

NEWAYGO COUNTY HAZARD MANAGEMENT PLAN 2015 - 2020





STATE OF MICHIGAN
COUNTY OF NEWAYGO
BOARD OF COMMISSIONERS

At a regular session of the said Board held in the City of White Cloud, in said County,
on the 22nd day of July 2015, the following Resolution was adopted.

RESOLUTION #07-023-15
ADOPTION OF THE NEWAYGO COUNTY
HAZARD MANAGEMENT PLAN

WHEREAS, the County of Newaygo, Michigan has experienced repetitive disasters that have damaged commercial, residential and public properties, displaced citizens and businesses, closed streets and bridges dividing the community both physically and emotionally, and presented general public health and safety concerns; and

WHEREAS, the Disaster Mitigation Act of 2000 provides the legal basis for FEMA's mitigation plan requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance.

WHEREAS, the Newaygo County has prepared a Hazard Management Plan in accordance with the Disaster Mitigation Act of 2000 which outlines the community's options to reduce overall damage and impact from natural and technological hazards; and

WHEREAS, the Newaygo County Hazard Management Plan has been reviewed by community residents, business owners, and federal, state and local agencies, and has been revised to reflect the community's concerns;

WHEREAS, by Newaygo County Resolution 04-012-07, The Newaygo County Local Emergency Planning Team (LEPT) has been established as the permanent Emergency Management advisory body serving the functions of the Homeland Security Local Planning Team (LPT) and SARA Title III Hazardous Materials Local Emergency Planning Committee (LEPC), to provide a forum for representatives of local government, private businesses, and public organizations to participate in community emergency planning and preparedness activities.

NOW THEREFORE BE IT RESOLVED:

1. The Newaygo County Hazard Management Plan 2015 Edition is hereby adopted as the official Hazard Mitigation Plan for the County of Newaygo.
2. The Newaygo County Emergency Services Director is charged with supervising the implementation of the Newaygo County Hazard Management Plan's recommendations within the funding limitations as provided on behalf of the Newaygo County Board of Commissioners or other sources.
3. The Newaygo County Emergency Services Director shall submit a written annual progress report, approved by the Local Emergency Planning Team, to the Newaygo County Board of Commissioners in accordance with the following format:
 - a. A review of the current edition of the plan.
 - b. A review of any disasters or emergencies that occurred during the previous calendar year.
 - c. A review of the actions taken, including what was accomplished during the previous year.
 - d. A discussion of any implementation problems.
 - e. Recommendations for new projects or revised action items. Such recommendations shall be subject to approval by the Newaygo County Board of Commissioners.
4. Any and all resolutions adopting a Hazard Mitigation Plan, including resolution number 08-024-07 passed on August 22, 2007, are hereby repealed.
5. This resolution shall have immediate effect.

Motion by: Lethorn, Supported by: Ortwein, to adopt the foregoing Resolution.
The Ayes being: Dear, Gardner, Johnson, Lethorn, Malke, Ortwein, Trapp
Nays: None Absent: None

The Resolution was adopted
July 22, 2015.


Patrick J. Gardner, Chairman
Newaygo County Board of Commissioners

STATE OF MICHIGAN)
)
COUNTY OF NEWAYGO]

I, Andrew B. Robinson, County Clerk, do hereby certify that the foregoing is a true copy of a Resolution adopted by the Newaygo County Board of Commissioners at a regular session held on the 22nd of July 2015.


Andrew B. Robinson
Newaygo County Clerk

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STANDARD DISTRIBUTION

(PLACE HOLDER)

INTRODUCTION

Newaygo County is vulnerable to a wide range of natural, technological and human-related hazards. Managing these many varied threats, and protecting life and property, are the challenges faced by emergency management officials at all levels of government. In order to attain effective emergency management capability, an understanding of the multitude of hazards that confront the County must first be obtained, and then a plan must be developed to systematically address those threats.

The intent of this document is to: 1) serve as the jurisdiction's hazard analysis, to educate local policy makers and emergency service organizations of the area's hazards and vulnerabilities; and 2) to provide a strategy to guide and implement county-wide and community-specific mitigation activities. It is extremely important that the information and strategies detailed in this document be considered by all government, public, and private entities in their development processes. This team approach to hazard mitigation will help ensure a safer and sustainable community.

This document was originally developed in 2006 from local information suggested according to Michigan State Police – Emergency Management Division Pub201A Hazard Analysis Guidance Tool and formatted to a similar manner utilized by Newaygo County Emergency Service's Local Hazard Analysis for Newaygo County.

In addition, modifications to the document have been made to satisfy Section 104 of the Disaster Mitigation Act of 2000 (42 USC 5165), which states that local governments applying for pre- and post-disaster mitigation funds must have approved local mitigation plans. Pursuant to these requirements, this document received FEMA approval in 2008. Following adoption of the document on the county level, five townships in Newaygo County were successful in adopting it at the local level as well.

Questions and comments concerning this document should be addressed to the Newaygo County Emergency Services Department, 1018 Newell Street, PO Box 885, White Cloud MI 49349, telephone number (231) 689-7354. The office is the coordinating agency for all emergency management activities in Newaygo County, and is responsible for continually monitoring and updating the Newaygo County Emergency Action Guidelines and directing numerous other disaster related activities. These responsibilities are done in conjunction with the Local Emergency Planning Team and its Hazard Mitigation Subcommittee.

Hazard Analysis Introduction

The first step in the process of building effective emergency management capability is the preparation of a hazard analysis that provides an understanding of those threats. When coupled with relevant land use and demographic information, a hazard analysis becomes the foundation upon which all emergency planning efforts in the community are built; a powerful planning tool that enables emergency management officials to set priorities and goals for resource allocation towards mitigation (prevention) and preparedness (response) activities.

A hazard analysis provides an understanding of the potential threats facing the community. By pinpointing the location, extent and magnitude of past disasters or emergency situations, and by examining knowledge of new or emerging risks, it is possible to estimate the probability of such events occurring and the vulnerability of people and property. By viewing this information along with

relevant land use, economic, and demographic information from a well prepared “community profile,” emergency management coordinators can make assumptions about those segments of the community that might be impacted in a given situation. This, in turn, allows them to set priorities and goals for resource allocation and response, recovery, and mitigation activities prior to an incident occurring.

Hazard Mitigation Introduction

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, technological, and man-made hazards. It is an essential element of emergency management, along with preparedness, response, and recovery. There is a cyclical relationship between the four phases of emergency management. A community prepares for a disaster, and then responds when it occurs. Following the response, there is a transition into the recovery process, during which mitigation measures are evaluated and adopted. This, in turn, improves the preparedness posture of the community for the next incident and so on. When successful, mitigation will lessen the impacts to such a degree that succeeding incidents will remain incidents and not become disasters.

Hazard mitigation strives to reduce the impact of hazards on people and property through the coordination of resource programs and authorities so that, at the very least, communities do not contribute to the increasing severity of the problem by allowing repairs and reconstruction to be completed in such a way as to simply restore damaged property as quickly as possible to pre-disaster conditions. Such efforts expedite a return to “normalcy”; however, replication of pre-disaster conditions results in a cycle of damage, reconstruction, and damage again.

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 individual can break the cycle of damage, reconstruction, and damage again.

Recognizing the importance of reducing community vulnerability to natural and technological hazards, Newaygo 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 Newaygo County remains a vibrant, safe, enjoyable place in which to live, raise a family, and conduct business.

Target Area

The Newaygo County Hazard Management Plan is a “multi-jurisdictional” plan which helps qualify the county and constituent local governments to apply for certain types of hazard mitigation assistance. However, communities must have participated in the development of this plan and adopt it to be eligible to apply. So although the plan was created at the county level, all municipalities within Newaygo County were invited to participate in the plan development at numerous points throughout

the planning process. There are four cities, one village, and twenty-four townships in Newaygo County:

Cities	Fremont	Grant	Newaygo	White Cloud
Villages	Hesperia			
Townships	Ashland	Croton	Goodwell	Monroe
	Barton	Dayton	Grant	Norwich
	Beaver	Denver	Home	Sheridan
	Big Prairie	Ensley	Lilley	Sherman
	Bridgeton	Everett	Lincoln	Troy
	Brooks	Garfield	Merrill	Wilcox

Plan Background

This plan was developed pursuant to the Hazard Mitigation Act of 2000 and was partially funded under pre-disaster mitigation funds under the Hazard Mitigation Program Grant. In 2004, Newaygo County began the Hazard Mitigation Planning Process by contracting with West Michigan Shoreline Regional Development Commission (WMSRDC) to collaborate with Newaygo County Emergency Services, the Newaygo County Local Emergency Planning Team (LEPT), and an ad hoc steering committee in the development of the Hazard Mitigation Plan.

Emergency Services provided on-going guidance and assistance in the plan development, with local input from the ad hoc steering committee. Additional input was provided through a mail survey sent in March 2004 to 143 individuals and agencies affiliated with Newaygo County. The survey mailing reached a broad spectrum of local, county, regional, and state officials, such as county departments, the county board, regional commissioners, county road commissioners, county and local planning commissioners, local zoning officials, city mayors and managers, township supervisors, law enforcement, fire chiefs, public works, school superintendents, social service agencies, and chambers of commerce.

The survey responses were helpful in identifying hazards, vulnerable areas, and potentially hazardous situations within the county. For example, survey responses identified underground natural gas storage fields in Goodwell Township; conveyed concern for a lack of emergency resources in the county (just four ambulances for entire county); and identified the Merrill Township railroad chemical spill that occurred in 1979. Feedback from this survey guided the establishment of goals and objectives, the recommendation of activities, and the prioritization of actions contained within this plan.

In 2006, a final draft plan was developed by WMSRDC and submitted to the Federal Emergency Management Agency (FEMA) for preliminary approval. Final approval by FEMA is contingent on formal adoption of the jurisdiction encompassed by a plan, which in this case was Newaygo County. After review of the Hazard Mitigation Plan by the Newaygo County Board of Commissioners, it was determined not to formally adopt the original plan submitted by West Michigan Shoreline Regional Development Commission due to concern the plan did not fully meet the needs of Newaygo County.

In 2007, Newaygo County Emergency Services Department worked with the Newaygo County Local Emergency Planning Team, which meets on a monthly basis, to develop a revision of the original

Hazard Mitigation Draft to meet the needs of Newaygo County. The Newaygo County LEPT is the permanent Emergency Management advisory body serving the functions of the Homeland Security Local Planning Team (LPT), SARA Title III Hazardous Materials Local Emergency Planning Committee (LEPC), Hazard Mitigation Council, and Citizen Corps Council to provide a forum for representatives of local government, private businesses, and public organizations to participate in community emergency planning and preparedness activities. Representatives of the committee include Newaygo County Board of Commissioners, Newaygo County Administration, Newaygo County Emergency Services, City and Township Representatives, Newaygo County Central Dispatch, Newaygo County Sheriff's Department, Newaygo County Police Chiefs Association, Newaygo County Fire Chiefs Association, Newaygo County Medical Control Authority, Private EMS companies, District 10 Public Health Department, Newaygo County Road Commission, Newaygo County Community Mental Health, Newaygo County Department of Human Services, Newaygo County Commission on Aging, American Red Cross, Newaygo County Regional Educational Services Agency, and private companies including Gerber Products, AT&T, Consumer's Energy, etc.

In 2008, the plan was adopted by the Newaygo County Board of Commissioners and then received FEMA final approval on June 30, 2008. After that, the townships of Ashland, Barton, Bridgeton, Garfield, and Goodwell were the only municipalities in the county to successfully adopt the plan. Newaygo County Emergency Services made further updates to the plan, resulting in the 2009 Edition.

Plan Update

The intent of this plan revision was to work with those familiar with Newaygo County to describe the County, and to identify a clear process for minimizing the effects of natural disasters (weather, forest fires, etc.) or emergencies related to the County's built environment (transportation, structural fires, etc).

In addition, mitigation planning regulations state that "a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding." In 2011, Oceana County was awarded a grant to update the FEMA-approved hazard mitigation plans for Lake, Mason, Muskegon, Newaygo, and Oceana counties. The West Michigan Shoreline Regional Development Commission was hired to work with each county to perform the updates and facilitate local adoptions of the plans.

This edition of the Newaygo County Hazard Management Plan was created through cooperation and coordination between Newaygo County Emergency Services and WMSRDC. Newaygo County assumed responsibility for performing the hazard analysis, which included creation of a community profile and the identification and evaluation of hazards within the county. WMSRDC was responsible for ensuring the plan satisfied requirements of a FEMA-approved hazard mitigation plan. This entailed tasks such as documenting stakeholder and public participation; provision of hazard mitigation strategies; coordinating the development of hazard mitigation goal, objectives and actions; and facilitating adoption of the plan at the county and local levels of government. Throughout the planning process, Newaygo County Emergency Services and WMSRDC made concerted efforts to engage the public and community stakeholders.

The plan is intended to cover a five-year period and should be updated again in 2020.

PLANNING PROCESS

This section chronicles the steps that were taken to update the Newaygo County Hazard Management Plan, documents the multitude of planning participants, and provides suggestions for how the Plan should be leveraged and maintained. In general, the planning process consisted of the elements listed below.

- Public and stakeholder involvement;
- Establishment of an Advisory Team;
- Identification of hazards, risks and vulnerabilities;
- Identification and definition of goals and objectives;
- Identification of alternatives for solving problems;
- Selection of evaluation criteria to prioritize alternatives;
- Selection of potential hazard mitigation actions;
- Preparation of a draft plan;
- Preparation of the final plan;
- Implementation of the plan; and
- Monitoring and periodic revision of the plan.

Step 1 – Letters of Participation

This is a “multi-jurisdictional” plan developed and maintained at the county level with the support and input from constituent local jurisdictions. Therefore, the very first action of the planning process was to request a Letter of Participation from each local unit of government within Newaygo County. Out of thirty jurisdictions (including Newaygo County), just five chose not to submit a letter.

The chart on the following page shows the hazard mitigation participation “status” of each local jurisdiction in Newaygo County. Participation is based on whether or not a representative from a jurisdiction (1) attended a hazard mitigation meeting, (2) responded to a request for information, or (3) contributed to the plan in any other way during the planning process. The chart also communicates which jurisdictions have adopted the Plan at the local level.

Newaygo County Hazard Mitigation Plan Jurisdiction Participation					
Jurisdiction	2006 Hazard Mitigation Plan Participant*	Adopted 2007 Newaygo Co Hazard Management Plan**	2011 Letter to Participate	2015 Hazard Plan Update Participant	Participant Status
Newaygo Co.	✓	✓	✓	✓	Continuing
Ashland Twp		✓			Non-Participant
Barton Twp		✓	✓		
Beaver Twp				✓	New Participant
Big Prairie Twp			✓	✓	New Participant
Bridgeton Twp	✓	✓	✓	✓	Continuing
Brooks Twp	✓		✓	✓	Continuing
Croton Twp			✓	✓	New Participant
Dayton Twp			✓		
Denver Twp			✓		
Ensley Twp			✓	✓	New Participant
Everett Twp					Non-Participant
Fremont City			✓		
Garfield Twp		✓	✓		
Goodwell Twp	✓	✓	✓	✓	Continuing
Grant City			✓	✓	New Participant
Grant Twp	✓		✓		
Hesperia Village			✓		
Home Twp			✓		
Lilley Twp			✓		
Lincoln Twp	✓		✓	✓	Continuing
Merrill Twp	✓				Non-Participant
Monroe Twp			✓		
Newaygo City			✓	✓	New Participant
Norwich Twp			✓		
Sheridan Twp	✓			✓	Continuing
Sherman Twp	✓		✓	✓	Continuing
Troy Twp			✓		
White Cloud City	✓		✓		
Wilcox Twp			✓		
* Newaygo County Hazard Mitigation Plan (draft) met FEMA Disaster Mitigation Act requirements on 3/16/06					
** Newaygo County Hazard Management Plan approved by FEMA on 6/30/08					

Step 2 – Establish an Advisory Team

At the outset of the planning process, Newaygo County Emergency Services assembled an Advisory Team to aid the process of reviewing and updating the Newaygo County Hazard Management Plan. This team consisted of the Local Emergency Planning Team (LEPT) Section Leaders. These individuals are assigned by the Chief Elected Official and the Emergency Services Director and have the responsibility for maintaining a functional component of the jurisdiction's emergency plan. Next to the CEO or Director, these officials are the highest ranking officials within the emergency management system, managing the critical functional components of the Emergency Plan. This group was utilized at the early stages of the update process; however, as the Update evolved, the full LEPT emerged as the primary advisory body to the Plan Update. The LEPT includes representatives from the following agencies:

- Newaygo County Emergency Services Dept
- Newaygo County Board of Commissioners
- Local Government Representative
- Newaygo County Administration
- Newaygo County Central Dispatch
- Newaygo County Equalization Department
- Newaygo County Sheriff's Office
- Newaygo County Police Chief's Assn
- Michigan State Police Hart Post
- Newaygo County Fire Chief's Association
- Newaygo County Road Commission
- Spectrum Health Gerber Memorial Hospital
- Life EMS
- Pro Med EMS
- District 10 Public Health Department
- Newaygo County Community Mental Health
- Newaygo County MSU Extension Office
- Newaygo County Dept of Human Services
- American Red Cross
- Newaygo County Commission on Aging
- Newaygo County Regional Educational Service Agency
- Newaygo County Citizen Corps
- Newaygo County Information Technology

Annex C includes documentation of the planning participants, such as: LEPT appointees (as of 2015); Advisory Team members; and attendance lists from LEPT meetings where the Hazard Management Plan was discussed during the Update Process.

Step 3 – Identify Hazards and Risks

The hazard analysis is the foundation upon which all emergency planning efforts in the community are built. A hazard analysis provides understanding of the potential threats facing the community. By pinpointing the location, extent, and magnitude of past disasters or emergency situations, and by examining knowledge of new or emerging risks, it is possible to determine the probability of such events occurring and the vulnerability of people and property. When this information is viewed alongside relevant land use, economic, and demographic information from a well prepared "community profile," emergency managers can make assumptions about those segments of the community that might be impacted by various types of incidents. This, in turn, allows them to set priorities and goals for resource allocation and response, recovery, and mitigation activities prior to an incident occurring. Collectively, these decisions are the cornerstone of the community's emergency management program, and should guide all decisions pertaining to community emergency management activities.

Community Profile

The development of a community profile is accomplished by identifying and mapping, where appropriate, information that is relevant to hazard mitigation, such as the community's present land

use and development patterns, geography and climate, transportation network, demographic information, key industries, major organizations active in the community, the locations and nature of important community facilities, emergency warning system coverage, and other information that is relevant to the community's safety and smooth functioning.

Physical Profile – Preliminary data was gathered by WMSRDC and final data was compiled by Newaygo County Emergency Services Department. Historical data was provided by various sources including township, city, and County websites and master plans; the Michigan Historical Center Preservation Office; and the Newaygo County 2014 Directory compiled by the Newaygo County Clerk's Office. The Michigan Department of Environmental Quality, the Michigan Department of Natural Resources, the Newaygo County Parks and Recreation Master Plan of 2012, the Newaygo County Planning Commission, the National Weather Service, and the United States Geological Survey provided a majority of the data and statistics for the Physical Profile of Newaygo County including topography soil and geographical features, land features, elevation, vegetation, soil associations, climate weather patterns, and other physical features.

Social Profile – Preliminary data was gathered by WMSRDC and final data was compiled by the Newaygo County Emergency Services Department. The United States Census Bureau and the 2010 Census provided statistics for developing a social profile of Newaygo County including residents' age, gender, household composition, race, physical disabilities, income, employment, poverty status, and other social features.

For this edition of the Hazard Management Plan, Newaygo County Emergency Services updated the Community Profile chapter. This section was made available to the LEPT and all local units of government for review and comment. In addition, the WMSRDC updated the community profile tables found in Annex A. The chief elected official of each local jurisdiction was specifically provided an opportunity to participate in updating the profile table for his/her jurisdiction.

