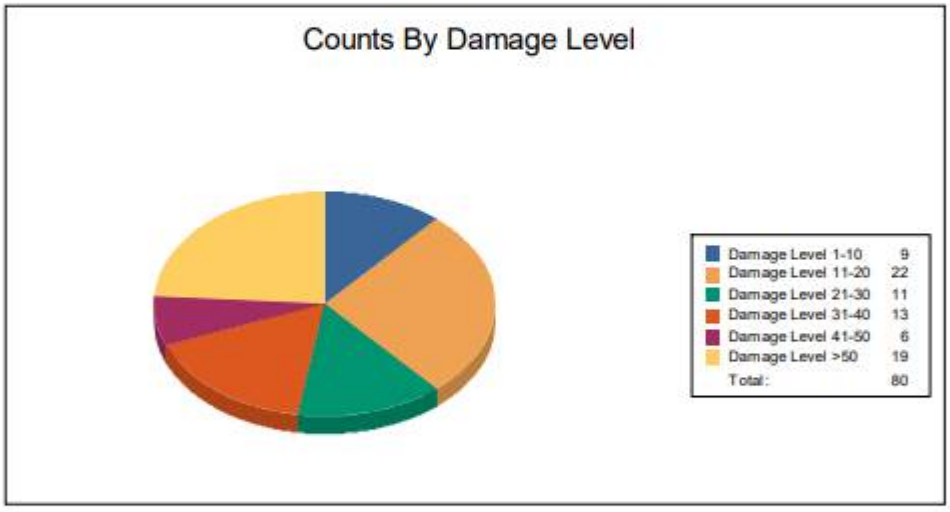


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	1	13	1	13	2	25	1	13	3	38
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	9	13	21	29	10	14	11	15	5	7	16	22

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 118 hospital beds available for use. On the day of the scenario flood event, the model estimates that 118 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	10	0	0	0
Hospitals	1	0	0	0
Police Stations	7	0	0	0
Schools	36	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

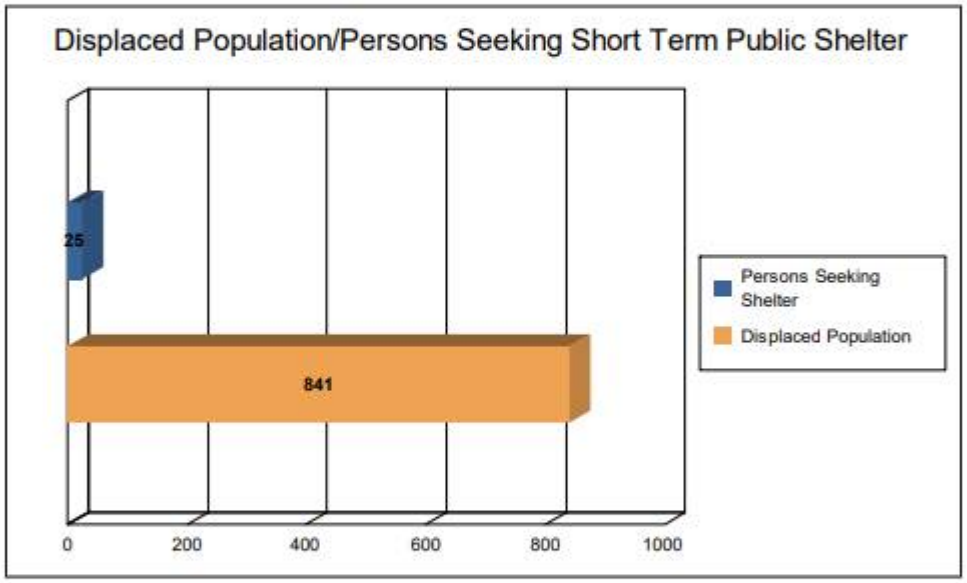
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 280 households (or 841 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 25 people (out of a total population of 70,311) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 121.36 million dollars, which represents 9.22 % of the total replacement value of the scenario buildings.