Hazard Identification

Newaygo County Emergency Services reviewed the 2012 Michigan Hazard Analysis (MSP/EMHSD Publication 103) as a starting point for identifying the hazards in Newaygo County. The Michigan Hazard Mitigation Plan (MSP/EMHSD Publication 106) was also used in this research. Information from local Hazard Specific Plans including the Muskegon River Dams Failure and Flooding Evacuation Plan and Newaygo County Community Wildfire Protection Plan were utilized. In addition, After Action Reports and Incident Reports from past local emergencies and disasters were reviewed to determine if the community has experienced, or may be susceptible to, specific hazards. Newaygo County Emergency Services also reviewed information obtained from the Functional Capability Assessment Interviews in determining preliminary hazard identification information. Specific hazard information was then obtained by various sources, such as the National Weather Service, United States Army Corps of Engineers, Michigan Department of Natural Resources, and Michigan Department of Environmental Quality. Professional evaluations were also used for specific hazard areas such as Public Health and Wildfires.

Community Input

The value of public involvement lies in sharing responsibility with those who will strongly influence the success or failure of the mitigation effort. Newaygo County has an established Local Emergency Planning Team (LEPT) which includes representatives from local government, private businesses,

and public organizations. Monthly meetings consist of General and Activity meetings focused around Newaygo County Emergency Services Annual Activity Schedule. General sessions are utilized to summarize activities and progression to include both Emergency Management functions and Homeland Security functions, while Activity meetings focus on specific projects. All LEPT members, community officials, and the general public are invited to attend and participate in both General and Activity meetings. Meeting agendas are distributed to Local Emergency Planning Team members in advance and meeting minutes are distributed shortly after the meeting.

Newaygo County Emergency Services also regularly distributes Informational Letters detailing Emergency Management Activities within Newaygo County to numerous governmental and response agencies County-wide, including representatives from all of the cities, village, and townships in Newaygo County. In addition, the Emergency Services website contains a page dedicated to enhancing awareness of hazard management, hazard mitigation, and for providing public access to the Newaygo County Hazard Management Plan.

Stakeholder Involvement – Numerous attempts to engage the community were made during the update of this plan. Valuable input was obtained through a survey sent to 146 individuals in February 2012. Community stakeholders who received this survey included: LEPT members; local elected and appointed officials; and county, regional and state agencies and departments. The survey was also made available to the public on the West Michigan Shoreline Regional Development Commission website during the drafting stage of the planning process.

The survey, developed with assistance of the Michigan State Police Emergency Management Division, was distributed early in the planning process and served a number of functions. First, the broad distribution of the survey to community stakeholders was intended to raise awareness throughout the community of hazard management planning in Newaygo County, as well as to encourage local input and participation. Second, the survey included a list of historical hazard events, as reported in the previous version of Newaygo County Hazard Mitigation Plan. This offered an opportunity for recipients to not only identify past and potential hazards in their community, but also allowed them to verify the existing content of the Plan. Third, the survey provided a prioritized list of hazards identified in the Newaygo County Hazard Management Plan, and asked recipients to rank those hazards according to their own priorities. Although feedback obtained from this section was inherently subjective, it was useful for gauging community opinion and was taken into consideration when the hazard rating and rankings were revisited during this Plan Update.

The survey incited responses from a wide range of local and regional entities; including Newaygo County Emergency Services, Department of Human Services, District #10 Health Department, Community Mental Health, Bridgeton Township Planning Commission, Croton Township Planning Commission, Ensley Township, Lincoln Township Zoning, Newaygo DPW, Newaygo Fire Department, and Sheridan Township Zoning. Survey feedback was used to help identify hazards, establish goals and objectives, recommend activities and prioritize actions. Although the survey produced a meager 6.8% response rate, it was successful in increasing awareness of hazard mitigation throughout Newaygo County. Explanations for the low response rate include the survey length, as well as the possibility that some recipients simply agreed with the survey content and chose not to respond.

Attempts to obtain input from local stakeholders were made at other points in the Planning Process as well. These efforts provided information about hazard mitigation and invited individuals to participate in the Plan Update. In April 2012, the chief elected official and in some cases the professional manager of each local jurisdiction received a copy of its community profile table for review and comment via mail or email. On June 6, 2012, WMSRDC staff attended the regular meeting of the Newaygo County Township Officer's meeting to provide an overview of the effort to update the Newaygo County Hazard Management Plan and to invite participation. In November 2013, local officials and the LEPT were again contacted via mail or email to request information regarding any hazard mitigation progress that had been made since the Plan was approved in 2008.

Neighboring counties were notified of the plan through a message sent to their Emergency Manager on October 15, 2013. All were asked to identify concerns of hazards in their county that may impact Newaygo County, and vice versa. Newaygo County is bounded by Lake County to the north; Kent and Muskegon counties to the south; Muskegon and Oceana counties to the west; and Mecosta and Montcalm counties to the east. All were given the option of reviewing drafts of this document.

Public Engagement – The Newaygo County LEPT hosted a public meeting to discuss hazard mitigation at the beginning of the planning process at its March 20, 2012 meeting. It was noticed in the Fremont Times-Indicator, discussed in the WMSRDC electronic newsletter, and announced in the February 2012 survey mailing. The meeting featured a presentation about the hazard mitigation planning process, and the public was invited to comment upon and discuss the survey that was distributed and made available on the WMSRDC website.

A second public meeting was held during the drafting stage of the planning process. This meeting was hosted by the LEPT at its regular meeting on January 20, 2015. The meeting was noticed in the Fremont Times-Indicator; announced on the WMSRDC and Newaygo County websites; announced on the Newaygo County Emergency Services Facebook page; and invitations were mailed and emailed to the LEPT members and all local elected officials in Newaygo County. These communications invited recipients to review the Community Profile, Hazard Analysis, and Hazard Evaluation sections, which were posted on the Newaygo County Emergency Services website prior to the public meeting. Invitees were offered an opportunity to comment on the drafted sections by attending the public meeting or by submitting written comments prior to the meeting. The meeting also featured a work session, whereas a proposed set of hazard mitigation action items were reviewed, discussed, and prioritized utilizing interactive polling technology.

The effort to update the hazard mitigation plans for Lake, Mason, Muskegon, Newaygo, and Oceana counties was featured several times in the WMSRDC's bi-monthly print newsletter. It was also featured in WMSRDC Updates, an electronic newsletter emailed, at a minimum, bi-monthly (opposite the printed newsletter). Not only were the newsletters distributed to all constituents in Lake, Mason, Muskegon, Newaygo and Oceana counties, but they also reached a majority of the county's neighboring communities. These communications were also presented on the WMSRDC's website. Lastly, the WMSRDC website, www.wmsrdc.org, allowed the public to become familiar with hazard mitigation and participate in the plan development. This website provided general information about hazard mitigation; offered a link to the latest approved edition of the county's Hazard Management Plan; and provided access to surveys and draft sections for public review.

Risk Assessment (Hazard Evaluation)

A Risk Assessment involves the examination of the community's hazards using measures that evaluate such factors as severity, exposure, frequency of events, types and extent of damage scope of impact, etc. Through this evaluation process, hazards are identified in detail and a community's overall risk from those hazards is assessed and often mapped, to identify key areas and to tie in with community's decision-making about future land development. Considering hazard-specific "worst-case" disaster scenarios may help to determine what critical issues the community may face—life safety, public health, loss of critical functions, economic impacts, and short/long term recovery issues—and to plan ways to deal with them.

The evaluation methodology for ranking hazards used by Newaygo County Emergency Services Department relied on risk assessment information such as historical occurrence, seasonal pattern, and predictability, etc. This information was gleaned from After Action Reports from past emergencies and disasters.

For this edition of the Newaygo County Hazard Management Plan, hazards were evaluated by Newaygo County Hazard Management using same methodology that was used in the previous edition of this plan. This edition has also been updated to include a hazard evaluation for each local jurisdiction within Newaygo County (see Annex B). The previous edition only evaluated hazards at the county level and for the county's cities.

Vulnerability Assessment

A Vulnerability Assessment can ensue by comparing areas where the hazards overlap with people and important facilities. An estimate of potential losses, usually expressed in dollar values, will be made, and priorities can be established as to which hazards are the most threatening. The highest-priority hazards will be the ones your community should place more emphasis, effort, and funds toward addressing.

When assessing vulnerability, Newaygo County Emergency Services considered points such as population concentrations, age-specific populations and special needs populations, types of structures and housing, etc.

Step 4 – Define Goals & Objectives

Developing clear goals and objectives can help the community clarify problems, issues and opportunities in hazard mitigation as well as other areas. Well-articulated goals and objectives are more likely to succeed. An important part of developing goals and objectives is raising community awareness of the relationship between community development practices and the community's level of hazard vulnerability and risk. Also, raising citizen awareness can help gain support for ongoing mitigation planning efforts.

The Newaygo County LEPT originally established a set of mitigation goals and objectives based on issues identified in the Hazard Analysis and the Risk Assessment (Hazard Evaluation). For the 2015 updated edition of this plan, the inherited goals and objectives were reviewed by the Newaygo County Hazard Mitigation Advisory Team. It was determined that the goals and objectives remain valid, as therefore no significant changes or additions were proposed during this review. The two foremost factors contributing to this conclusion were that: 1) conditions within the county have remained

generally the same since the previous edition of this plan; and 2) the results of the hazards evaluation were comparable to the previous hazards evaluation.

Step 5 – Identify Alternatives for Solving Problems

Often, there are different ways that objectives can be met, each of which may have pros and cons, costs and benefits. This step is intended to provide a comprehensive resource for community stakeholders to use in identifying solutions to the community's problems. With this information, Newaygo County Local Emergency Planning Team identified a broad set of possible hazard mitigation actions from which to select recommended actions for implementation.

Updates conducted on this section in 2014 included review and revision of mitigation alternative descriptions, including how alternatives are being utilized within Newaygo County (the capabilities of the community). Other updates included a revised description of basic mitigation strategies (see table on previous page), and the inclusion of common mitigation funding sources. Appropriate information from the Michigan Hazard Mitigation Plan (MSP/EMHSD Publication 106) was included as well.

Step 6 – Establish Evaluation Criteria

Selecting the appropriate evaluation criteria will help ensure that the proposed range of alternative mitigation measures will be evaluated in a manner that best reflects the values, policies and desires of the community. Once these criteria have been applied, community officials should have a better idea as to which alternatives are the most meritorious and desirable.

Newaygo County Emergency Services in conjunction with the Newaygo County Local Emergency Planning Team developed evaluation criteria to establish priorities for projects and alternatives. The criteria include, but are not limited to, factors related to potential for hazards, availability of alternate facilities, population density, project cost, available funding, and other considerations.

Step 7 – Select Feasible Mitigation Strategies

Newaygo County Emergency Services and the Newaygo County LEPT applied the evaluation criteria (Step 6) to the broad set of hazard mitigation alternatives (Step 5) in order to identify appropriate actions to be highlighted for implementation. Care was taken to ensure that the Plan's Goals and Objectives will be met by the newly selected "Action Agenda." To facilitate implementation of the Action Agenda, each recommended action was prioritized and further described in terms of the expected timeframe for completion, responsible parties, and potential sources for technical and financial assistance.

For the updated edition of this plan, the previous set of recommended action items (Action Agenda) was reviewed by the Newaygo County LEPT and those local communities that were previously successful in adopting the original Plan. Progress made towards those items was documented and taken into consideration when evaluating whether or not to retain them on the Action Agenda.

Step 8 – Prepare a Draft Plan

WMSRDC in conjunction with Newaygo County Emergency Services and the Newaygo County Local Emergency Planning Team prepared a draft plan which was submitted to the Michigan State Police Emergency Management and Homeland Security Division (MSP-EMHSD) and the Federal Emergency Management Agency (FEMA) for formal review. The draft plan was then reviewed by the Newaygo County Board of Commissioners and recommended changes were made.

Step 9 – Prepare a Final Draft Plan

Based on necessary changes and recommendations by the Newaygo County Board of Commissioners, MSP-EMHSD and FEMA, a final draft plan was prepared and presented to the Newaygo County Board for adoption. At that point, the timer was set for five years; the date which this Plan must be updated again to remain effective.

Step 10 – Implement Plan

Following County Board approval, the plan is then sent to local governments for public hearings and adoption, as desired, to qualify them for pre- and post- disaster hazard mitigation assistance. Documentation of all local adoptions will be returned to the Newaygo County Emergency Services for notification to MSP-EMHSD and FEMA. Local jurisdictions that are successful in adopting this Plan will be encouraged to incorporate appropriate recommendations contained within this Plan into their existing planning mechanisms, such as master plans and zoning ordinances.

Newaygo County Emergency Services Director will use the Hazard Management Plan as the Hazard Analysis and Hazard Mitigation Plan for Newaygo County. The Hazard Management Plan will be utilized to coordinate Hazard Mitigation programs across Newaygo County and guide decisions pertaining to Emergency Management Activities. Newaygo County Emergency Services will also keep local jurisdictions apprised of hazard mitigation funding opportunities, and assist applicants in securing funds as needed.

Step 11 – Monitor and Revise Plan

Communities and plans are both dynamic entities. Communities grow and change over time. In order to be effective, plans must also grow and evolve to avoid becoming void and obsolete. Planning doesn't stop once the plan is initiated. The plan must be evaluated and updated periodically to ensure the success of the hazard mitigation program. The Plan focuses on the period between 2015 and 2020.

This section describes a monitoring system that will help in the annual Hazard Mitigation Plan evaluation and periodic update. A monitoring system also helps keep the plan running on schedule even when there are other jobs or duties to perform. Local officials wear different hats and are responsible for multiple assignments. Few have the luxury of focusing on one assignment, task, or plan. Because the local community is often involved in administering numerous other programs, it is important to develop a monitoring system (e.g. project work schedule) to help remind each participant of their part in carrying out the plan as well as when associated tasks should be completed.

The Newaygo County Emergency Services Department will monitor the implementation of the Hazard Management Plan and report annual progress of the plan to members of the Newaygo County Local Emergency Planning Team (LEPT). Monitoring includes noting the following events throughout the year: occurrence of hazards, adoption of the plan by local governments, applications for hazard mitigation funds, grant awards, and project implementation. In addition to staff and LEPT knowledge, input would be obtained from comments submitted to the Emergency Services office. It would also be obtained from declarations of disasters and emergencies by the President and the Governor and updates on NOAA and NCDC websites.

Newaygo County will comply with the FEMA requirement that the plan be reviewed every five years and updated if necessary. The Newaygo County Emergency Services Director is responsible for all updates with the assistance from the LEPT. Projects that were completed over that time would be replaced with new ones. Priorities will be re-assessed. Development patterns will be analyzed to see if they have rendered the previous hazard analysis out-of-date.

The mandatory five-year review and update of the community mitigation plan is necessary because of ever-changing circumstances. Risks may change, areas may have increased or decreased risks and vulnerabilities, and therefore goals and priorities might have to be altered. There may even be new hazards that appear in that time. Evaluations of the plan should also assess how well the plan is working and if there are problems (financial, legal, coordination, etc.) with implementing the action items in the document.

While adjustments would be made throughout the process as new issues emerge and evolve, this method would ensure that the county remains on course in implementing the program.

Continuing Public Involvement

In addition to the mandatory update and evaluation of the plan, there must be a process by which public involvement can continue as the hazard mitigation plan is updated. Copies of the plan will be available in the Emergency Services office and at all local government offices. The plan will also be made available to the public on the Emergency Services website. All comments will be directed to the Emergency Services Director who will receive and compile all other forms of correspondence.

During the update of the plan, all methods previously used for assuring public involvement will be utilized again: surveys, contacts with neighboring counties, LEPT meetings, public hearings, etc.

Incorporation into Existing Planning Mechanisms

The County's transmittal of the Hazard Management Plan to local governments requests that they incorporate the document into local land use plans and zoning ordinances, as appropriate. Almost all communities in Newaygo County have adopted land use plans and regularly update them (the communities without plans include: Goodwell Township, Lincoln Township, and Troy Township). According to Public Act 33 of 2008, municipal jurisdictions must notify neighboring jurisdictions, the county, the region, and any registered public utility, railroad, or other governmental entities of the municipality's intention to amend, revise, or create a totally new plan. By law, each of these entities has the opportunity to comment on local land use plans, and is encouraged to do so in order to promote more coordinated land use planning.

NEWAYGO COUNTY COMMUNITY PROFILE

Newaygo County

Named after Chippewa Indian Chief Naw-wa-goo, who was a signer on the treaty of Saginaw in 1812, Newaygo County is located “in the heart of the Muskegon River Valley” in the west central part of Michigan’s Lower Peninsula. Newaygo County is composed largely of rural residential and national forest and is traversed by M-20, M-37, and M-82. According to the U.S. Census Bureau, the county has a total area of 861 square miles and is the 36th largest in the state. The county seat is located in White Cloud. With 234 natural lakes and 356 miles or rivers and streams, tourism, along with agriculture and manufacturing, are the primary drivers of the Newaygo County economy. The Muskegon River continues to be the main attraction for summer cottage residents and fishermen, who find it nearly the best source anywhere in Michigan for steelhead in the spring and salmon in the fall. Newaygo County offers many opportunities for hunting, fishing, camping, canoeing, and boasts an impressive recreational trail system contained within the Manistee National Forest.



Historical Overview

Establishment and Early Growth

Settlement of the area began in 1836 when Michel Charleau, a French Fur Trader, took a group of Chicago businessmen interested in land and timber up the Muskegon River. When they reached the banks of what is now known as the City of Newaygo, the party observed the great expanse of white pines. Determining the area would provide a good business opportunity, they established claims on the junction of the Muskegon River and the mouth of a creek which they named Pennoyer Creek. Soon plans were developed for the first saw mill on Pennoyer Creek, thus launching the first permanent settlement in the County. On September 1, 1837, Pennoyer Mill was complete and began operation, floating lumber to Muskegon on rafts then shipping the lumber to Chicago. The lumber boom soon followed in the late 1800's, significantly impacting the physical and cultural landscape of Newaygo. Its location on the Muskegon River upstream from Muskegon, a major lumber town at the time, along with its proximity to vast amounts of timber, encouraged settlement of the area and ultimately put the county on the map.

The boundaries for Newaygo County were set in 1840, but being unorganized, it was attached to Kent County to the south. Newaygo County became a separate County and formally organized in 1851. During the first elections in 1851 the Probate Court, Sheriff, and Clerk's Offices were established. Jacob Barnhard was the first judge of probate court, James Berry was the first Sheriff, and Loyal Palmer was the first Clerk. During the 1855 elections the Treasurer, Prosecuting Attorney, and Surveyor's Offices were established. John Swartout was the first Treasurer, Edgar Gray was the first Prosecuting Attorney, and William Utley was the first Surveyor. The Drain Commissioners office was established in 1869 and the Judge of Circuit Court was established in 1876. Charles Carmichael was the first drain commissioner and Michael Brown was the first Judge of Circuit Court. The first marriage records were filed in the clerk's office in 1851, and the first birth and death records were filed in 1867.

Newaygo was the first County Seat and a brick courthouse was built in 1886. There are many legends and stories concerning the name chosen for the County. It is believed that the name was derived from an Ottawa Indian brave, Nah-way-go, who had a reputation for bravery and strength and was known for his courage on the battlefield. He was seen and admired by the area's first white settlers.

As the settlements grew, roads were constructed and in 1849, the first state road was built from Croton and Newaygo to Muskegon. In 1854, a state road was built from Newaygo to Grand Rapids and facilitated the construction of the Big Red Mill at Newaygo. The Grand Rapids, Newaygo, and Lake Shore Rail Road came to Newaygo in 1872, connecting the city with Grand Rapids. In 1875 the rail road was extended to White Cloud.

A group of settlers, led by Daniel Weaver, first settled in the Fremont area in 1855. The Weaver homestead served as the first post office and public school in the area. In November 1855, Fremont Township was established and named in honor of John C. Fremont, a western explorer and Republican Party candidate for US President. Weaver and his fellow settlers cleared the dense timber in order to farm. In the early 1870's, more immigrant families came to Fremont from the Holland and Muskegon areas, growing the Dutch community. Lumbering became a major industry and a railroad spur linked Fremont to the national rail network.

Settlement and growth came late to the future County Seat, White Cloud. Prior to 1870, there was no real growth. However, construction of the railroad in 1875 spurred new growth. When lumberman Wilcox and Morgan came to the area, there was already a settlement there, Alleyton, started by Mr. Alleyton. Wilcox and Morgan started a second settlement across the river called Morgan Station. In 1872, lumbering operations started on the White River and fast growth came to the area. At the request of the postal officials, Morgan Station was renamed White Cloud and in 1872, the Village was incorporated. Both settlements continued to grown and by 1882, they had 136 school age children. Alleyton grew larger and faster and was considered the more elegant of the two. By 1880, it had 550 residents, and 32 businesses.

In the southern portion of Newaygo County, Grant Center was established in 1882. During that year Andrew J. Squier built the first saw mill and a railroad station was built on the Pere Marquette Railroad. Grant Center was incorporated in 1893, with the name shortened to Grant in 1899. The community was named after President and Civil War General Ulysses S. Grant. Similar to other communities within Newaygo County, Grant was centered around the lumbering industry. During the community's early years, 20,000 board feet of lumber and 30,000 shingles per day were shipped out of Grant. In 1885, Squier was producing 1,000,000 board feet of lumber per year. In 1872 and 1873, nine million feet of logs were shipped to Grand Rapids from Newaygo County, most of which came from the Ashland Station (2 miles south of present day Grant) at the rate of 100,000 a day.

Fire was extremely detrimental to early settlements in Newaygo County. In 1871, Fremont experienced a major forest fire that caused extensive damage, especially to the lumber mills. In 1883 a massive fire destroyed the City of Newaygo, leaving only two buildings standing. Soon thereafter, White Cloud became the County seat. On July 4, 1894, after already suffering from one fire, another struck, wiping out the Village of White Cloud. It was never rebuilt, and little remains to indicate its former existence.

When the lumbering era began in the early 1800's in Michigan, it was expected to last hundreds of years. However, within approximately fifty years, the vast softwood timber resources in the Lower Peninsula, including those in Newaygo County were harvested and the slash burned over more than once. Some believe that more logs were floated down the Muskegon River than any other river in the world. It is estimated that only one out of every three trees were actually harvested, the rest having been destroyed by forest fires. The forests and the soils were forever changed as a result of clear cutting, forest fires and farming.

By the early 1890's, with the vast timber resources depleted, lumbering moved out of the area. By the last quarter of the 19th century, some of the easier to drain wetlands were converted to farmland. In the early 20th century, Rice Lake in Grant Township was drained and its lakebed is now used for specialty crops. As the logging industry slowed and farming increased, a canning factory established in Fremont to market the produce, grew into a major enterprise known today as Gerber Products. With the lumbering era over, other industries began to replace the economic focus of the area. In 1898, the marl beds just north of Newaygo were acquired by D.L. Stivens of Newaygo Manufacturing Company and a group of Grand Rapids businessmen and a cement company was formed. By 1902, the first barrels were shipped.

Not all of the land that was originally settled was suitable for farming and many farms were later abandoned. Much of this land reverted to the Federal Government and today is managed as part of the Manistee National Forest. Today, the United States Forest Service owns approximately 108,000 acres or almost 20% of the County. Other farmland was purchased for recreational uses. Forest products from the second growth forests and recreation are the chief resources of the northern two-thirds of the County. In the southern third of the County, farming and industry has evolved. With some of the largest muck farms located in the eastern half of the County, Grant is known as the onion

capital of the world. There are also significant apple and peach orchards. The County's two hydroelectric dams on the Muskegon River produce enough kilowatts of electricity to power a city of 23,000 people. Both Croton Dam and Hardy Dam are on the National Register of Historic Places. Croton was constructed in 1906-07 and was the first hydro facility in the nation to use 110,000 volt transmission lines. Hardy went into service in 1931 and at the time was the tallest earthen dam in the world. Today it is still Michigan's tallest earthen dam and provides a 3,800 acre reservoir that is enormously popular for outdoor recreation. Newaygo County's three largest cities incorporate all these major uses. The City of Newaygo is known for its angling opportunities for chinook salmon, steelhead and brown trout, as well as boating, canoeing and kayaking. Fremont is the home of the world's leader in baby food, Gerber Products. White Cloud, with its motto emphasizing its recreation activities, "Where the North Begins and the Pure Waters Flow" is the County Seat.

Notable Citizens and Events



Daniel Gerber (1873 - 1952) and Gerber Products

Gerber traces its origins to the Fremont Canning Company, a small packager of peas, beans, and fruits in rural Michigan begun by Frank Gerber and his father in 1901. At that time, Gerber also served as a partner in his father's tannery. When the tannery closed in 1905, Gerber focused all his efforts on building the canning company. By 1914 he had expanded his plant to permit year-round production. Three years later, with the death of his father, Gerber became president of the company and saw its sales exceed \$1 million for the first time. Following a brief postwar dip in profits, Fremont Canning experienced steady growth during the 1920s.



In 1927, Mrs. Gerber began hand-straining solid food for her seven-month-old daughter and suggested the work could be easily done at the Fremont Canning Company, where the Gerber family produced a line of canned fruits and vegetables. Experiments with strained baby foods began shortly thereafter, and Sally Gerber became the company's first baby food analyst. Soon workers in the plant requested samples for their babies.



By late 1928, strained peas, prunes, carrots and spinach, not to mention beef vegetable soup, were ready for the national market. At that time, national distribution was nearly unheard of, meaning that the foods would only be available in a few stores in every area of the country. To compensate, the Gerber's launched an advertising campaign featuring a coupon and the now-famous Gerber Baby. The ads appeared in publications from The Journal of the American Medical Association to Good Housekeeping. Grocers who had been skeptical were now placing orders by the dozen. Within six months, Gerber Baby Foods were on grocery store shelves across the nation.

In 1952, The Gerber Foundation was established and provided \$14,700 in support to various organizations that first year, including organizations such as the American Red Cross, America's

Future, 4-H Clubs, Boys and Girls Clubs, the United Negro College Fund, and the National Fire Protection Association, among others. Small grants were also awarded to various community agencies within those communities where Gerber Products Company had a presence. Since the Foundation has provided millions of dollars to enhance the quality of life of infants and young children in nutrition, care, and development, it remains as the guiding beacon for Foundation giving. Beginning in 1953, scholarships were provided to a wide variety of institutions across the United States as well as to dependents of Gerber Products Company Associates.

In addition to the Gerber Foundation, the Gerber Life Insurance Company was formed as a subsidiary of Gerber Products Company in 1967. It is one of the top direct-response marketing insurance companies and a leading producer of juvenile life insurance. As of today, Gerber Life Insurance Company has more than \$9 billion of life insurance in force and insures more than 2 million people throughout the United States and Puerto Rico.

By 1973, Gerber was the world's largest supplier of baby foods with sales of \$278 billion. Gerber also added non-baby food products to the company's line including lotions, vaporizers, toys, and Gerber Baby ware, an extensive line of shirts, socks, crib sheets, and other baby gear. Daniel Gerber is now listed as one of the Twentieth Century Great American Business Leaders.

William Herman Bolthouse (1915 - 2004) and Bolthouse Farms



In 1915, William's parents launched a small vegetable farm in Grant, Michigan. Once William graduated from High School in 1931, he began working on the family farm. William married Helen Adeline Humphreys on January 11, 1938. Shortly after their marriage, his father deeded that Grant farm to William and Helen, which started one of the more successful agribusiness ventures in the United States.

From the very beginning the company was known for quality and innovation. Vegetable varieties were continually improved, and the company advanced from field packing celery to storing onions for off-season supply. Before long, local canneries relied on William Bolthouse for carrots, celery, spinach, and onions. These local canneries soon were companies like Gerber Products, The Campbell Soup Company, and H.J. Heinz. By 1950 Bolthouse Farms® was a leading supplier of carrots with the green tops attached, were the standard in the 1940's and 50's, but customers were interested in the added convenience of modern packaging. In 1954 William Bolthouse incorporated his business and in 1959 he built a fresh carrot cellophane packing facility. With quality recognized by customers, the company began marketing to the newly emerging chain stores and supermarkets. Even today the trade calls whole, bagged carrots "cellos!"

By the 1970's the chain stores and supermarkets had become reliant on the quality of Bolthouse carrots, but there was one problem— customers wanted fresh carrots year-round. William H. Bolthouse, began searching America for just the right location to harvest carrots every day. In 1972,

he decided that Bakersfield, California had the right combination of sun, soil, and climate. Growing carrots in Bakersfield was anything but the “conventional wisdom” back then. To the surprise of many, the new packing plant grew quickly as customers enjoyed superior carrot quality in any season of the year.

In 1985 William H Bolthouse turns the company over to his son, William J. Bolthouse. According to the business research company, Hoover's, with 2,100 employees Bolthouse Farms is one of the United States' leading producers of carrots and is also a leading producer of super-premium refrigerated products. In 2005, the Bolthouse family sold the company to private equity firm Madison Dearborn Partners LLC, who owned the company until 2012 when Campbell Soup Company bought Bolthouse Farms for \$1.55 billion. The location in Grant, Michigan remained open until June of 2010.

Croton Dam

In 1904, the Croton Dam was commissioned by The Grand Rapids-Muskegon Power Company, a subsidiary of William A. Foote and James B. Foote's Jackson Electric Light Works. The Foote brothers were responsible for other hydroelectric projects in Michigan including the Trowbridge Dam on the Kalamazoo River, the Webber Dam on the Grand River, and the Rogers Dam on the Muskegon River.



The construction on the Croton Dam began in June of 1907. William D. Fargo was assigned to oversee the project as the Chief Engineer. Fargo had developed new methods for construction of earth embankment dams on foundations of soft soils, which made use of hydraulic sluicing. The Croton Dam is one of the earliest examples of the use of this technique east of the Mississippi River. The chief advantage of the hydraulic sluicing method was its cost. The total cost of constructing the 370-foot-long (110 m) embankment, which contained 104,000 cubic yards (80,000 m³) of material, was only \$7,076, or about 7 cents per cubic yard of material moved. Fargo also used this method to construct a fill of 20,000 cubic yards (15,000 m³) for a highway bridge crossing the Muskegon River immediately downstream from the dam. The fill Fargo built for the highway bridge approach cost roughly the same.



In order to achieve efficient power transmission over 50 miles (80 km) to Grand Rapids, a 100,000-volt high voltage line was built, then the highest-voltage transmission line in the world. Dr. Charles Steinmetz, the “wizard” of General Electric, visited the site and conducted tests on the transmission lines in 1908. The line voltage was increased to 110,000 volts in early 1909.

The plant and its 110,000 volt transmission line (the highest voltage used at that time) attracted international attention. Curious spectators rode excursion trains to the site, where they received a tour of the dam and powerhouse, as well as a grand dinner. When the plant went into full service in September 1907 it represented the latest advances in electrical generation and transmission. Engineers from Russia, England, France, Italy, Japan, and India came to tour the plant when it opened.

The Croton Hydroelectric Generating Dam has been in continuous operation since it opened in 1907. The 40 foot high dam impounds 7.2 billion gallons of water in its 1,209 acre reservoir. Currently owned and operated by Consumers Energy, the Croton Dam is capable of generating 8,850 kilowatts of electricity at peak outflow, enough to serve a community of about 6,000 residential customers. This facility is listed in the National Register of Historic Places.

Hardy Dam

Located in Big Prairie Township, the Hardy Hydroelectric Generating Dam is the third largest earthen-filled dam in the world, and the largest east of the Mississippi River. Its impoundment forms Michigan's largest inland lake with over 50 miles of shoreline and a reservoir of 4,000 acres. The Hardy Dam is capable of generating 30,000 kilowatts of electricity which is enough power to serve a community of 16,600 people.



Constructed from 1929 to 1931, on a site once known as the Oxbow, the Hardy Hydroelectric Plant was built by Consumers Power Company. The plant was named for George Hardy, a partner in the firm that financed Consumers' projects from 1911 through 1928. The complex includes a Spanish Colonial Revival-style powerhouse and intake tower, an oil house, and a dormitory. It originally included four operator's houses on the eastern bank of the pond, which were Sears-Roebuck kit homes. Due to advancements in fossil fuel steam generating plants, this was the last conventional hydroelectric plant built by Consumers. The Hardy plant is listed in the National Register of Historic Places.



Geography and Climate



Location, Communities, and Proximity to Surrounding Cities

Newaygo County is located in the west central region of Michigan's Lower Peninsula. The City of White Cloud, located in the center of Newaygo County, which is the county seat and the third largest city in Newaygo County with a population of 1,381. The other three cities include Fremont, located in the south-west area of the county with the largest population of 4,128;

Newaygo, located south-central along the Muskegon River, with the second largest population of 1,689; and Grant, located in the southern most point of the county, with the smallest population of 850. Fremont, White Cloud, Newaygo, and Grant serve many of the needs of the county residents, however, the City of Grand Rapids (population 193,710) located approximately twenty five miles from the county's southern border, Big Rapids (population 10,313) located ten miles from the county's east boarder, and Muskegon (population 39,259), located approximately fifteen miles from the county's southwestern border, also serve as core communities.

City of Fremont



The City of Fremont is located along M-82 with the south half of the city located in Sheridan Township and the north half of the city located in Dayton Township, all which lie in the south west portion of Newaygo County. Known as the Baby Food Capital of the World, the city of Fremont has a rich history. Fremont was first settled and became a township in 1855. By the mid-1870s, the Gerber family moved to the area and opened a tannery. The city's history and economic growth have been intertwined with the family ever since. By the 1920s, the Gerber's founded a baby food company using the area's rich agricultural resources. Due to the presence of Gerber Foods and the proven demand for its products, Fremont experienced gradual, controlled growth throughout the 20th Century. Due to this progressive growth, the city has been able to provide and maintain public services when and where they were necessary.

According to *Michigan Works! West Central*, major employers in Fremont include:

- Gerber Products (1,200 employees)
- Spectrum Health Gerber Memorial Hospital (620 employees)
- DURA Automotive Systems (375 employees)
- Fremont Public Schools (275 employees)
- Gerber Life Insurance (200 employees)
- Wal-Mart Stores, Inc. (195 employees)
- Pine Medical Group (110 employees)
- Transitional Health Services (105 employees)



City of Newaygo



The City of Newaygo is located at the junction of M-37 and M-82 with the east half of the city located in Brooks Township and the west half of the city located in Garfield Township, all which lie in the south-central portion of Newaygo County along the Muskegon River. The City of Newaygo is the oldest community in the County. The Penoyer and Brooks families were among the first settlers to Newaygo. They founded Newaygo's first saw mill known as the "Big Red Mill". The rail service came through Newaygo in 1873, connecting with metropolitan Grand Rapids, Chicago, and Detroit. In 1883 a massive fire destroyed Newaygo, leaving only two buildings standing. The architectural influence existing today is of the late Victorian style. The proximity of the Muskegon River was the driving force of Newaygo's early economy, with mills, lumbering, and recreation developing near by. Although not as populated or geographically large as

Fremont, this area has seen steady growth in recent years due to easy access and close proximity to Grand Rapids. Major employers in Newaygo include:

- Magna Mirrors (550 employees)
- Newaygo Public Schools (218 employees)
- Save-A-Lot Quality Food Stores (52 employees)
- SandMold Systems (49 employees)



The City of White Cloud



The City of White Cloud is located at the junction of M-37 and M-20 with the south half of the city located in Everett Township and the north half located in Wilcox Township, which is in the center of Newaygo County. White Cloud is the community seat and hosts all county government offices including County Administration, Central Dispatch, the Sheriff Department, Jail, Community Mental Health, Department of Human Services, and Emergency Services. Major employers include:

- County of Newaygo (247 employees)
- White Cloud Public Schools (186 employees)
- North American Refractories (125 employees)
- Newaygo County Department of Human Services (76 employees)
- Family Health Care (76 employees)

The City of Grant



The City of Grant is the smallest city in Newaygo County and home to one of the few remaining wooden water towers in the State of Michigan. Grant is located on M-37 in Newaygo County's southern townships of Ashland and Grant. The City is located on a major Michigan Highway that acts as a popular direct route for travel between Grand Rapids and Traverse City. Many of the city's residents commute to Grand Rapids, Muskegon, and Fremont for employment, making Grant a "bedroom community." Although the City limits are smaller than some surrounding communities, the Grant Area is the fastest growing area in Newaygo County. Grant Public Schools is the largest school district in Newaygo County with an enrolled student population of 2,217 students in 2011. In 2006, Family Health Care built a new facility on the corner of M-37 and State Street to service the

Grant Community bringing prominent healthcare professionals into the area. Farming is also a prominent employer in the area. With some of the largest muck farms located in the eastern half of the County, Grant is known as the onion capital of the world. There are also significant apple and peach orchards around the area. Major Employers in the area include:

- Grant Public Schools (297 employees)
- Gene's Family Market, 33 East State St (73 employees)
- Family Health Care (61 Employees)
- Wilbur Ellis (20 Employees)



The Village of Hesperia

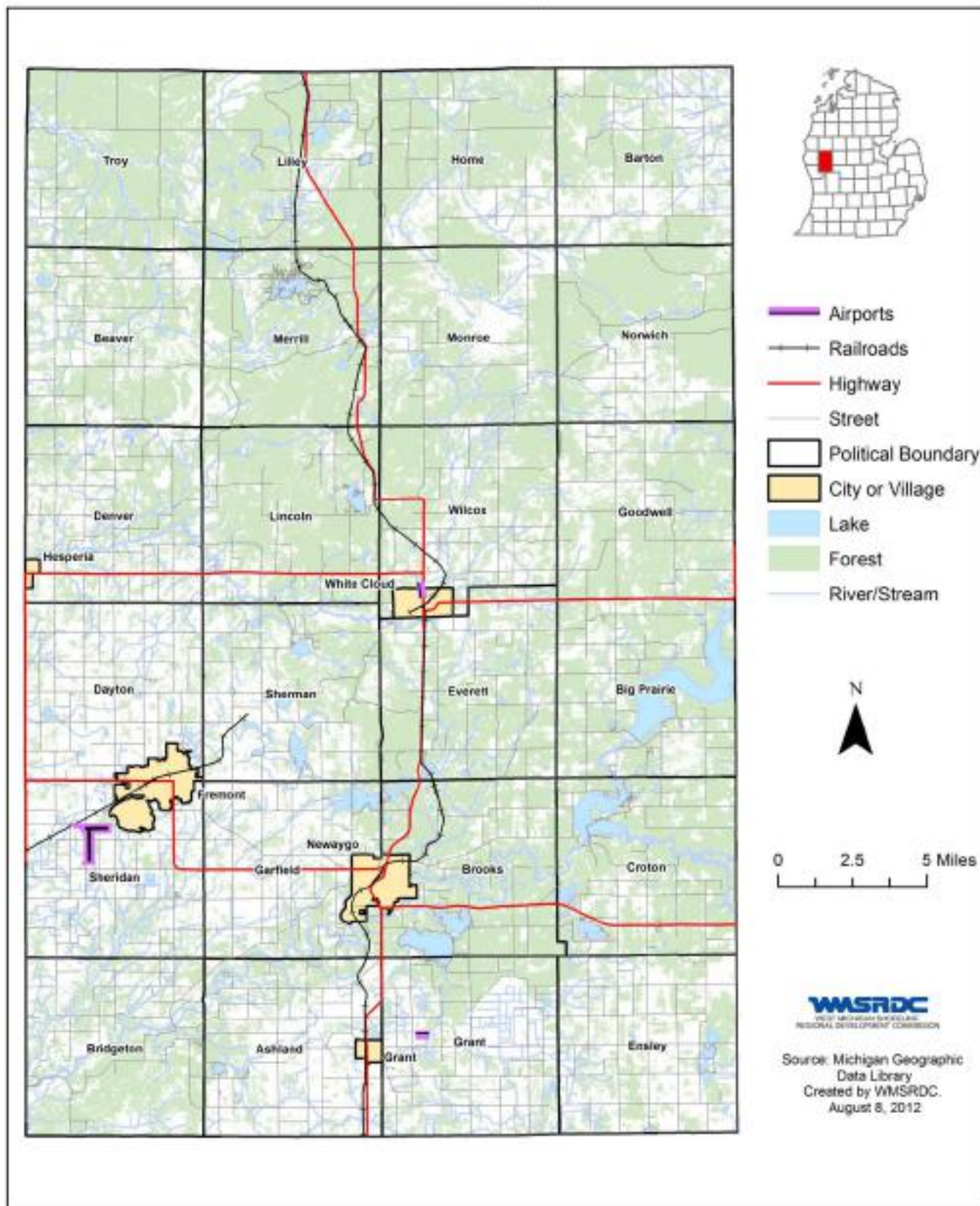


The Village of Hesperia is located in Newaygo County's western township of Denver and extends into Oceana County. Hesperia is the only village in Newaygo County. Situated on the White River along M-20, Hesperia was named from Hesperides in Greek Mythology, meaning blissful garden located in the western part of Greece. In 1856 Booth Perry settled the area followed shortly thereafter by Pat McFarland and Alex McLaren. The village of Hesperia was platted in 1866 and became a village in 1883. Major employers in Hesperia include:

- Hesperia Community Schools (164 employees)



Newaygo County Base Map



Distance to Major Cities

Newaygo County is situated at the northern end of the Greater Grand Rapids and Muskegon metropolitan areas and is a short distance to several regional economic hubs such as:



Muskegon	15 miles or 24 km
Grand Rapids	25 miles or 40 km
Traverse City	75 miles or 121 km
Lansing	110 miles or 176 km
Detroit	190 miles or 305 km
Chicago	220 miles or 353 km
Indianapolis	280 miles or 451 km
Cleveland	310 miles or 498 km

Climate and Weather Patterns

The climate of Newaygo County is highly varied due to topographical variations and the proximity of the county to Lake Michigan. The climatological records of the county are not considered the most reliable because the report gives data that are from Personal Weather Stations (PWS) located in the county uploaded to Weather Underground. These stations do not contain official National Weather Service data. Any records from these stations are then compared to the National Weather Service stations located in Grand Rapids and Muskegon. Table 1 through Table 6 provides a monthly overview of the county’s weather patterns based on climate data. Tables 1 through 3 are temperature data from the Fremont Weather Station and Tables 4 through 6 are precipitation data from the National Weather Service in Grand Rapids with combined averages taken from Grand Rapids and Muskegon data sets.