Building-Related Losses

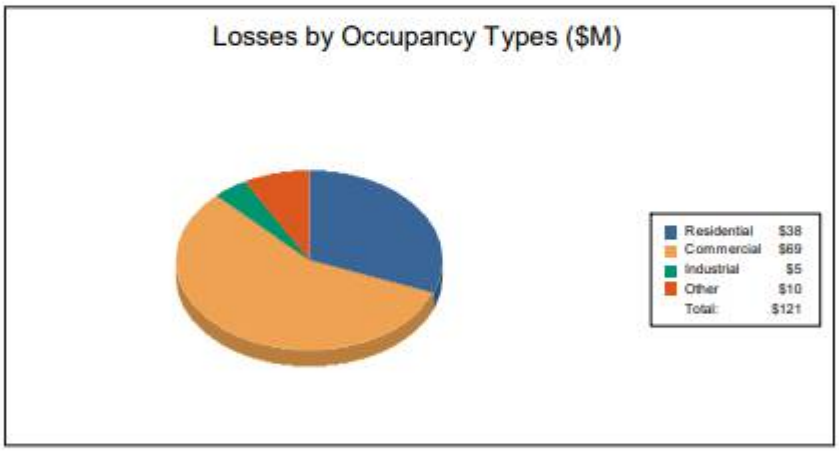
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 69.99 million dollars. 42% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 31.23% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	20.98	9.76	1.37	0.51	32.62
	Content	9.95	21.38	2.90	2.33	36.57
	Inventory	0.00	0.35	0.42	0.03	0.80
	Subtotal	**30.94**	**31.49**	**4.69**	**2.88**	**69.99**
Business Interruption						
	Income	0.05	16.54	0.04	0.55	17.19
	Relocation	4.82	3.68	0.05	0.32	8.87
	Rental Income	1.97	2.76	0.01	0.12	4.86
	Wage	0.13	14.30	0.08	5.94	20.45
	Subtotal	**6.97**	**37.29**	**0.18**	**6.93**	**51.37**
ALL	**Total**	**37.91**	**68.77**	**4.88**	**9.81**	**121.36**



Appendix A: County Listing for the Region

Michigan
- Isabella

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Michigan				
Isabella	70,311	5,310,210	1,727,218	7,037,428
Total	**70,311**	**5,310,210**	**1,727,218**	**7,037,428**
Total Study Region	**70,311**	**5,310,210**	**1,727,218**	**7,037,428**

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Michigan

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 578 square miles and contains 2,595 census blocks. The region contains over 26 thousand households and has a total population of 70,311 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 23,623 buildings in the region with a total building replacement value (excluding contents) of 7,037 million dollars. Approximately 90.34% of the buildings (and 75.46% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 23,623 buildings in the region which have an aggregate total replacement value of 7,037 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	5,310,210	75.5%
Commercial	1,032,048	14.7%
Industrial	311,414	4.4%
Agricultural	60,233	0.9%
Religion	107,437	1.5%
Government	36,680	0.5%
Education	179,406	2.5%
Total	**7,037,428**	**100%**

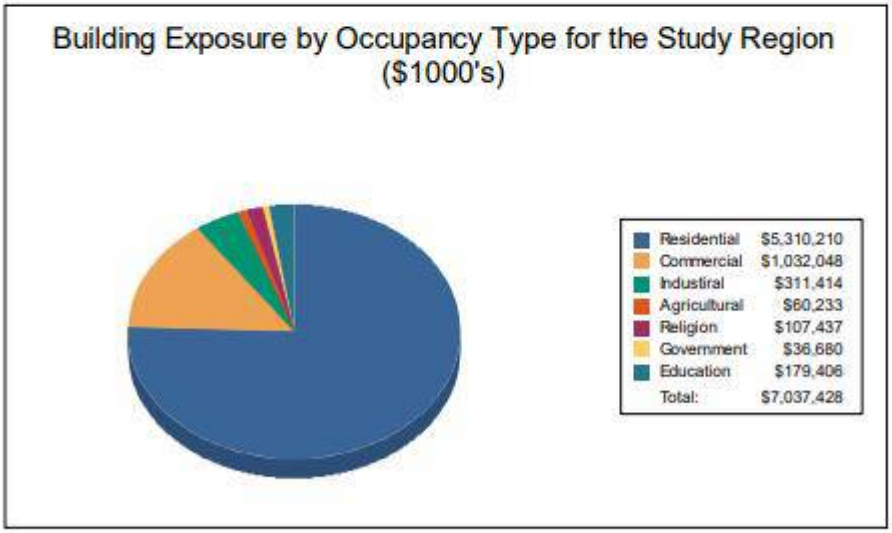
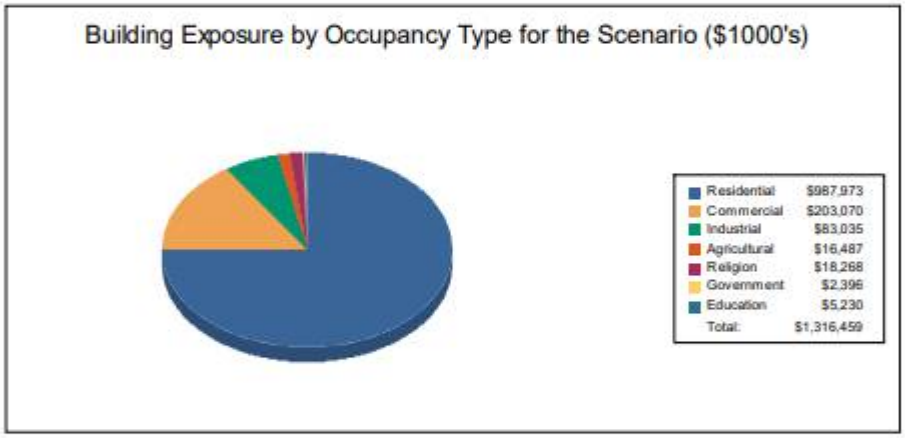