Overall, the climate of Newaygo County provides a four season location for winter, spring, summer and fall activities. In the winter, Newaygo County occasionally receives major winter storms and is often affected by Lake Effect Snow from Lake Michigan. Snowfall is often sufficient for extensive winter activities including cross country skiing, snowmobiling, sledding, tobogganing and snow shoeing. Winter temperatures are sufficiently cold to provide safe ice for ice fishing and ice skating. February is normally the county’s coldest month and August is normally the warmest. May usually

has the highest level of precipitation and February normally has the least. Snow depth within the county is normally greatest in January.

During spring and summer months, Newaygo County's climate provides ample opportunities for many types of outdoor recreation including mushroom picking, open water fishing, turkey hunting, 9 wildlife viewing, boating, non-motorized trail use (e.g. hiking, bicycling, equestrian, etc.), off-road vehicle use and camping. In the summer, Newaygo County's lakes and rivers are critical recreation resources. County parks on Hardy Pond, the Muskegon River and Pettibone Lake provide welcome breaks from the heat for campers, swimmers, anglers, boaters and those just seeking the cool blue of inland waters. With over 300 lakes and hundreds of miles of rivers and streams, there are water based recreation opportunities for almost every taste. Prevailing winds are normally from the southwest. During fall, the mixture of Newaygo county's softwood (pine, fir, cedar) forests and hardwoods (oak, maple, aspen, etc.) provide a tremendous spectacle of color for sightseers. Other outdoor recreation opportunities such as trail use, hunting, fishing, wildlife viewing, camping and boating are available.

*Table 1: Record Monthly Temperatures in Degrees Fahrenheit
Source: Weather Underground Weather Station in Fremont, Michigan*

Month	Record High	Date	Previous Record	Record Low	Date	Previous Record
January	63°F	01-25-1950	59°F (1-24-1950)	-16°F	01-03-1918	
February	67°F	02-11-1999	58°F (02-21-1930)	-30°F	02-11-1899	
March	82°F	03-20-2012 03-21-2012	77°F (03-27-1967) (03-30-1967)	-11°F	03-16-1897	
April	86°F	04-29-1970	85°F (04-27-1899)	1°F	04-07-1982	9°F (04-01-1923)
May	93°F	05-29-1962	90°F (05-10-1930)	22°F	05-10-1974	
June	98°F	06-20-1995	94°F (06-11-1956) (06-24-1901)	31°F	06-11-1972	34°F (06-04-1945) (06-08-1949)
July	99°F	07-07-2012 07-30-1913		39°F	07-02-2001	40°F (07-11-1945)
August	99°F	08-03-1964	96°F (08-24-1947)	36°F	08-16-1979	40°F (08-15-1929)
September	95°F	09-01-1953 09-06-1957	94°F (09-02-1913) (09-03-1953)	27°F	09-27-1989 09-28-1991	28°F (09-25-1947) (09-26-1947)
October	89°F	10-18-1910		19°F	10-29-1905	
November	76°F	11-02-1961 11-20-1930	74°F (11-19-1930) (11-01-1935)	-14°F	11-25-1950	-8°F (11-24-1950)
December	64°F	12-02-1982	63°F (12-06-1951) (12-05-2001)	-15° F	12-31-1976	-11°F (12-30-1976)

Table 2: Average Daily High in Degrees Fahrenheit
Source: Weather Underground Weather Station in Fremont, Michigan

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total Average
January	27	27	29	39	34	32	24	30	26	36	32	31
February	28	34	35	33	25	30	33	32	31	36	30	32
March	42	46	39	45	49	40	43	52	38	56	36	44
April	56	60	62	61	54	61	55	62	54	56	50	57
May	65	68	64	67	73	66	67	70	68	71	71	68
June	76	73	83	77	81	77	75	76	76	78	76	77
July	80	79	82	84	82	66	75	82	84	90	79	80
August	82	75	81	81	81	81	75	83	79	78	78	79
September	72	77	77	69	77	74	73	68	70	71	71	73
October	59	60	62	56	66	60	53	61	62	56	59	59
November	48	47	49	48	46	46	50	48	47	46	42	47
December	38	35	30	41	35	33	32	31	37	38	28	34

Table 3: Average Daily Low in Degrees Fahrenheit
Source: Weather Underground Weather Station in Fremont, Michigan

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total Average
January	15	14	19	29	23	21	9	21	15	24	19	19
February	14	18	23	20	14	15	20	22	18	24	15	18
March	24	32	20	28	30	25	27	31	25	39	22	28
April	35	38	38	39	36	38	36	40	36	34	33	37
May	45	49	44	48	50	43	47	50	49	49	49	48
June	53	56	63	56	58	58	56	58	56	55	56	57
July	60	60	62	64	61	62	54	64	64	63	59	61
August	62	56	61	61	63	59	58	63	60	67	56	61
September	51	53	55	51	54	55	52	52	51	48	51	52
October	40	43	43	39	49	40	40	40	42	39	41	41
November	35	34	33	34	32	33	36	34	34	31	29	33
December	26	22	23	30	25	21	23	23	28	27	17	24

2013 Temperatures for Grand Rapids, Michigan

Source: <http://www.weatherpark.com/history>

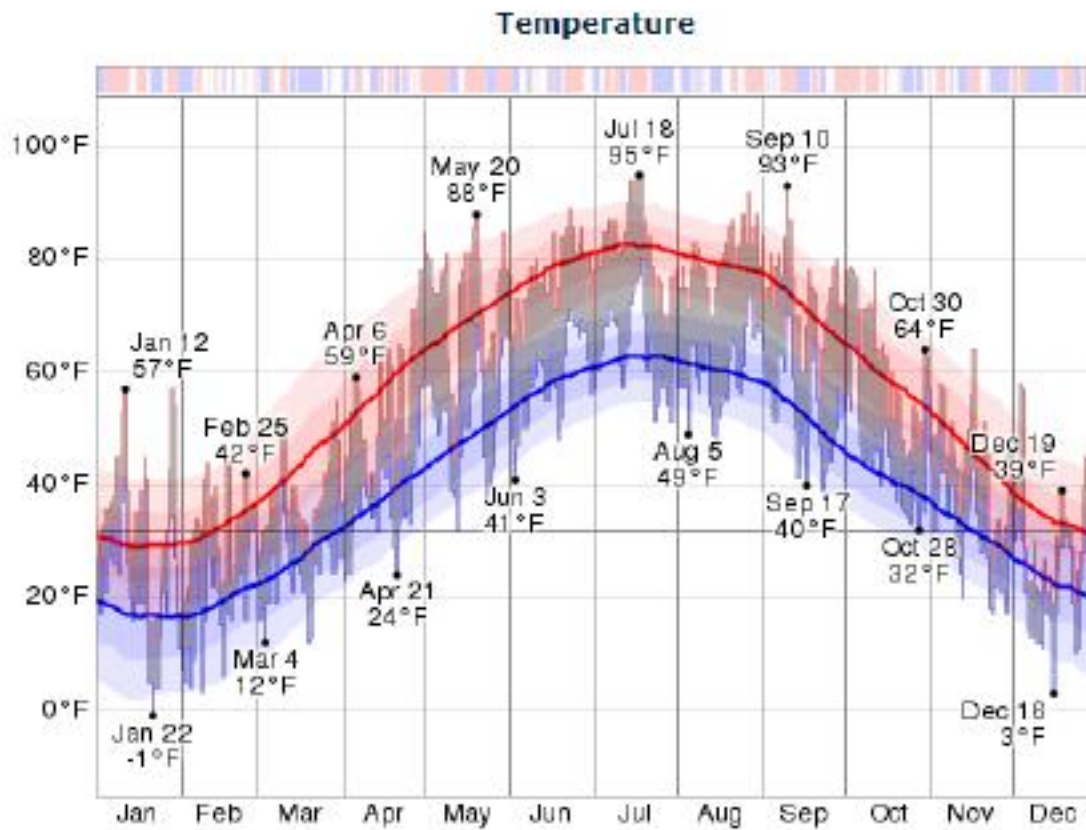


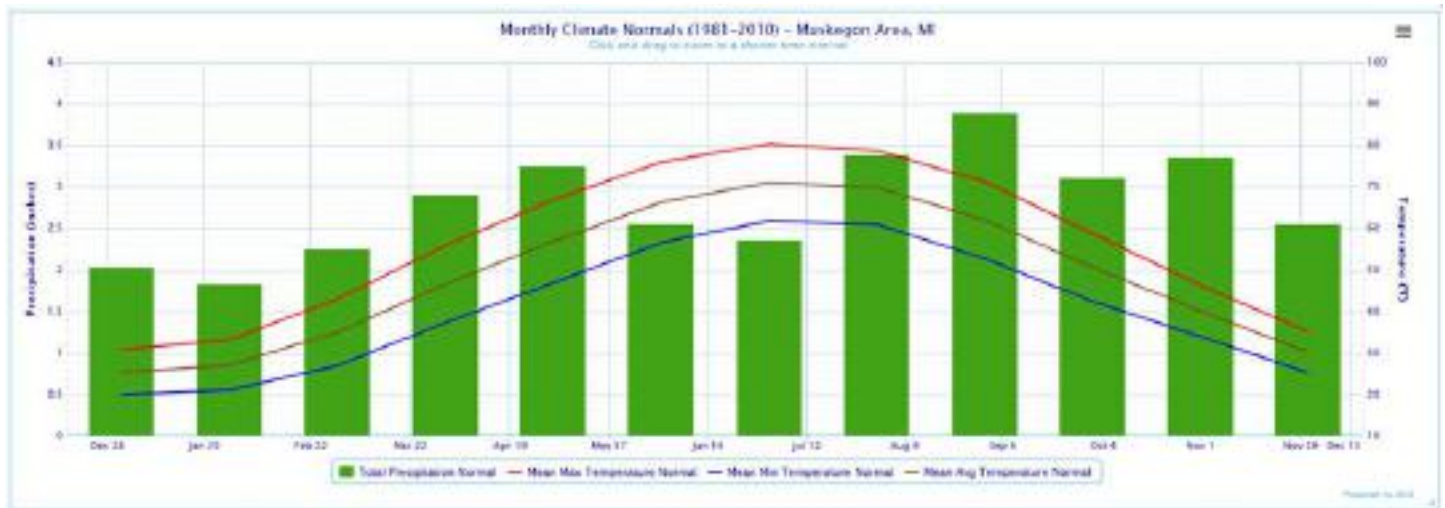
Table 4: Record Precipitation in Inches for Fremont

Source: Weather Underground Weather Station in Fremont, Michigan

Month	Record Precipitation	Date	Record Daily Snowfall	Date
January	1.46	01-26-1978	21.7	01-26-1978
February	2.12	02-22-1922	14.2	02-01-1965
March	1.98	03-02-1976	10.5	03-02-2002
April	2.66	04-11-2001	11.0	04-16-1961
May	4.10	05-22-1904	5.0	05-09-1923
June	5.08	05-27-1921	-	-
July	3.75	07-04-1901	-	-
August	4.29	08-13-2011	-	-
September	4.06	09-10-1986	T	-
	4.33	09-11-1986		
October	3.21	10-03-1954	4.70	10-27-1967
November	2.12	11-05-1990	16.00	11-14-1908
December	2.58	12-02-1982	14.80	12-17-1963

Table 5: Daily Average Precipitation in Inches
Source: National Weather Service

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total Average
January	0.06	0.09	0.27	0.27	0.62	0.16	0.07	0.03	0.07	0.10	0.16	0.17
February	0.04	0.09	0.16	0.21	1.66	0.19	0.13	0.94	0.10	0.07	0.13	0.34
March	0.10	0.28	0.13	0.35	0.14	0.11	0.09	0.03	0.12	0.11	0.04	0.14
April	0.25	0.19	0.09	0.27	0.21	0.11	0.17	0.10	0.20	0.09	0.31	0.18
May	0.33	0.51	0.21	0.36	0.08	0.07	0.07	0.11	0.11	0.08	0.14	0.19
June	0.13	0.29	0.45	0.21	0.12	0.19	0.15	0.21	0.10	0.09	0.15	0.19
July	0.24	0.22	0.22	0.51	0.06	0.16	0.05	0.13	0.18	0.09	0.09	0.18
August	0.27	0.25	0.26	0.19	0.13	0.04	0.16	0.06	0.16	0.08	0.06	0.15
September	0.39	0.11	0.45	0.28	0.07	0.29	0.07	0.15	0.09	0.05	0.06	0.18
October	0.21	0.39	0.12	0.32	0.11	0.11	0.22	0.08	0.12	0.21	0.16	0.19
November	0.45	0.23	0.36	0.27	0.03	0.09	0.05	0.07	0.10	0.02	0.12	0.16
December	0.13	0.15	0.12	0.25	0.12	0.24	0.10	0.06	0.08	0.10	0.09	0.13

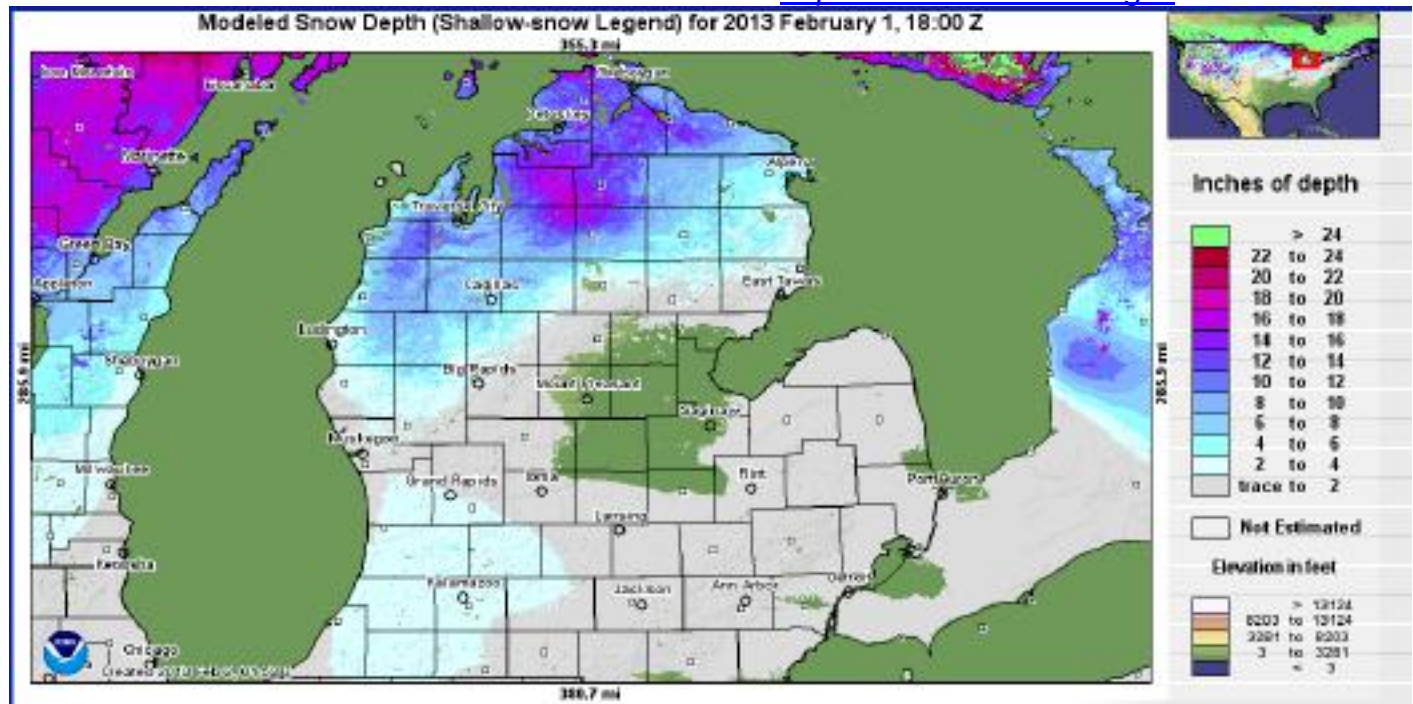


Month	Total Precipitation Normal	Mean Max Temperature Normal	Mean Min Temperature Normal	Mean Avg Temperature Normal
January	2.00	30.8	20.1	25.4
February	1.83	33.2	21.1	27.1
March	2.20	43.0	27.0	35.0
April	2.91	55.9	37.3	46.6
May	3.28	66.8	46.9	56.8
June	2.65	76.0	56.6	66.3
July	2.37	80.4	61.9	71.1
August	3.09	78.8	61.0	69.9
September	3.09	71.3	52.8	62.1
October	3.11	58.8	40.5	50.7
November	3.36	46.4	34.0	40.2
December	2.55	35.1	25.3	30.2

Table 6: Average Depth of Snow Cover in Inches
Source: National Weather Service

MONTH	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total Average
January	3	8	5	1	3	4	8	5	7	3	2	5
February	6	11	3	1	11	10	4	5	13	1	6	6
March	3	0	3	0	4	2	0	1	1	0	2	1
April	0	0	0	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0	0	0	0	0	0
November	0	0	2	0	0	2	0	0	0	0	0	0
December	1	1	4	1	3	6	4	2	0	1	5	3

Source: Interactive Snow Information <http://www.nohrsc.noaa.gov>



Geography and Land Use Patterns

Topography, Soils, and Other Geographical Features

Understanding the local environment and land use patterns help identify changes that can have significant repercussions for people, the economy, and the environment. Some changes have natural causes, such as volcanic eruptions or drought, while other changes on the land, such as resource extraction, agricultural practices, and urban growth, are human-induced processes. There are other types of changes that are a combination of natural and human-induced factors; for example, landslides and floods are fundamentally natural processes that are often intensified or accelerated by human land use practices. In order to understand Newaygo County's topography, soils, and other graphical features, it is important to understand the history behind Michigan and the glacial activity.

As recently as 12,000 years ago, major glacial activity impacted Newaygo County's topography. The underlying bedrock, except for one small area, is covered by 50 to 500 feet of glacial material. Large ridges, or end moraines, developed along the front of the glacier as it halted in its retreat toward the north-east. These moraines are from a quarter of a mile to one and a half miles in width and from ten feet in height to 40 feet. The moraines form a concentric pattern that extends from the northeastern corner of the county toward the southwestern part. Level to undulating ground moraines formed as materials carried by the glacier were deposited. The outwash plains in the county are the old gravelly and sandy channels of swift streams that formed as the glacier melted.

Physical Land Features

The bedrock in Newaygo County consists of edges of bowl-like formations that fill the Michigan Basin. Marshall Sandstone underlies the entire County. The Michigan Formation overlies the Michigan Sandstone in the eastern half of the County. This formation is primarily limestone, gypsum, and dolomite interceded with shale and sandstone. To the east, Bayport Limestone and Parma Sandstone progressively overlie these rocks. In the central part of the County and in some areas in the eastern half, red beds overlie the Michigan, Saginaw, and Grand River Formations. They consist mainly of sandstone, shale, clay and minor beds of limestone and gypsum. Overlying the rock formations is a mall of glacial drift, which was deposited after the Wisconsinian Glaciation. The glacial drift ranges from 200 to 800 feet in thickness. It is coarse gravel to fine lacustrine clay. Many of the soils in the County formed in the drift.

The present surface features in the County generally are the result of glacial action. Two major physiographic regions are recognized in the County; one consists of several outwash plains and lake plains in nearly level valleys having definite boundaries. Glacial melt-water streams, which were much larger than the current rivers and streams, deposited outwash material in the valleys. The abandoned melt-water channels are filled with organic deposits in some areas and kettle lakes in others. As the ice receded and the levels of the glacial lakes dropped, the valleys were incised and terraces formed along the present streams and rivers. The other physiographic region consists of rolling and hilly moraines rising from the nearly level valleys or plains. Streams and rivers have greatly modified the

surface in Newaygo County. The predominant water feature is the valley of the Muskegon River, which exits the southwestern part of the County.

Elevation

The highest elevation is 1,300 feet above sea level in the far northeastern part of the County.

The lowest elevation in the county is approximately 633 feet in the City of Newaygo near the Muskegon River.

Native Vegetation

As with many Michigan communities, Newaygo County was originally covered with a dense forest of deciduous trees. As the county was cleared for farming and development, or the trees removed for timber, the area's forests were replaced by farm fields, open field areas, orchards and smaller forests containing both deciduous and coniferous trees.

Soils Associations

A soil association is an area of land that has a distinctive proportional pattern of soils. Each association consists of one or more major soils and some minor soils and each association has a distinctive pattern of soils, relief, and drainages. The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitability can be identified on the map as well as soils that are not suitable. Because of the small scale, the map is not suitable for selecting a site for a road or building or other structure; however, more detailed maps are available for specific areas for planning purposes. There are eight general soil associations identified for the Newaygo County area as follows:

1. Plainfield-Grattan-Brems Association: Nearly level to steep, excessively drained and moderately well-drained, sandy soils on outwash plains and moraine.
2. Cosad-Del Rey-Sickles Association: Nearly level and gently undulating, somewhat poorly drained and poorly drained, sandy and loamy soils on lake plains.
3. Glendora-Abscota-Algansee Association: Nearly level and gently undulating, very poorly drained, somewhat poorly drained, and moderately well drained, sandy and loamy soils on flood plains.
4. Marlette-Metea-Sprinks Association: Nearly level to steep, moderately well-drained and well drained, loamy and sandy soils on moraines.
5. Coloma-Spinks-Matea Association: Nearly level to steep, excessively drained and well drained, sandy soils on moraines.
6. Toogood-Boyer Association: Nearly level to steep, somewhat excessively drained to moderately drained, sandy soils on outwash plains and terraces.
7. Adrian-Carlisle-Martisco Association: Nearly level, very poorly drained, organic soils on lake plains and outwash plains.
8. Pipestone-Covert-Kingsville Association: Nearly level and gently undulating, somewhat poorly drained, moderately well drained, and poorly drained, sandy soils on outwash plains.

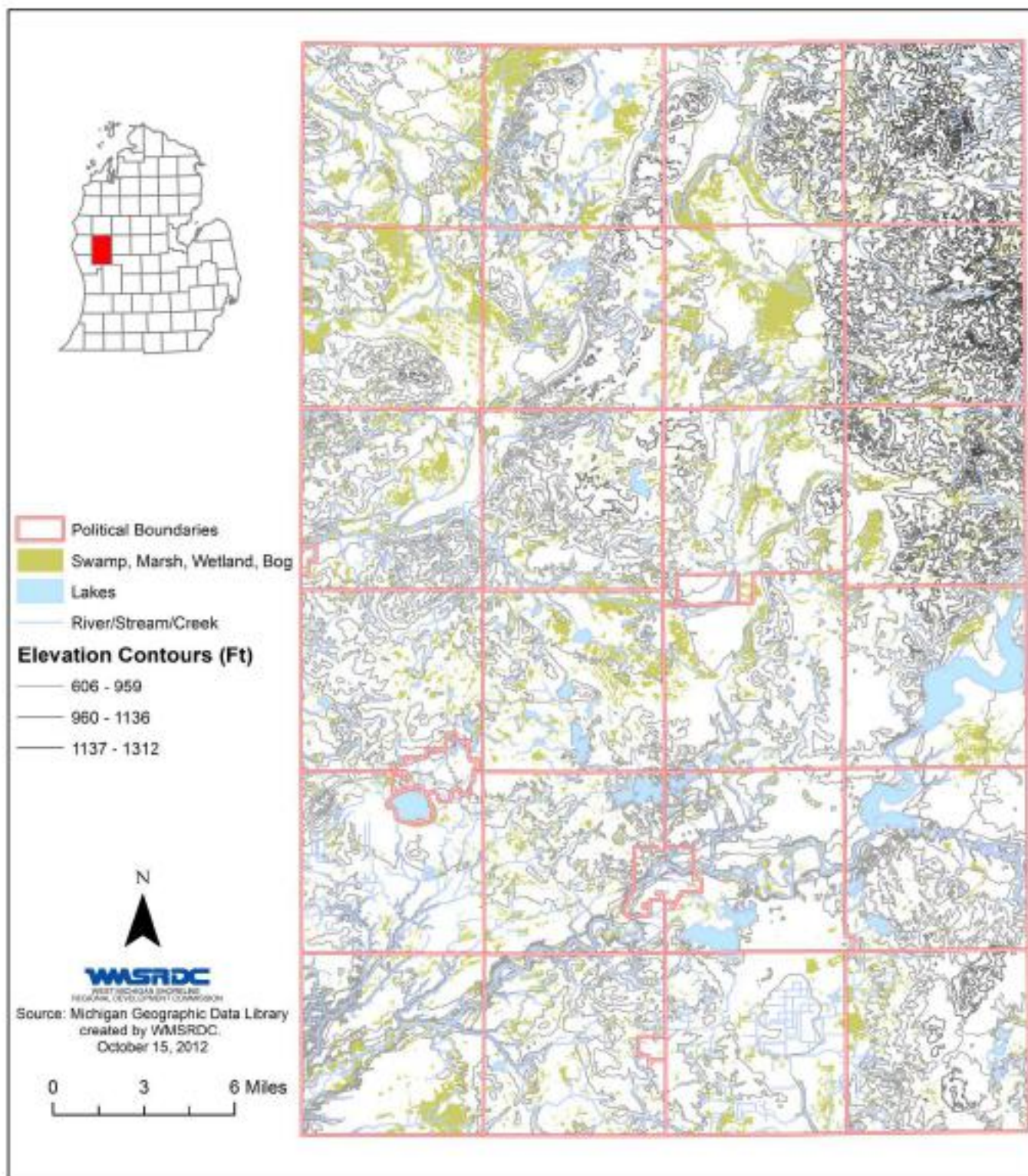
Some of the soils in the County are well suited to development. These include the less sloping, well drained soils in the Plainfield-Grattan-Brems, Coloma-Spinks-Matea, and Toogood-Boyer

associations. The Cosad-Del Rey-Sickles and Marlette-Metea-Spinks associations are better suited to farming than the other associations. Most of the soils in the County are well suited or fairly well suited for woodlands. Many soils are well suited to parks and other recreational areas. Un-drained areas of Adrian and other poorly drained or very poorly drained soils provide habitat for many species of wildlife and are good nature study areas.

GENERAL SOILS MAP



Newaygo County Natural Terrain Map



Current Land Use

Newaygo County encompasses more rural characteristics than urban characteristics with a little over 80% of its population located in the townships. The majority of the residential, retail, and industrial development has occurred in the County's four cities, Fremont, Grant, Newaygo, and White Cloud.

Water Resources

Newaygo County has abundant surface and ground water resources. The ground water is a source of good quality drinking water for the residents of the County. Newaygo County is comprised of 234 natural lakes and ponds, 356 miles of rivers and streams covering 12,543 acres, which provide outstanding recreational opportunities. Most of the larger natural lakes are in the southern half of the County and within 10 miles of the City of Newaygo. The areas around the lakes have been intensively developed for residential uses. As a result, some of the lakes are sandy and are used intensely for residential and agricultural purposes that generate effluent from septic systems and livestock wastes, causing water quality concerns. Recent efforts have been implemented to upgrade sewage treatment in many Newaygo County waterfront areas. Another challenge is algae blooms from agricultural nutrient inputs. Again, best management practices of applying appropriate amounts of fertilizer and vegetative buffers between crop fields and waterways are being implemented, but some problems still persist. Fortunately, most of the lakes have high-quality water. Lakes with water quality challenges include Hess, Fremont, Peterson, and Hesperia Lakes. The smaller lakes in the public forest areas provide a wide variety of recreational opportunities and activities. The numerous unnamed bodies of water scattered throughout the County provide habitat for many species of wetland wildlife.

Table 7: Newaygo County Lakes over 100 Acres

Source: <http://lakelocate.com/>

Lake Name	Lake Size in Acres
Hardy Dam Pond	3,750 (2,845 in County)
Croton Pond	1235
Hess Lake	1125
Fremont Lake	790
Pickerel Lake	318
Brooks Lake	293
Ryerson Lake	262
Bills Lake	204
Woodland Lake	202
Diamond Lake	181
Pettit Lake	169
Kimball Lake	153
Nichols Lake	143
Robinson Lake	137
Newaygo Lake	127
Crystal Lake	125
Pickerel Lake	122
Sylvan Lake	113



Newaygo County is drained by several rivers. The northern part of the County is drained by the Pere Marquette and Little Pere Marquette Rivers. The White River originates in the central plain in the County and flows west through White Cloud to Lake Michigan. The Muskegon River drains a large area of the middle and southern parts of the county flowing in a southwesterly direction through Newaygo. Crockery Creek and the Rogue River, which are in the southernmost part of the County, flow south into the Grand River Basin.

Forest Lands

Sixty-one percent of Newaygo County's 537 thousand acres of land is forested (MSU Extension 2006). Of this, 62% is in private ownership, almost all owned by small, non-industrial owners. Of the 38% in public ownership, the vast majority is part of the Manistee National Forest managed by the US Forest Service. Oak-hickory, beech-maple and lowland hardwoods make up 79% of the forest land in the county. Pine types (white, red and jack) are predominant on 15% of the forested acreage.

Farming

The diversity of soils and conditions appropriate for a wide variety of truck and vegetable crops helped create the conditions that made Gerber in Fremont a worldwide leader in baby foods. Because many of the soils are suitable for cropland, the climate is favorable, and the markets for farm products are nearby, farming probably will continue to be an important part of the economy in Newaygo County. In 2007, it is estimated that about 133,403 acres (a quarter) of Newaygo County was farmland. This is an increase of 1.2% since 1997. There has also been a 20.8% increase in the number of farms in Newaygo County since 1997. Since much of the prime farmland is located in the southwest and southerly portions of the County, which is also closest to the Muskegon and Grand Rapids metropolitan areas, it is anticipated that there will be increased pressure from non-farm land use development in the future. However, the nature of soils in these areas also has serious erosion limitations and these characteristics will influence future land uses. The following tables reflects the change in agriculture and farmstead land use from 1997 to 2007 and the current land use and farm size.



Table 8: Change in Agriculture-Farmstead Land Use and Farm Size
Source: 2007 Census of Agriculture

AGRICULTURE-FARMSTEAD LAND USE	2007	2002	1997	% Change
Total Number of Farms	951	902	787	20.8%
Total Number of Acres	133,403	135,422	131,779	1.2%
Total Cropland (Farms)	812	813	739	9.9%
Total Cropland (Acres)	89,457	93,491	94,890	-5.7%
Total Harvested Cropland (Farms)	649	689	663	-2.1%
Total Harvested Cropland (Acres)	74,516	72,732	74,140	0.5%
Total Grazing Land (Farms)	206	364	372	-4.5%
Total Grazing Land (Acres)	4,907	9,607	11,257	-56.4%
Average Size of Farm in Acres	140	150	167	-16.2%

Table 9: Agriculture-Farmstead Land Use and Farm Size
Source: 2007 Census of Agriculture

AGRICULTURE-FARMSTEAD LAND USE	Number of Farms	Acres	Total Farms%	Total Acres %
Total	951	133,403		
Total Cropland	812	89,457	85.38%	67.06%
Total Harvested Cropland	649	74,516	68.24%	55.86%
Total Grazing Land	206	4,907	21.66%	3.68%
Farm Size in Acres				
Farms by size - 1 to 9 acres	34	174	3.58%	0.13%
Farms by size - 10 to 49 acres	370	10,134	38.91%	7.60%
Farms by size - 50 to 69 acres	74	4,277	7.78%	3.21%
Farms by size - 70 to 99 acres	149	11,899	15.67%	8.92%
Farms by size - 100 to 139 acres	89	10,115	9.36%	7.58%
Farms by size - 140 to 179 acres	52	8,062	5.47%	6.04%
Farms by size - 180 to 219 acres	59	11,596	6.20%	8.69%
Farms by size - 220 to 259 acres	16	3,809	1.68%	2.86%
Farms by size - 260 to 449 acres	51	18,697	5.36%	14.02%
Farms by size - 500 to 999 acres	43	11,156	4.52%	8.36%
Farms by size - 1,000 to 1,999 acres	10	14,279	1.05%	10.70%
Farms by size - 2,000 acres or more	4	10,989	0.42%	8.24%
Average Size of Farm in Acres		140		

Historic Sites and Districts

According to the National Park Service, the National Register of Historic Places is the official list of the Nation's historic places worthy of preservation. Authorized by the National Historic Preservation Act of 1966, the National Park Service's National Register of Historic Places is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources. To be considered eligible, a property must meet the National Register Criteria for Evaluation. This involves examining the property's age, integrity, and significance. The following are considered during evaluation:



- ◆ Is the property old enough to be considered historic (generally at least 50 years old)
- ◆ Does the property still look much the way it did in the past?
- ◆ Is the property associated with events, activities, or developments that were important in the past?
- ◆ Is the property associated with the lives of people who were important in the past?
- ◆ Is the property associated with significant architectural history, landscape history, or engineering achievements?
- ◆ Does the property have the potential to yield information through archeological investigation about our past?

Within Newaygo County there are four properties listed on the National Register of Historic Places and several historic sites in Newaygo County, however, there are no registered Historical Districts at this time that have been established.



Table 10: Places Listed in the National Register of Historical Places
Source: National Register of Historic Places, National Park Service.gov

Site Name (as listed in register)	Site Address	City	Property Type	Period of Significance	Date Listed in National Register	Record Number	NRIS Item Number
Croton Dam Mound Group	Address Restricted	Croton Township	Prehistoric Site	500-999 BC	06/23/2009	358182	08000846
Hardy Hydroelectric Plant	6928 E. 36th Street	Big Prairie Twp.	Power plant	1925-1949	12/01/1997	426923	97001479
Croton Hydroelectric Plant	Croton Dam Road	Croton Township	Power plant	1900-1924	08/16/1979	377986	79001165
Toft Lake Village Site	Address Restricted	Croton Township	Prehistoric Site	0-1499 AD	06/20/1972	363688	72001476

Table 11: Places Listed in the State of Michigan Register of Historical Places
Source: Michigan Historical Center, State Historic Preservation Office

Site Name (as listed in register)	Site Address	City	Property Type	Period of Significance	Date Listed in State Register	Site ID Number
Big Prairie Grange No. 935 Hall	1968 Elm Avenue	Goodwell Township	Grange hall	1901-1930	03/28/1985	P24316
Croton Congregational Church	Croton-Hardy Dr. and Division St.	Croton	Church	1871-1911	01/22/1987	P24317
Oak Grove District No. 3 Schoolhouse	6382 East 80 th	Croton Township	Schoolhouse	1920-1968	06/30/1988	P24319
Ensley Windmill Tower	4634 South Luce Avenue	Fremont	Windmill	1826-1865	07/26/1978	P24322
First Christian Reformed Church	201 North Decker Avenue	Fremont	Church (Demolished)	1901-1930	01/20/1984	P24309
Gerber, Cornelius, Cottage	6480 West Cottage Grove	Fremont	Frame house	1866-1900	10/23/1979	P24310
City of Grant Depot and Water Tower	Between Lincoln and Pine Streets	Grant	Railroad Depot / Water tower	1866-1900	06/10/1980	P24311
Weaver, Daniel, House	84 South Cook Street	Hesperia	Frame house	1866-1900	09/26/1987	P24323
Penoyer's Sawmill and Dam	Penoyer Creek	Newaygo	Ruin Sawmill	1826-1865	08/22/1985	P24312
Saint Mark's Episcopal Church	30 Justice Street	Newaygo	Church	1866-1900	09/21/1983	P24313
Woods, John F., Residence	59 Bridge Street	Newaygo	Brick house	1826-1865	06/10/1980	P24314
Birch Grove School	3962 North Felch	White Cloud	Schoolhouse	1866-1900	10/02/1980	P24321
White Cloud Village Hall	1084 Wilcox	White Cloud	Courthouse (Demolished)	1901-1930	03/16/1982	P24315

Parks and Recreation

Newaygo County is blessed with many outdoor recreation opportunities, such as State and Federal forests, recreation opportunities provided by local units of government, privately owned recreation opportunities from both commercial providers and individual households and conservancy-owned natural areas. The following is a list of campgrounds in Newaygo County provided by the District 10 Public Health Department Environmental Officer.