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	987,973	75.0%
Commercial	203,070	15.4%
Industrial	83,035	6.3%
Agricultural	16,487	1.3%
Religion	18,268	1.4%
Government	2,396	0.2%
Education	5,230	0.4%
Total	**1,316,459**	**100%**



Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 118 beds.
There are 36 schools, 10 fire stations, 7 police stations and 1 emergency operation center.

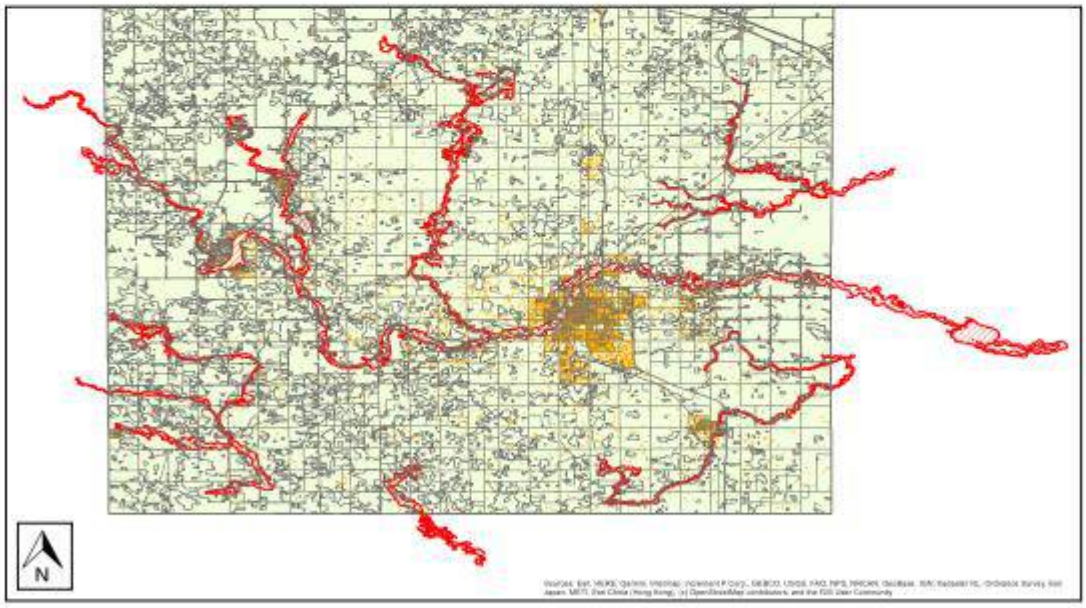
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Isabella_MI
Scenario Name:	1
Return Period Analyzed:	500
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 78 buildings will be at least moderately damaged. This is over 44% of the total number of buildings in the scenario. There are an estimated 25 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