Name of Establishment	Address	City, State, Zip	Number of Sites
Big Bend Park	2000 Beech Avenue	White Cloud, MI 49349	230
Brooks Lake M.H. Club	2263 Spruell	Newaygo, MI 49337	15
Camp Calvary	7500 Pettit Drive	Newaygo, MI 49337	22
Chinook Campground	5471 W 112 th Street	Grant, MI 49327	168
Cindy Lou's Hide A Way	6245 N Comstock Road	Hesperia, MI 49421	22
Croton Dam Float Trips	5355 Croton Drive	Newaygo, MI 49337	24
Croton Township Campground	7683 Croton Hardy Drive	Newaygo, MI 49337	167
Dan Raymond Park	6971 W 112 th Street	Grant, MI 49327	164
Diamond Lake (aka Camp Swampy)	3351 N Mundy Road	White Cloud, MI 49349	51
Ed Henning County Park	500 Croton Drive	Newaygo, MI 49337	64
Fremont Lake Park	933 Cottage Grove	Fremont, MI 49412	66
Full Salvation Union Camp	879 E Yoder Lane	White Cloud, MI 49349	15
Green Jug Resort	1190 Bingham Avenue	White Cloud, MI 49349	15
Heights Hide A Way	4424 Parson Road	Fremont, MI 49412	13
Hess Lake Mobile Home	825 E 88 th Street	Newaygo, MI 49337	34
Leisure Time RV Park	4799 South Spruce	White Cloud, MI 49349	94
Little Switzerland Resort	254 Pickeral Lake Drive	Newaygo, MI 49337	80
Lonesome Lake Campground	318 W 18 Mile Road	Bitely, MI 49309	50
Mystery Creek Campground	9570 S Wisner Avenue	Newaygo, MI 49337	85
Newaygo State Park	2793 Beech Street	Newaygo, MI 49337	99
Oxbow Park	2973 Cottonwood	Newaygo, MI 49337	197
Pettibone Lake Park	490 W Pettibone Drive	Bitely, MI 49309	16
Pickeral Lakeside Campground	12666 N Woodbridge	Bitely, MI 49309	46
Salmon Run Campground	8845 Felch Avenue	Grant, MI 49327	80
Sandy Beach Campground	6926 30 th Avenue	White Cloud, MI 49349	200
Shi Lo Cum	2940 N Felch Avenue	White Cloud, MI 49349	35
Sportsman Park Campground	2500 Sportsman Drive	White Cloud, MI 49349	86
Timbers Edge Campground	4345 North Warner	Hesperia, MI 49421	50
White Cloud City Campground	680 Wilcox	White Cloud, MI 49349	98
Wolverine Service Club Recreation Area	Whitney Bridge Road	Newaygo, MI 49337	10
Woods and Water Campground	4495 South Spruce	White Cloud, MI 49349	334

For additional information on Newaygo County's parks and recreation opportunities, please visit the Newaygo County Convention and Visitors Bureau at <http://www.newaygocountytourism.org>

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Anticipated Land Use

Newaygo County has a county-wide Parks and Recreation land use plan which serves as the primary policy guide for local officials considering development proposals, land divisions, capital improvements, and other matters related to land use and development; thus, it provides a stable and consistent basis for decision-making. The county does not enforce any county zoning ordinances leaving much of the land use decisions up to the individual townships and Cities. All of the Communities in Newaygo County have zoning ordinances and all but Troy Township has Land Use Plans.

Potential Land Use Conflicts and Known Hazards

Like most communities Newaygo County does have several unique situations that present hazards or land use conflicts. Several should be noted:

- ♦ All four cities within Newaygo County, Fremont, Newaygo, Grant, and White Cloud have industry located near retail and residential areas. Although the communities have not had recent significant instances where an unacceptable release of chemicals has occurred, it is a great potential to affect a substantial amount of residences should an unacceptable release occur.
- ♦ M-20, and M-82 are heavily traveled east-west transportation routes and M-37 is a major north-south transportation route. These routes run through all of the Cities and Village of Hesperia in the County. In addition to privately operated vehicles, these roads are traveled by commercial truck traffic carrying many different types of hazardous materials.
- ♦ The Marquette Railroad operates on CSX Transportation's rail lines running through the center of the county parallel to M-37. The rail line cuts through the heart of Grant, Newaygo and White Cloud. With several road to rail crossing throughout the county, surprisingly there is no history of car/train accidents.
- ♦ Newaygo County has many water resources and flooding problems. There are 356 miles of rivers and streams within Newaygo County. The Muskegon River runs Northeast to Southwest through the center of the county. The City of Newaygo lies along the river banks along with numerous campgrounds and recreational businesses. The White River originates in the central part of the County and flows westward. The Pere Marquette and Little Pere Marquette River drain in the north east part of the county. Many portions of these areas have structures and critical infrastructure within the flood planes of these rivers.
- ♦ With agriculture playing a major role in Newaygo County, first responders to fires on farms may not be aware of potential chemical hazards. Another issue with farms is the stealing of Anhydrous Ammonia to make Methamphetamine and creating good potential for a release.

Public Infrastructure

Like most rural communities public infrastructure does not extend throughout the county. Many residences provide their own water and sewer through the use of wells and septic systems. Some industry does the same. Larger companies without municipal services normally have a second high capacity well in order to service their fire protection system. Public infrastructure is addressed in greater detail under Key Community Facilities/Organizations.

Housing Stock

Newaygo County has a total of 25,075 housing units. The housing profile of the county is much different than that of the state. Compared to the state as a whole, the county has a slightly higher level of homeownership, however major differences should be noted in the percentage of mobile homes and trailers, the percentage of vacant, the age of the home, and home values. The higher percentage of mobile homes versus multiple family housing or apartments creates the potential for additional hazards due to mobile homes being more susceptible to certain types of weather damage related to wind damage from storms or damage from hail. Another important figure to take note of is the difference of vacant housing units between Newaygo County and the State. Newaygo County has approximately 26.6% of its available housing units vacant compared to Michigan's 14.6%. However, 73% of the vacant housing in Newaygo County is seasonal and vacation homes. This can be problematic for the county during winter months since vacant homes can create problems such as broken pipes or gas leaks if they go uncared for.

Table 12, Housing Data, Newaygo County and the State of Michigan provides a summary of Newaygo County's housing stock and how it compares to the State of Michigan as a whole.



Table 12, Housing Data, Newaygo County and the State of Michigan
Sources: Median Values and raw housing data taken from the 2010 U.S. Census

	Newaygo County		Michigan	
HOUSING SUBJECT	Total	Percentage	Total	Percentage
Total Number of Housing Units	25,075	100%	4,532,233	100%
Occupied Housing Units	18,406	73.4%	3,872,508	85.4%
Owner-Occupied Housing	15,170	82.4%	2,793,342	72.1%
Renter-Occupied Housing Units	3,236	17.6%	1,079,166	27.9%
Vacant Housing Units	6,669	26.6%	659,725	14.6%
Seasonal or Recreational Units	4,885	19.5%	263,071	5.8%
Units in Structure				
1-unit detached	18,287	72.9%	3,249,245	71.8%
1-unit attached	154	0.6%	203,734	4.5%
2 units	281	1.1%	118,013	2.6%
3 or 4 units	216	0.9%	117,982	2.6%
5 to 9 units	369	1.5%	190,285	4.2%
10 to 19 units	268	1.1%	154,922	3.4%
20 or more units	209	0.8%	237,482	5.2%
Mobile Home	5,284	21.1%	253,248	5.6%
Boat, RV, Van, etc	16	0.1%	743	0.0%
Age of Housing				
Built 2005 or later	652	2.8%	168,214	3.7%
Built 2000 to 2004	652	2.8%	319,691	7.1%
Built 1990 to 1999	2,168	9.3%	580,791	12.8%
Built 1980 to 1989	2,168	9.3%	449,484	9.9%
Built 1970 to 1979	1,954	8.4%	691,913	15.3%
Built 1960 to 1969	3,044	13.1%	551,778	12.2%
Built 1950 to 1959	4,439	19.1%	708,476	15.7%
Built 1940 to 1949	3,237	14.0%	368,881	8.2%
Built 1939 or earlier	4,086	17.6%	686,156	15.2%
Total Housing	25,084		4,525,654	
Home Values				
Less than \$50,000	2,203	14.0%	409,930	15.1%
\$50,000 to \$99,999	4,097	26.0%	707,551	26.1%
\$100,000 to \$149,999	4,271	27.1%	555,568	20.5%
\$150,000 to \$199,999	2,368	15.1%	444,042	16.4%
\$200,000 to \$299,999	1,700	10.8%	355,727	13.1%
\$300,000 to \$499,999	803	5.1%	163,110	6.0%
\$500,000 to \$999,999	226	1.4%	53,442	2.0%
\$1,000,000 or more	65	0.4%	16,910	0.6%
Median Value	\$115,800		\$118,100	

Table 13, Housing Data, City of Fremont and Newaygo County
Sources: Median Values and raw housing data taken from the 2010 U.S. Census

	City of Fremont		Newaygo County	
HOUSING SUBJECT	Total	Percentage	Total	Percentage
Total Number of Housing Units	2,112	100%	25,084	100%
Occupied Housing Units	1,816	86.0%	18,406	73.4%
Owner-Occupied Housing	1,301	71.6%	15,170	82.4%
Renter-Occupied Housing Units	515	28.4%	3,236	17.6%
Vacant Housing Units	296	14.0%	6,669	26.6%
Seasonal or Recreational Units	31	1.5%	4,885	19.5%
Units in Structure				
1-unit detached	1,353	64.1%	18,287	72.9%
1-unit attached	28	1.3%	154	0.6%
2 units	97	4.6%	281	1.1%
3 or 4 units	68	3.2%	216	0.9%
5 to 9 units	176	8.3%	369	1.5%
10 to 19 units	105	5.0%	268	1.1%
20 or more units	31	1.5%	209	0.8%
Mobile Home	254	12.0%	5,284	21.1%
Boat, RV, Van, etc	0	0.0%	16	0.1%
Age of Housing				
Built 2005 or later	2	0.1%	652	2.8%
Built 2000 to 2004	287	13.6%	652	2.8%
Built 1990 to 1999	285	13.5%	2,168	9.3%
Built 1980 to 1989	249	11.8%	2,168	9.3%
Built 1970 to 1979	178	8.4%	1,954	8.4%
Built 1960 to 1969	175	8.3%	3,044	13.1%
Built 1950 to 1959	411	19.5%	4,439	19.1%
Built 1940 to 1949	99	4.7%	3,237	14.0%
Built 1939 or earlier	426	20.2%	4,086	17.6%
Total Housing	2,112		25,084	
Home Values				
Less than \$50,000	235	18.1%	2,203	14.0%
\$50,000 to \$99,999	346	26.6%	4,097	26.0%
\$100,000 to \$149,999	421	32.4%	4,271	27.1%
\$150,000 to \$199,999	212	16.3%	2,368	15.1%
\$200,000 to \$299,999	42	3.2%	1,700	10.8%
\$300,000 to \$499,999	33	2.5%	803	5.1%
\$500,000 to \$999,999	12	0.9%	226	1.4%
\$1,000,000 or more	0	0.0%	65	0.4%
Median Value	\$107,200		\$115,800	

Table 14, Housing Data, City of Newaygo and Newaygo County
Sources: Median Values and raw housing data taken from the 2000 U.S. Census

	City of Newaygo		Newaygo County	
HOUSING SUBJECT	Total	Percentage	Total	Percentage
Total Number of Housing Units	957	100%	25,075	100%
Occupied Housing Units	868	90.7%	18,406	73.4%
Owner-Occupied Housing	436	50.2%	15,170	82.4%
Renter-Occupied Housing Units	432	49.8%	3,236	17.6%
Vacant Housing Units	89	9.3%	6,669	26.6%
Seasonal or Recreational Units	18	1.9%	4,885	19.5%
Units in Structure				
1-unit detached	475	49.6%	18,287	72.9%
1-unit attached	0	0.0%	154	0.6%
2 units	29	3.0%	281	1.1%
3 or 4 units	80	8.4%	216	0.9%
5 to 9 units	53	5.5%	369	1.5%
10 to 19 units	73	7.6%	268	1.1%
20 or more units	138	14.4%	209	0.8%
Mobile Home	109	11.4%	5,284	21.1%
Boat, RV, Van, etc	0	0.0%	16	0.1%
Age of Housing				
Built 2005 or later	3	0.3%	652	2.8%
Built 2000 to 2004	164	17.1%	652	2.8%
Built 1990 to 1999	187	19.5%	2,168	9.3%
Built 1980 to 1989	110	11.5%	2,168	9.3%
Built 1970 to 1979	90	9.4%	1,954	8.4%
Built 1960 to 1969	58	6.1%	3,044	13.1%
Built 1950 to 1959	107	11.2%	4,439	19.1%
Built 1940 to 1949	37	3.9%	3,237	14.0%
Built 1939 or earlier	201	21.0%	4,086	17.6%
Total Housing	957		25,084	
Home Values				
Less than \$50,000	78	17.9%	2,203	14.0%
\$50,000 to \$99,999	186	42.7%	4,097	26.0%
\$100,000 to \$149,999	122	28.0%	4,271	27.1%
\$150,000 to \$199,999	33	7.6%	2,368	15.1%
\$200,000 to \$299,999	14	3.2%	1,700	10.8%
\$300,000 to \$499,999	3	0.7%	803	5.1%
\$500,000 to \$999,999	0	0.0%	226	1.4%
\$1,000,000 or more	0	0.0%	65	0.4%
Median Value	\$88,600		\$115,800	

Table 15, Housing Data, City of White Cloud and Newaygo County
Sources: Median Values and raw housing data taken from the 2000 U.S. Census

HOUSING SUBJECT	City of White Cloud		Newaygo County	
	Total	Percentage	Total	Percentage
Total Number of Housing Units	614	100%	25,075	100%
Occupied Housing Units	530	86.3%	18,406	73.4%
Owner-Occupied Housing	305	57.5%	15,170	82.4%
Renter-Occupied Housing Units	225	42.5%	3,236	17.6%
Vacant Housing Units	84	13.7%	6,669	26.6%
Seasonal or Recreational Units	10	1.6%	4,885	19.5%
Units in Structure				
1-unit detached	394	64.2%	18,287	72.9%
1-unit attached	2	0.3%	154	0.6%
2 units	28	4.6%	281	1.1%
3 or 4 units	11	1.8%	216	0.9%
5 to 9 units	79	12.9%	369	1.5%
10 to 19 units	22	3.6%	268	1.1%
20 or more units	22	3.6%	209	0.8%
Mobile Home	56	9.1%	5,284	21.1%
Boat, RV, Van, etc	0	0.0%	16	0.1%
Age of Housing				
Built 2005 or later	9	1.5%	652	2.8%
Built 2000 to 2004	16	2.6%	652	2.8%
Built 1990 to 1999	80	13.0%	2,168	9.3%
Built 1980 to 1989	104	16.9%	2,168	9.3%
Built 1970 to 1979	103	16.8%	1,954	8.4%
Built 1960 to 1969	68	11.1%	3,044	13.1%
Built 1950 to 1959	90	14.7%	4,439	19.1%
Built 1940 to 1949	47	7.7%	3,237	14.0%
Built 1939 or earlier	97	15.8%	4,086	17.6%
Total Housing	614		25,084	
Home Values				
Less than \$50,000	54	17.7%	2,203	14.0%
\$50,000 to \$99,999	132	43.3%	4,097	26.0%
\$100,000 to \$149,999	68	22.3%	4,271	27.1%
\$150,000 to \$199,999	4	1.3%	2,368	15.1%
\$200,000 to \$299,999	32	10.5%	1,700	10.8%
\$300,000 to \$499,999	12	3.9%	803	5.1%
\$500,000 to \$999,999	0	0.0%	226	1.4%
\$1,000,000 or more	3	1.0%	65	0.4%
Median Value	\$86,100		\$115,800	

Table 16, Housing Data, City of Grant and Newaygo County
Sources: Median Values and raw housing data taken from the 2010 U.S. Census

	City of Grant		Newaygo County	
HOUSING SUBJECT	Total	Percentage	Total	Percentage
Total Number of Housing Units	378	100%	25,075	100%
Occupied Housing Units	315	83.3%	18,406	73.4%
Owner-Occupied Housing	178	56.5%	15,170	82.4%
Renter-Occupied Housing Units	137	43.5%	3,236	17.6%
Vacant Housing Units	63	16.7%	6,669	26.6%
Seasonal or Recreational Units	2	0.5%	4,885	19.5%
Units in Structure				
1-unit detached	200	52.9%	18,287	72.9%
1-unit attached	18	4.8%	154	0.6%
2 units	15	4.0%	281	1.1%
3 or 4 units	41	10.8%	216	0.9%
5 to 9 units	20	5.3%	369	1.5%
10 to 19 units	33	8.7%	268	1.1%
20 or more units	12	3.2%	209	0.8%
Mobile Home	39	10.3%	5,284	21.1%
Boat, RV, Van, etc	0	0.0%	16	0.1%
Age of Housing				
Built 2005 or later	5	1.3%	652	2.8%
Built 2000 to 2004	53	14.0%	652	2.8%
Built 1990 to 1999	52	13.8%	2,168	9.3%
Built 1980 to 1989	45	11.9%	2,168	9.3%
Built 1970 to 1979	49	13.0%	1,954	8.4%
Built 1960 to 1969	12	3.2%	3,044	13.1%
Built 1950 to 1959	41	10.8%	4,439	19.1%
Built 1940 to 1949	32	8.5%	3,237	14.0%
Built 1939 or earlier	89	23.5%	4,086	17.6%
Total Housing	378		25,084	
Home Values				
Less than \$50,000	39	21.9%	2,203	14.0%
\$50,000 to \$99,999	61	34.3%	4,097	26.0%
\$100,000 to \$149,999	45	25.3%	4,271	27.1%
\$150,000 to \$199,999	17	9.6%	2,368	15.1%
\$200,000 to \$299,999	16	9.0%	1,700	10.8%
\$300,000 to \$499,999	0	0.0%	803	5.1%
\$500,000 to \$999,999	0	0.0%	226	1.4%
\$1,000,000 or more	0	0.0%	65	0.4%
Median Value	\$92,100		\$115,800	

Table 17, Housing Data, Village of Hesperia and Newaygo County (Portions of the Village are in Oceana County)

Sources: Median Values and raw housing data taken from the 2010 U.S. Census

HOUSING SUBJECT	Village of Hesperia		Newaygo County	
	Total	Percentage	Total	Percentage
Total Number of Housing Units	466	100%	25,075	100%
Occupied Housing Units	424	91.0%	18,406	73.4%
Owner-Occupied Housing	293	69.1%	15,170	82.4%
Renter-Occupied Housing Units	131	30.9%	3,236	17.6%
Vacant Housing Units	42	9.0%	6,669	26.6%
Seasonal or Recreational Units	6	1.4%	4,885	19.5%
Units in Structure				
1-unit detached	335	71.9%	18,287	72.9%
1-unit attached	3	0.6%	154	0.6%
2 units	20	4.3%	281	1.1%
3 or 4 units	0	0.0%	216	0.9%
5 to 9 units	50	10.7%	369	1.5%
10 to 19 units	25	5.4%	268	1.1%
20 or more units	18	3.9%	209	0.8%
Mobile Home	15	3.2%	5,284	21.1%
Boat, RV, Van, etc	0	0.0%	16	0.1%
Age of Housing				
Built 2005 or later	0	0.0%	652	2.8%
Built 2000 to 2004	16	3.4%	652	2.8%
Built 1990 to 1999	49	10.5%	2,168	9.3%
Built 1980 to 1989	35	7.5%	2,168	9.3%
Built 1970 to 1979	66	14.2%	1,954	8.4%
Built 1960 to 1969	75	16.1%	3,044	13.1%
Built 1950 to 1959	76	16.3%	4,439	19.1%
Built 1940 to 1949	59	12.7%	3,237	14.0%
Built 1939 or earlier	90	19.3%	4,086	17.6%
Total Housing	466		25,084	
Home Values				
Less than \$50,000	46	15.7%	2,203	14.0%
\$50,000 to \$99,999	138	47.1%	4,097	26.0%
\$100,000 to \$149,999	60	20.5%	4,271	27.1%
\$150,000 to \$199,999	36	12.3%	2,368	15.1%
\$200,000 to \$299,999	5	1.7%	1,700	10.8%
\$300,000 to \$499,999	4	1.4%	803	5.1%
\$500,000 to \$999,999	4	1.4%	226	1.4%
\$1,000,000 or more	0	0.0%	65	0.4%
Median Value	\$92,000		\$115,800	

Table 18, Mobile Homes Distribution in Newaygo County
Sources: Raw housing data taken from the 2010 U.S. Census

NEWAYGO COUNTY MOBILE HOMES DISTRIBUTION		
COMMUNITY	# Mobile Homes	% Mobile Homes
Newaygo County *	5,284	100%
City of Fremont	254	4.8%
City of Newaygo	109	2.1%
City of White Cloud	56	1.1%
City of Grant	39	0.7%
Village of Hesperia	15	
Ashland Township	256	4.8%
Barton Township	145	2.7%
Beaver Township	116	2.2%
Big Prairie Township	807	15.3%
Bridgeton Township	296	5.6%
Brooks Township	394	7.5%
Croton Township	401	7.6%
Dayton Township	63	1.2%
Denver Township	272	5.1%
Ensley Township	222	4.2%
Everett Township	299	5.7%
Garfield Township	119	2.3%
Goodwell Township	77	1.5%
Grant Township	275	5.2%
Home Township	62	1.2%
Lilley Township	185	3.5%
Lincoln Township	154	2.9%
Merrill Township	172	3.3%
Monroe Township	86	1.6%
Norwich Township	43	0.8%
Sheridan Township	6	0.1%
Sherman Township	108	2.0%
Troy Township	85	1.6%
Wilcox Township	183	3.5%

* total of cities and townships; village total already included with township totals

source:
U.S. Census
Bureau

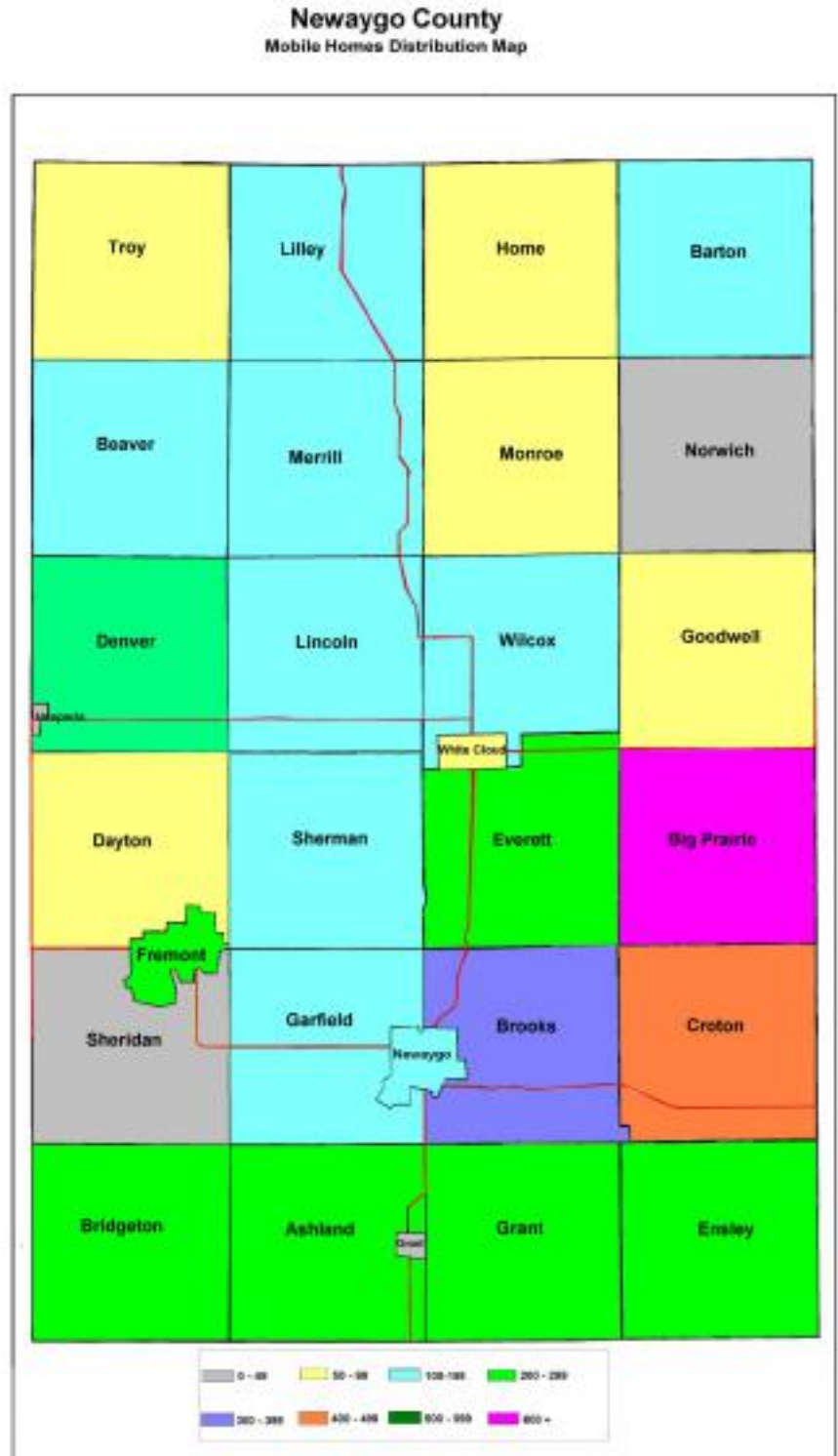
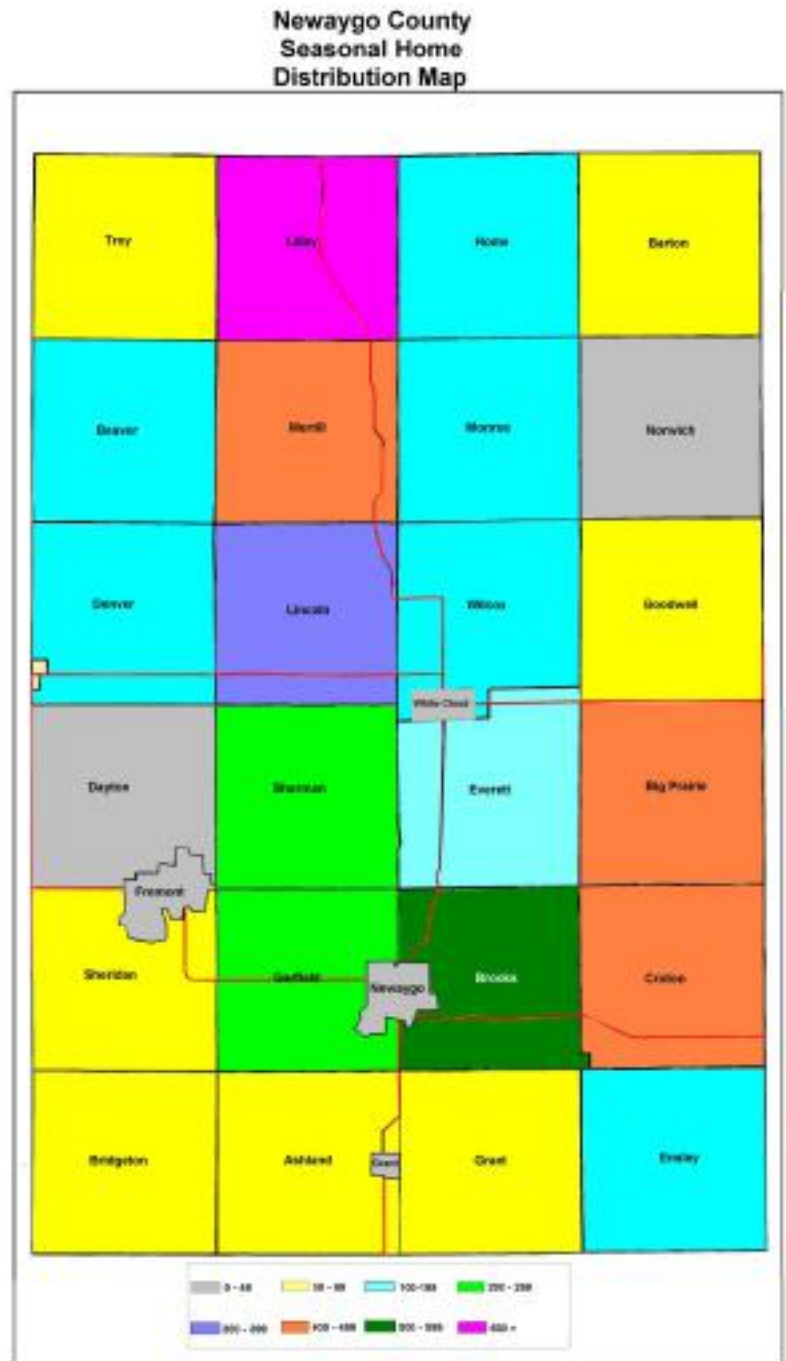


Table 19, Seasonal Homes Distribution in Newaygo County
Sources: Raw housing data taken from the 2010 U.S. Census

NEWAYGO COUNTY SEASONAL HOMES DISTRIBUTION		
COMMUNITY	#	%
	Seasonal Homes	Seasonal Homes
Newaygo County	4,885	100%
City of Fremont	31	0.6%
City of Newaygo	18	0.4%
City of White Cloud	10	0.2%
City of Grant	2	0.0%
Village of Hesperia	6	
Ashland Township	89	1.8%
Barton Township	91	1.9%
Beaver Township	100	2.0%
Big Prairie Township	455	9.3%
Bridgeton Township	82	1.7%
Brooks Township	573	11.7%
Croton Township	473	9.7%
Dayton Township	35	0.7%
Denver Township	100	2.0%
Ensley Township	110	2.3%
Everett Township	111	2.3%
Garfield Township	212	4.3%
Goodwell Township	94	1.9%
Grant Township	69	1.4%
Home Township	138	2.8%
Lilley Township	629	12.9%
Lincoln Township	314	6.4%
Merrill Township	450	9.2%
Monroe Township	170	3.5%
Norwich Township	25	0.5%
Sheridan Township	57	1.2%
Sherman Township	228	4.7%
Troy Township	94	1.9%
Wilcox Township	125	2.6%

* total of cities and townships; village total
 already included with township totals

source:
 U.S. Census
 Bureau



Transportation Network

Highways and Roads

Several modes of transportation are available within Newaygo County, however movement into, out of, and within the county is primarily by private automobile. Four state highways serve the county. M-37 runs the entire length of Newaygo County from North to South and connects Grand Rapids, Grant, Newaygo, White Cloud, Baldwin, and Traverse City. M-37 also connects to M-20 and M-82 in Newaygo County. M-20 runs the east to west and connects Mt Pleasant, Big Rapids, White Cloud, Hesperia, and Hart. M-82 also runs east to west and connects Howard City, Newaygo, Fremont, and Muskegon. The Newaygo County Road Commission maintains local roads and bridges and contracts with MDOT for snow and debris removal on State roads. Roads include a mix of both paved and graveled surfaces. North-South Roads west of M-37 are named after Presidents of the United States and east of M-37 are named after trees. East-West Roads north of M-20 are Mile Roads and south of M-20 are 10ths.

Major local connectors or “Class A” roads include the following list:

Old M-20 East

(May not be Class A in Mecosta County)

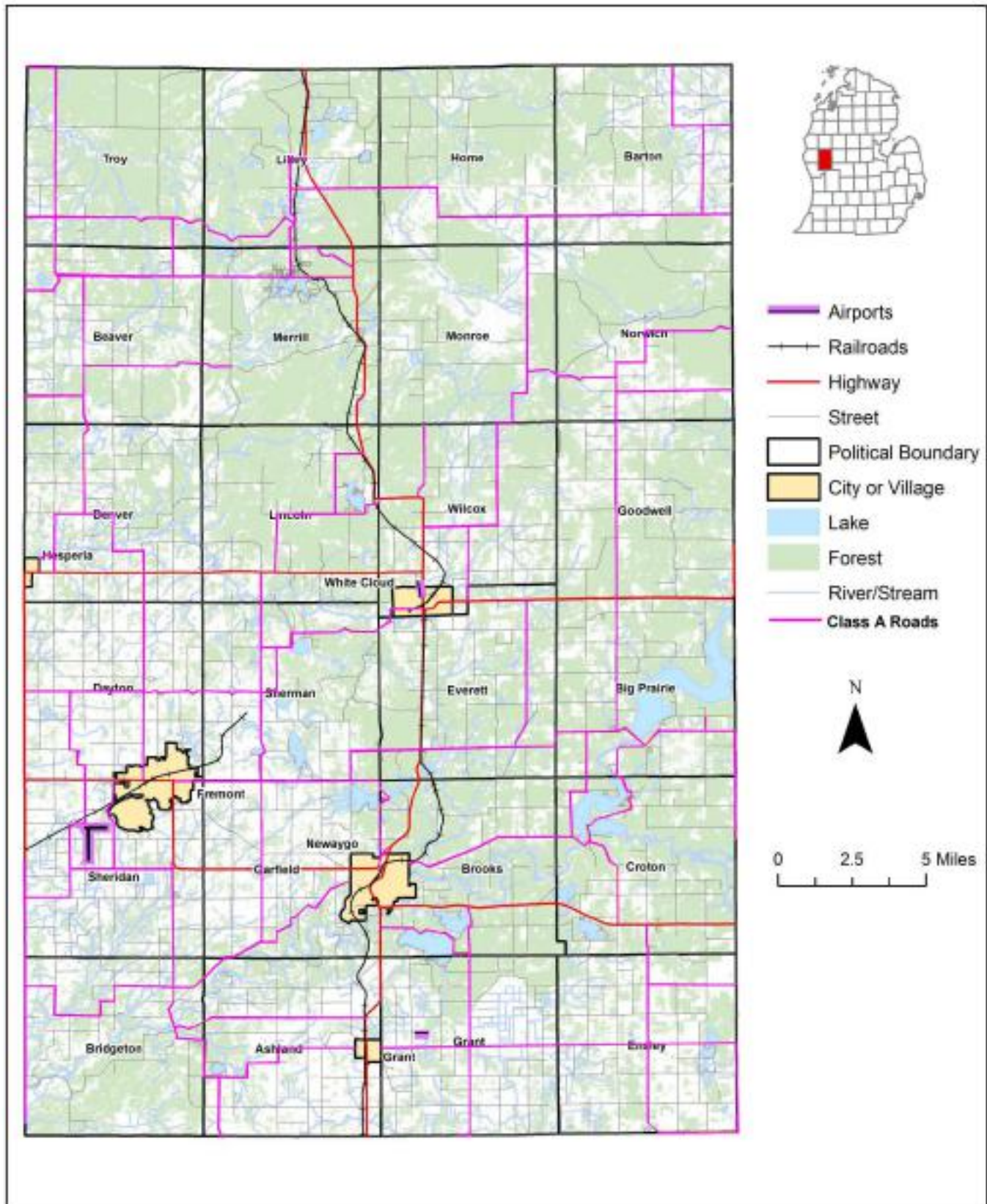
- ◆ 9 Mile from Cypress to Mecosta County
- ◆ Cypress from 8 Mile to 9 Mile
- ◆ 8 Mile from Elm to Cypress
- ◆ Elm from 8 Mile to Polk
- ◆ Polk/Fillmore from Oak to Elm
- ◆ Oak from Fillmore to 7 Mile
- ◆ 7 Mile from Oak to Thornapple
- ◆ Thornapple from 6 Mile to 7 Mile
- ◆ 6 Mile from Thornapple to Poplar
- ◆ Poplar from 6 Mile to Monroe
- ◆ Monroe from Poplar to M-37

Old M-20 West

- ◆ Echo Dr. west out of White Cloud to Bingham
- ◆ Bingham from Echo to 12th St.
- ◆ 12th St. from Bingham to Wisner
- ◆ Wisner from 12th St. to 24th St.
- ◆ 24th St. from Wisner to Baldwin
- ◆ Baldwin from 24th St. to 72nd St. (M-82)
- ◆ 16th St. from M-37 to Walnut
- ◆ 40th St. from M-37 to Gordon
- ◆ Gordon from 40th St. to 48th St.
- ◆ 48th St. from Gordon to Warner
- ◆ Stone from 1 Mile (M-20) to 48th St.
- ◆ Green Ave. from 48th St. (M-82) south to 64th St.
- ◆ Warner from 72nd (M-82) to White River
- ◆ 104th St. from Maple Island to Dickinson
- ◆ Dickinson from 104th St. to 112th St.
- ◆ 112th St. from Dickinson to Fitzgerald
- ◆ 128th St. from Alger to Bagley
- ◆ Bagley from 128th St. to 124th St.
- ◆ 124th St. from Bagley to Wisner
- ◆ Wisner from 124th St. to 120th St.
- ◆ Moore from Alger to Croswell
- ◆ 120th St. from Cypress to Elder
- ◆ Spruce from M-82 to Moore
- ◆ Green Ave. south of 48th (M-82) south to Lake Dr.

Newaygo County

Class A Road Map



Local Transit Service

There is no transit service in Newaygo County.

Airports

The Newaygo County has three airports within the County. The White Cloud Airport is located just 1 mile north of the City of White Cloud on M-37 and is owned and operated by the City of White Cloud. The airport is primarily used for business, flight school, and industry and does not have scheduled flights. The airport has one runway: Runway 18/36. Runway 18/36 is an asphalt runway 2917 ft by 60 ft at an elevation of 915.0 ft lighted by medium intensity runway edge lights. 100 Low Lead Aviation Fuel is available at the airport as well as hangars and tie-downs for parking.

The Fremont Municipal Airport is 3 miles southwest of the City of Fremont and is owned and operated by the City of Fremont. The airport is primarily used for business, glider operations, and industry and does not have scheduled flights. The airport has two asphalt runways, runway 18/36 and runway 9/27. Runway 18/36 is 6,498 feet by 100 feet at an elevation of 769.7 ft with a weight bearing capacity of 30,000 lbs and is marked with runway lights. Runway 9/27 is 3502 feet by 75 feet at an elevation of 766.9 feet with a weight bearing capacity of 16,000 lbs on a single wheel and is marked with medium intensity runway edge lights. 100 Low Lead Aviation Fuel and Jet A Fuel are both available along with hangars and tie-downs for parking.

Grant Airport is located 2 miles northeast of Grant and is privately owned by David Koopman from Grant. The airport has one turf runway, Runway 9/27, 2,517 feet by 120 feet at an elevation of 815.0 feet marked with low intensity runway edge lights. The airport does not have fuel, however it does have tie-downs for parking.

There are six major airports that are located within two hours of Newaygo County.

Airport Name	Distance from County
Muskegon County Airport	15 Miles
Gerald R. Ford International Airport	25 Miles
Traverse City Cherry Capital Airport	75 Miles
MBS International Airport	83 Miles
Kalamazoo Battle Creek International Airport	85 Miles
Lansing Capital Region International Airport	85 Miles
Bishop (Flint) International Airport	135 Miles
Detroit Metropolitan International Airport	185 Miles

Rail Service and Water Ports

Newaygo County does not have either passenger rail service or a water port. There are 22 Amtrak Stations in Michigan, with the closest in Grand Rapids which is approximately 25 miles outside the county. There are 6 water ports on Lake Michigan, with the closest in Muskegon which is approximately 15 miles outside the county.

Population Characteristics

Current and Historical Data

The 2010 census shows since 1970 Newaygo County is currently growing at a faster rate than the state average, however this has not always been true. From the 1900 through the 1970 Census, Newaygo County grew at a slower rate than the state through 1970 and declined in population twice during the early 1900's. The population decline occurred during WWI and a time of disease, such as the Spanish Flu, Small Pox, and Consumption. Table 20, Past Population Comparison, Newaygo County and the State of Michigan 1850-2010 shows Newaygo County's population during each census since 1850, the percentage change in Newaygo County's population, and the percentage change in Michigan's population.