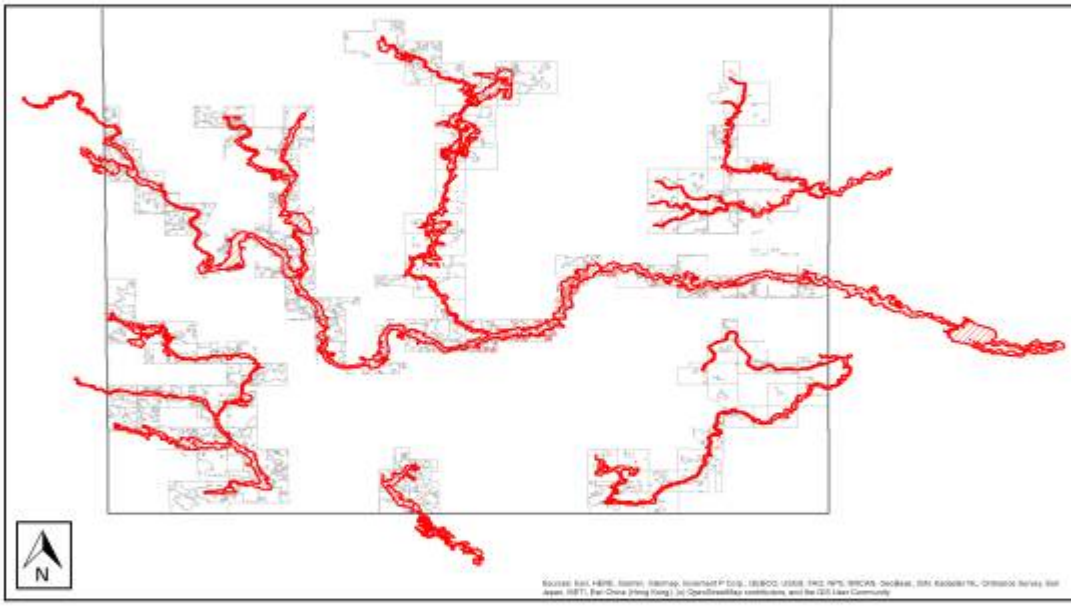


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	8	9	24	28	9	10	9	10	11	13	25	29
Total	**8**		**24**		**9**		**9**		**11**		**25**	

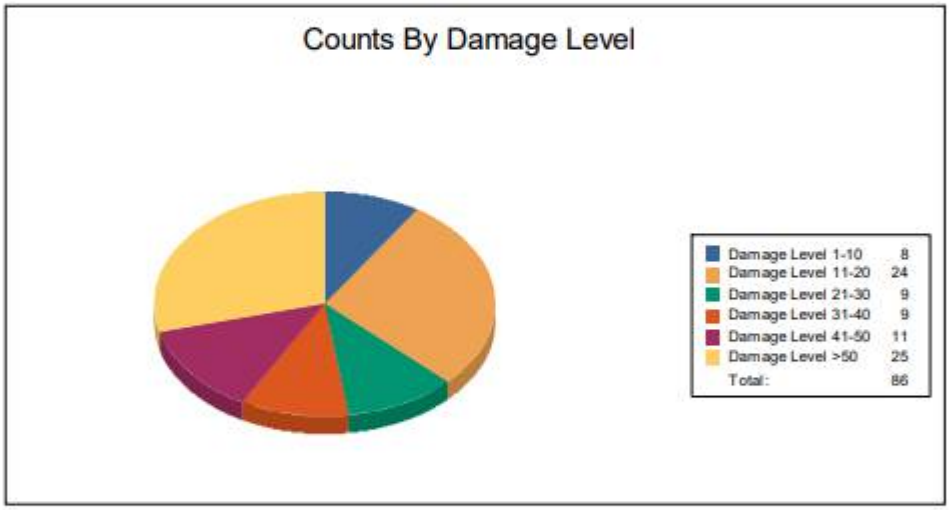


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	2	100
Masonry	0	0	1	13	1	13	1	13	2	25	3	38
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	8	11	23	30	8	11	8	11	9	12	20	26

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 118 hospital beds available for use. On the day of the scenario flood event, the model estimates that 118 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	10	0	0	0
Hospitals	1	0	0	0
Police Stations	7	0	0	0
Schools	36	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

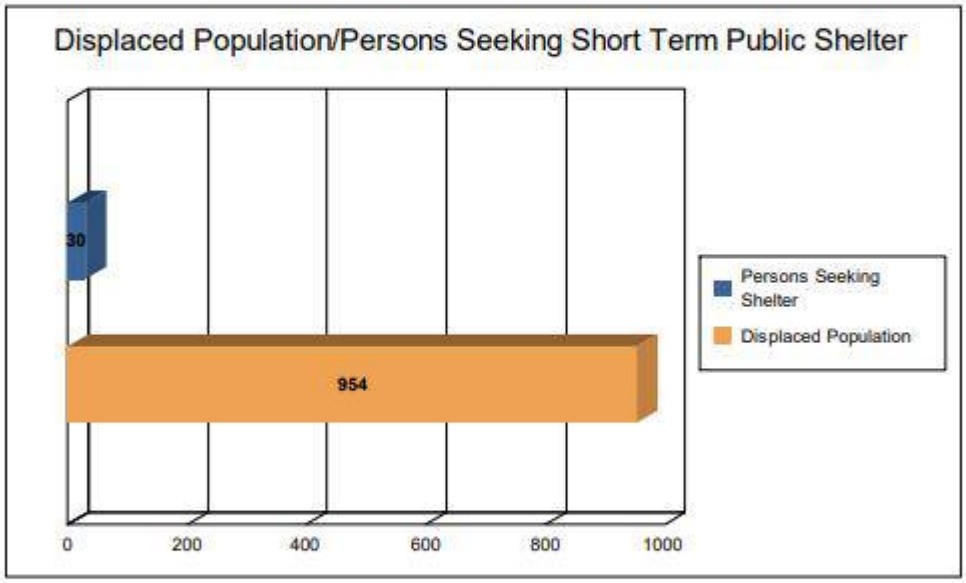
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 318 households (or 954 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 30 people (out of a total population of 70,311) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 138.37 million dollars, which represents 10.51 % of the total replacement value of the scenario buildings.

Building-Related Losses

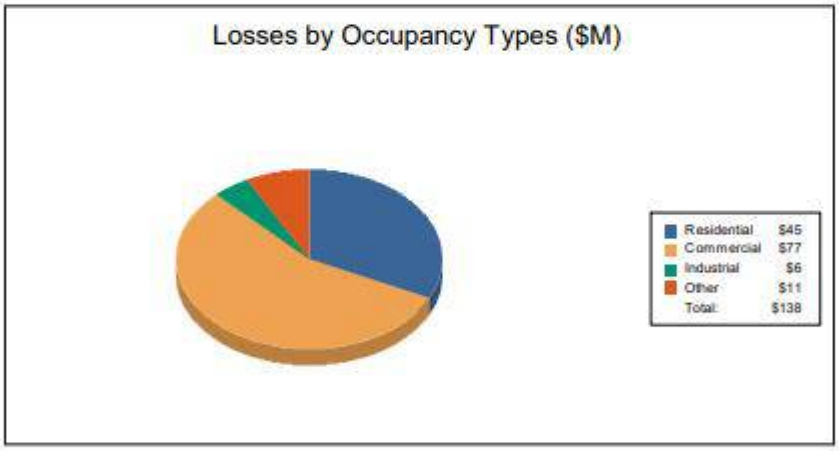
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 82.19 million dollars. 41% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 32.30% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	24.99	11.44	1.69	0.67	38.79
	Content	11.87	24.26	3.55	2.72	42.40
	Inventory	0.00	0.42	0.55	0.04	1.00
	Subtotal	**36.86**	**36.12**	**5.79**	**3.43**	**82.19**
Business Interruption						
	Income	0.06	17.96	0.05	0.62	18.70
	Relocation	5.45	3.96	0.06	0.34	9.81
	Rental Income	2.18	2.97	0.01	0.13	5.29
	Wage	0.15	15.73	0.10	6.41	22.38
	Subtotal	**7.84**	**40.61**	**0.23**	**7.50**	**56.18**
ALL	**Total**	**44.70**	**76.73**	**6.02**	**10.92**	**138.37**



Appendix A: County Listing for the Region

Michigan

- Isabella

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Michigan				
Isabella	70,311	5,310,210	1,727,218	7,037,428
Total	**70,311**	**5,310,210**	**1,727,218**	**7,037,428**
Total Study Region	**70,311**	**5,310,210**	**1,727,218**	**7,037,428**

APPENDIX F -Adoption Resolutions

ISABELLA COUNTY BOARD OF COMMISSIONERS
RESOLUTION NO. 2023-01

A RESOLUTION SUPPORTING PARTICIPATION IN THE ALL HAZARDS MULTI-JURISDICTIONAL MITIGATION PLANNING PROCESS AND ADOPTION OF THE ALL HAZARDS MULTI-JURISDICTIONAL MITIGATION PLAN

WHEREAS, the Isabella County governing body desires to prepare and mitigate for such hazards and seeks to promote the public health, and general welfare of the jurisdiction and the safe, orderly, and healthful development of the jurisdiction; and

WHEREAS, the Isabella County governing body worked with their members and other participating jurisdictions and entities to develop an All-Hazards Multi-Jurisdictional Mitigation Plan; and

WHEREAS, mitigation plans must conform to 44 CFR, Part 201, and all applicable mitigation planning guidance issued by FEMA; and

WHEREAS, a community must be a participant in a current, FEMA-approved mitigation plan to be eligible for FEMA mitigation grant funding; and

WHEREAS, the Michigan Department of Homeland Security and Emergency Management supports local mitigation planning and encourages local governments to participate in the All-Hazards Multi-Jurisdictional mitigation planning process; and

WHEREAS, staff recommends that the Isabella County governing body approve the All-Hazards Multi-Jurisdictional Mitigation Plan Update; and

WHEREAS, the Isabella County governing body deems it in the public interest to approve this plan.

NOW THEREFORE BE IT RESOLVED, that the governing body of Isabella County has considered, approved and adopted this Resolution on this 17th day of January, 2023.

Tobin D. Hope, Board Chairperson
Isabella County Board of Commissioners

Minde B. Lux, Clerk
Isabella County

Minutes of the regular meeting of the City Commission held Monday, January 9, 2023, at 7:00 p.m., in the City Commission Room, 320 W. Broadway St., Mt. Pleasant, Michigan with virtual options.

Moved by Commissioner Eke and seconded by Commissioner Wingard to approve the following items on the Consent Calendar:

6. Approval of the Isabella County Hazard Management Plan.

AYES: Commissioners Alsager, Assmann, Eke, Perschbacher & Wingard
NAYS: None
ABSENT: Commissioners Busch & Chapman
Motion carried.

I, Heather Bouck, Clerk for the City of Mt. Pleasant, Michigan, do hereby certify that the foregoing is a true and complete copy of action taken by the City Commission at a regular meeting held January 9, 2023

Dated: January 18, 2023

H Bouck

Heather Bouck, City Clerk

RESOLUTION 2023-031

A RESOLUTION SUPPORTING PARTICIPATION IN THE ALL HAZARDS MULTI-JURISDICTIONAL MITIGATION PLANNING PROCESS AND ADOPTION OF THE ALL HAZARDS MULTI-JURISDICTIONAL MITIGATION PLAN

WHEREAS, the City of Clare governing body desires to prepare and mitigate for such hazards and seeks to promote the public health, and general welfare of the jurisdiction and the safe, orderly, and healthful development of the jurisdiction; and

WHEREAS, the City of Clare governing body worked with their members and other participating jurisdictions and entities to develop an all-hazards multi-jurisdictional mitigation plan; and

WHEREAS, mitigation plans must conform to 44 CFR, Part 201, and all applicable mitigation planning guidance issued by FEMA; and

WHEREAS, a community must be a participant in a current, FEMA-approved mitigation plan to be eligible for FEMA mitigation grant funding; and

WHEREAS, the Michigan Department of Homeland Security and Emergency Management supports local mitigation planning and encourages local governments to participate in the All Hazards Multi-jurisdictional mitigation planning process; and

WHEREAS, staff recommends that the City of Clare governing body approve the All Hazards Multi-Jurisdictional Mitigation Plan Update; and

WHEREAS, the City of Clare governing body deems it in the public interest to approve this plan.

NOW THEREFORE, be it resolved that the governing body of the City of Clare hereby approves participation in and adopts the All Hazards Multi-Jurisdictional Mitigation Plan Update.

ALL RESOLUTIONS AND PARTS OF RESOLUTIONS INSOFAR AS THEY CONFLICT WITH THE PROVISIONS OF THIS RESOLUTION BE AND THE SAME ARE HEREBY RESCINDED.

The Resolution was introduced by Commissioner ____and supported by Commissioner ____. The Resolution declared adopted by the following roll call vote:

YEAS:

NAYS:

ABSENT:

Resolution approved for adoption on this 15th day of May, 2023

_____

Diane Lyon, City Clerk