Table 20: Past Population Comparison, Newaygo County and the State of Michigan 1850-2010
Sources: Population figures and other raw data taken from U.S. Census Historical Data
Percentages calculated by Newaygo County Emergency Services

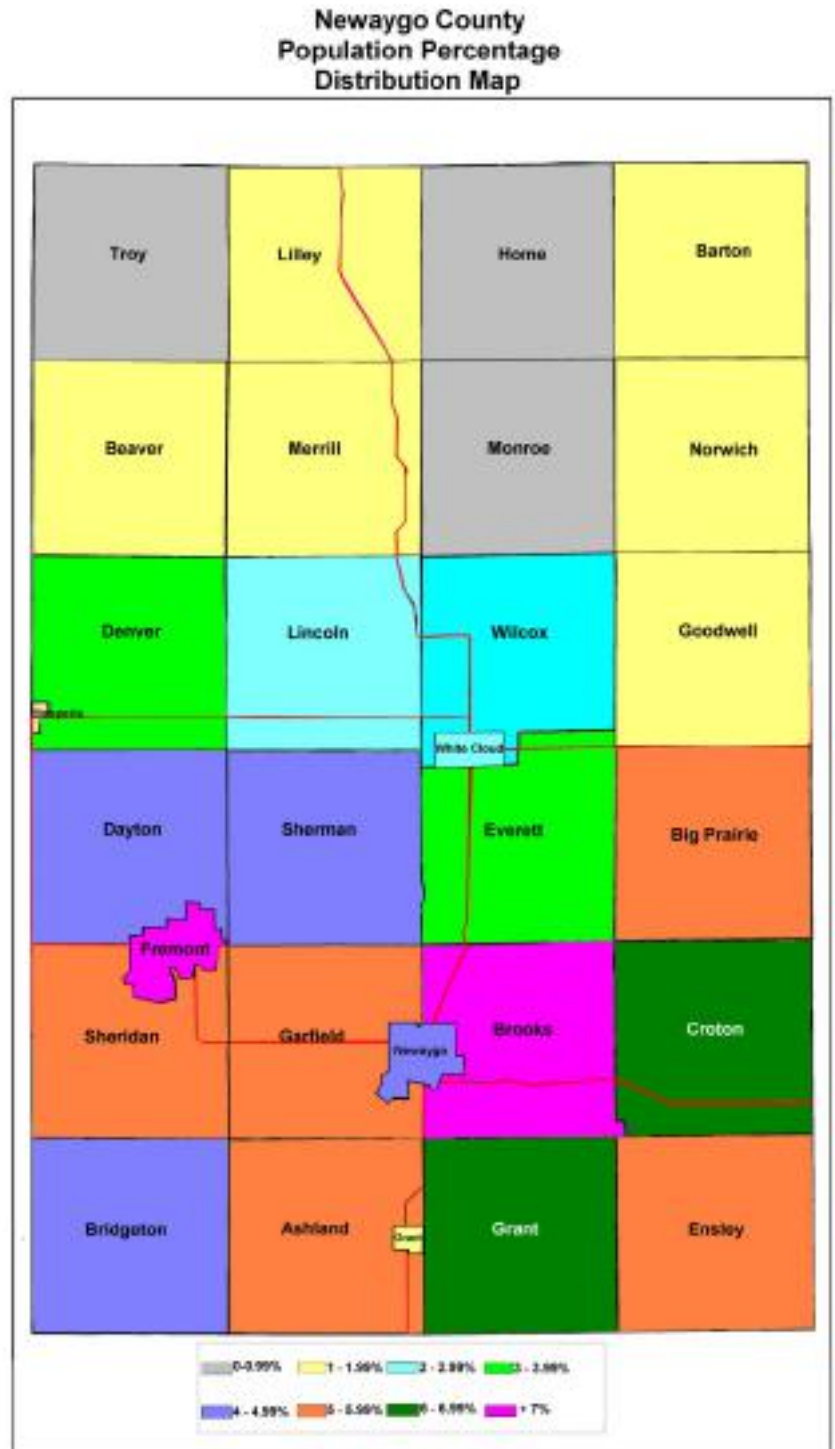
YEAR	Newaygo County		Michigan	
	Population	Percentage Change	Population	Percentage Change
1850	510			
1860	2,760	81.52%		
1870	7,294	62.16%		
1880	14,688	101.37%		
1890	20,476	29.59%		
1894	19,125	-7.06%		
1900	17,673	-8.21%	2,420,982	
1910	19,220	8.75%	2,810,173	16.08%
1920	17,378	-9.25%	3,668,412	30.54%
1930	17,029	-2.00%	4,842,325	32.00%
1940	19,286	13.25%	5,256,106	8.55%
1950	21,567	11.83%	6,371,766	21.23%
1960	24,160	12.02%	7,823,194	22.78%
1970	27,992	15.86%	8,875,083	13.45%
1980	34,917	24.74%	9,262,078	4.36%
1990	38,202	9.41%	9,295,297	0.36%
2000	47,874	25.84%	9,938,444	6.92%
2010	48,460	1.22%	9,883,640	-0.55%

Table 21, Population Distribution in Newaygo County
Sources: Raw population data taken from the 2010 U.S. Census

NEWAYGO COUNTY POPULATION DISTRIBUTION		
COMMUNITY	Population	% Population
Newaygo County	48,460	100%
City of Fremont	4,081	8.42%
City of Newaygo	1,976	4.08%
City of White Cloud	1,408	2.91%
City of Grant	894	1.84%
Village of Hesperia	954	
Ashland Township	2,773	5.72%
Barton Township	717	1.48%
Beaver Township	509	1.05%
Big Prairie Township	2,573	5.31%
Bridgeton Township	2,141	4.42%
Brooks Township	3,510	7.24%
Croton Township	3,228	6.66%
Dayton Township	1,949	4.02%
Denver Township	1,928	3.98%
Ensley Township	2,635	5.44%
Everett Township	1,862	3.84%
Garfield Township	2,537	5.24%
Goodwell Township	547	1.13%
Grant Township	3,294	6.80%
Home Township	232	0.48%
Lilley Township	797	1.64%
Lincoln Township	1,275	2.63%
Merrill Township	667	1.38%
Monroe Township	320	0.66%
Norwich Township	607	1.25%
Sheridan Township	2,510	5.18%
Sherman Township	2,109	4.35%
Troy Township	283	0.58%
Wilcox Township	1,098	2.27%

* total of cities and townships; village total
 already included with township totals

source:
 U.S. Census
 Bureau



Seasonal Population Trends

In the spring and summer months, Newaygo County experiences a significant population increase due to seasonal residences, summer youth camps, and numerous recreational activities. The following is an estimated population during the peak months. The population estimate for seasonal homes is based on the number of seasonal homes in Newaygo County times the average household size reported in the 2010 US Census. The data for the number of campsites in Newaygo County is from the District 10 Public Health Department Environmental Office. The data for the Youth Camps, Hotels, and Bed and Breakfasts are based on their total reported capacity.

	Newaygo County Population	Newaygo County % Change
2010 Census Total	48,460	
Seasonal Homes (4,885 Homes x 2.60 Persons per household)	12,701	+ 26.2%
Campsites (2,630 sites x 4 Persons per campsite)	10,520	+ 21.7%
Youth Camps 7 Camps	1,484	+ 3.1%
Hotels and Bed & Breakfasts 23 Facilities	1,024	+ 2.1%
Outdoor recreational activities (Muskegon River, Parks, and special events)		
Projected Increase	61,488	

Projected Population

Based on data from "The Economic and Demographic Outlook for Michigan through 2040" prepared by the University of Michigan Institute for Research on Labor, Employment, and the Economy for the Michigan Department of Transportation Bureau of Transportation Planning, it is projected Newaygo County will continue to grow at a faster rate than the statewide average through the year 2040.

Household Distribution

Household Distribution can influence a community's needs since the distribution often identifies unique community traits. Newaygo County has several household characteristics that may influence hazard planning. Table 20 shows the County has a higher proportion of family households than Michigan. Within the overall category of family households, Newaygo County has a higher percentage of married couples than the state, a lower proportion of female householders with no spouse and lower percentage of male householders with no spouse compared to Michigan as a whole.

Table 22: Household and Family Characteristics of Newaygo County and the State of Michigan
Source: 2010 U.S. Census

Households By Type	Newaygo County		Michigan	
	Total	Percentage	Total	Percentage
Total households	18,406	100%	3,872,508	100%
Family households (families)	13,162	71.5%	2,554,073	66%
Male Householder	9,937	54.0%	1,774,864	45.8%
Female Householder	3,225	17.5%	779,209	20.1%
Nonfamily households	5,244	28.5%	1,318,435	34.0%
Male householder	2,698	14.7%	618,903	16.0%
Living Alone	2,120	11.5%	483,093	12.5%
Female householder	2,546	13.8%	699,532	18.1%
Living Alone	2,161	11.7%	596,585	15.4%
Husband-Wife Families	10,363	100%	1,857,127	100%
With related children under 18 years	4,036	38.9%	773,630	41.7%
With own children under 18 years	3,696	35.7%	730,892	39.4%
Under 6 years only	635	6.1%	151,340	8.1%
Under 6 and 6 to 17 years	804	7.8%	150,573	8.1%
6 to 17 years only	2,257	21.8%	428,979	23.1%
Female householder, no husband present families	1,832	100%	511,583	100%
With related children under 18 years	1,194	65.2%	328,376	64.2%
With own children under 18 years	1,036	56.6%	284,562	55.6%
Under 6 years only	221	12.1%	57,710	11.3%
Under 6 and 6 to 17 years	183	10.0%	50,892	9.9%
6 to 17 years only	632	34.5%	1758,960	34.4%
Average Household size	2.60		2.49	
Average Family size	3.04		3.05	

Table 23: Household and Family Characteristics of City of Fremont and Newaygo County
Source: 2010 U.S. Census

Households By Type	City of Fremont		Newaygo County	
	Total	Percentage	Total	Percentage
Total households	1,781	100%	18,406	100%
Family households (families)	1,107	62.2%	13,162	71.5%
Male Householder	719	40.4%	9,937	54.0%
Female Householder	388	21.8%	3,225	17.5%
Nonfamily households	674	37.8%	5,244	28.5%
Male householder	238	13.4%	2,698	14.7%
Living Alone	200	11.2%	2,120	11.5%
Female householder	436	24.5%	2,546	13.8%
Living Alone	396	22.2%	2,161	11.7%
Husband-Wife Families	776	100%	10,363	100%
With related children under 18 years	286	36.9%	4,036	38.9%
With own children under 18 years	272	35.1%	3,696	35.7%
Under 6 years only	62	8.0%	635	6.1%
Under 6 and 6 to 17 years	68	8.8%	804	7.8%
6 to 17 years only	142	18.3%	2,257	21.8%
Female householder, no husband present families	263	100%	1,832	100%
With related children under 18 years	183	69.6%	1,194	65.2%
With own children under 18 years	171	65.0%	1,036	56.6%
Under 6 years only	45	17.1%	221	12.1%
Under 6 and 6 to 17 years	32	12.2%	183	10.0%
6 to 17 years only	94	35.7%	632	34.5%
Average Household size	2.27		2.60	
Average Family size	2.88		3.04	

Table 24: Household and Family Characteristics of City of Newaygo and Newaygo County
Source: 2010 U.S. Census

Households By Type	City of Newaygo		Newaygo County	
	Total	Percentage	Total	Percentage
Total households	786	100%	18,406	100%
Family households (families)	502	63.9%	13,162	71.5%
Male Householder	299	38.0%	9,937	54.0%
Female Householder	203	25.8%	3,225	17.5%
Nonfamily households	284	36.1%	5,244	28.5%
Male householder	101	12.8%	2,698	14.7%
Living Alone	77	9.8%	2,120	11.5%
Female householder	183	23.3%	2,546	13.8%
Living Alone	164	20.9%	2,161	11.7%
Husband-Wife Families	312	100%	10,363	100%
With related children under 18 years	154	49.4%	4,036	38.9%
With own children under 18 years	144	46.2%	3,696	35.7%
Under 6 years only	27	8.7%	635	6.1%
Under 6 and 6 to 17 years	37	11.9%	804	7.8%
6 to 17 years only	80	25.6%	2,257	21.8%
Female householder, no husband present families	159	100%	1,832	100%
With related children under 18 years	105	66.0%	1,194	65.2%
With own children under 18 years	99	62.3%	1,036	56.6%
Under 6 years only	31	19.5%	221	12.1%
Under 6 and 6 to 17 years	16	10.1%	183	10.0%
6 to 17 years only	52	32.7%	632	34.5%
Average Household size	2.51		2.60	
Average Family size	3.10		3.04	

Table 25: Household and Family Characteristics of City of White Cloud and Newaygo County
Source: 2010 U.S. Census

Households By Type	City of White Cloud		Newaygo County	
	Total	Percentage	Total	Percentage
Total households	467	100%	18,406	100%
Family households (families)	294	63.0%	13,162	71.5%
Male Householder	174	37.3%	9,937	54.0%
Female Householder	120	25.7%	3,225	17.5%
Nonfamily households	173	37.0%	5,244	28.5%
Male householder	71	15.2%	2,698	14.7%
Living Alone	52	11.1%	2,120	11.5%
Female householder	102	21.8%	2,546	13.8%
Living Alone	89	19.1%	2,161	11.7%
Husband-Wife Families	180	100%	10,363	100%
With related children under 18 years	77	42.8%	4,036	38.9%
With own children under 18 years	72	40.0%	3,696	35.7%
Under 6 years only	17	9.4%	635	6.1%
Under 6 and 6 to 17 years	23	12.8%	804	7.8%
6 to 17 years only	32	17.8%	2,257	21.8%
Female householder, no husband present families	86	100%	1,832	100%
With related children under 18 years	63	73.3%	1,194	65.2%
With own children under 18 years	56	65.1%	1,036	56.6%
Under 6 years only	14	16.3%	221	12.1%
Under 6 and 6 to 17 years	7	8.1%	183	10.0%
6 to 17 years only	35	40.7%	632	34.5%
Average Household size	2.59		2.60	
Average Family size	3.20		3.04	

Table 26: Household and Family Characteristics of City of Grant and Newaygo County
Source: 2010 U.S. Census

Households By Type	City of Grant		Newaygo County	
	Total	Percentage	Total	Percentage
Total households	361	100%	18,406	100%
Family households (families)	229	63.4%	13,162	71.5%
Male Householder	130	36.0%	9,937	54.0%
Female Householder	99	27.4%	3,225	17.5%
Nonfamily households	132	36.6%	5,244	28.5%
Male householder	44	12.2%	2,698	14.7%
Living Alone	33	9.1%	2,120	11.5%
Female householder	88	24.4%	2,546	13.8%
Living Alone	82	22.7%	2,161	11.7%
Husband-Wife Families	148	100%	10,363	100%
With related children under 18 years	73	49.3%	4,036	38.9%
With own children under 18 years	69	46.6%	3,696	35.7%
Under 6 years only	20	13.5%	635	6.1%
Under 6 and 6 to 17 years	13	8.8%	804	7.8%
6 to 17 years only	36	24.3%	2,257	21.8%
Female householder, no husband present families	62	100%	1,832	100%
With related children under 18 years	46	74.2%	1,194	65.2%
With own children under 18 years	41	66.1%	1,036	56.6%
Under 6 years only	12	19.4%	221	12.1%
Under 6 and 6 to 17 years	11	17.7%	183	10.0%
6 to 17 years only	18	29.0%	632	34.5%
Average Household size	2.46		2.60	
Average Family size	3.06		3.04	

Table 27: Household and Family Characteristics of Village of Hesperia and Newaygo County
Source: 2010 U.S. Census

Households By Type	Village of Hesperia		Newaygo County	
	Total	Percentage	Total	Percentage
Total households	382	100%	18,406	100%
Family households (families)	231	60.5%	13,162	71.5%
Male Householder	160	41.9%	9,937	54.0%
Female Householder	71	18.6%	3,225	17.5%
Nonfamily households	151	39.5%	5,244	28.5%
Male householder	52	13.6%	2,698	14.7%
Living Alone	45	11.8%	2,120	11.5%
Female householder	99	25.9%	2,546	13.8%
Living Alone	88	23.0%	2,161	11.7%
Husband-Wife Families	152	100%	10,363	100%
With related children under 18 years	65	42.8%	4,036	38.9%
With own children under 18 years	56	36.8%	3,696	35.7%
Under 6 years only	4	2.6%	635	6.1%
Under 6 and 6 to 17 years	14	9.2%	804	7.8%
6 to 17 years only	38	25.0%	2,257	21.8%
Female householder, no husband present families	51	100%	1,832	100%
With related children under 18 years	44	86.3%	1,194	65.2%
With own children under 18 years	37	72.5%	1,036	56.6%
Under 6 years only	14	27.5%	221	12.1%
Under 6 and 6 to 17 years	5	9.8%	183	10.0%
6 to 17 years only	18	35.3%	632	34.5%
Average Household size	2.45		2.60	
Average Family size	3.14		3.04	

Age, Gender, Racial, Non-English Speaking, Special Needs, and Educational Data

In addition to population totals, U.S. Census data provides insight into other social characteristics of our country, state, and of Newaygo County's residents. Tables 28 through 35 provide a quick snapshot of many of these characteristics. Once again, for comparison purposes, statistics for the State of Michigan are also included.

Age Distribution

Age distribution of a county can influence the types of facilities and programs within the county. Age distribution within Newaygo County closely mirrors that of the state as a whole. The median age for Newaygo County is 36 while the median age for the State of Michigan is 35. Newaygo County has a larger percentage of citizens under the age of twenty, 31.7%, compared to the State, 29.0%, and a similar percentage of citizens over the age of sixty-five, 12.8%, compared to the State, 12.3%. These statistics are important in identifying the number of special needs populations or vulnerable facilities such as schools, nursing homes, and extended care facilities within the County. Special needs populations are an important consideration in disaster planning and response due to need for additional support and assistance beyond standard care.

Table 28: Age Distribution within Newaygo County and the State of Michigan
Source: 2010 U.S. Census, American Fact Finder

AGE CATEGORY	Newaygo County		Michigan	
	Total	Percentage	Total	Percentage
	48,460		9,883,640	
Under 5 years	3,018	6.2%	596,286	6.0%
5 to 9 years	3,230	6.7%	637,784	6.5%
10 to 14 years	3,533	7.3%	675,216	6.8%
15 to 19 years	3,594	7.4%	739,599	7.5%
20 to 24 years	2,616	5.4%	669,072	6.8%
25 to 29 years	2,453	5.1%	589,583	6.0%
30 to 34 years	2,509	5.2%	574,566	5.8%
35 to 39 years	2,712	5.6%	612,493	6.2%
40 to 44 years	3,120	6.4%	665,481	6.7%
45 to 49 years	3,897	8.0%	744,581	7.5%
50 to 54 years	3,821	7.9%	765,452	7.7%
55 to 59 years	3,438	7.1%	683,186	6.9%
60 to 64 years	2,991	6.2%	568,811	5.8%
65 to 69 years	2,415	5.0%	418,625	4.2%
70 to 74 years	1,954	4.0%	306,811	5.8%
75 to 79 years	1,345	2.8%	244,085	2.0%
80 to 84 years	958	2.0%	200,855	2.0%
85 years and over	856	1.8%	191,881	1.9%
Median Age	40.9		38.9	

Gender Distribution

Most communities have a higher proportion of females since they have a longer life expectancy. According to the 2010 United States Census, In Michigan, females account for 50.9% of the population and males account for 49.1% of the population. In Newaygo County, females account for 49.7% of Newaygo County's population and males account to 50.3% of the population. Throughout Newaygo County, all cities and the Village of Hesperia have a higher female population, with the exception of the City of White Cloud which has a larger male population due to the County Jail.

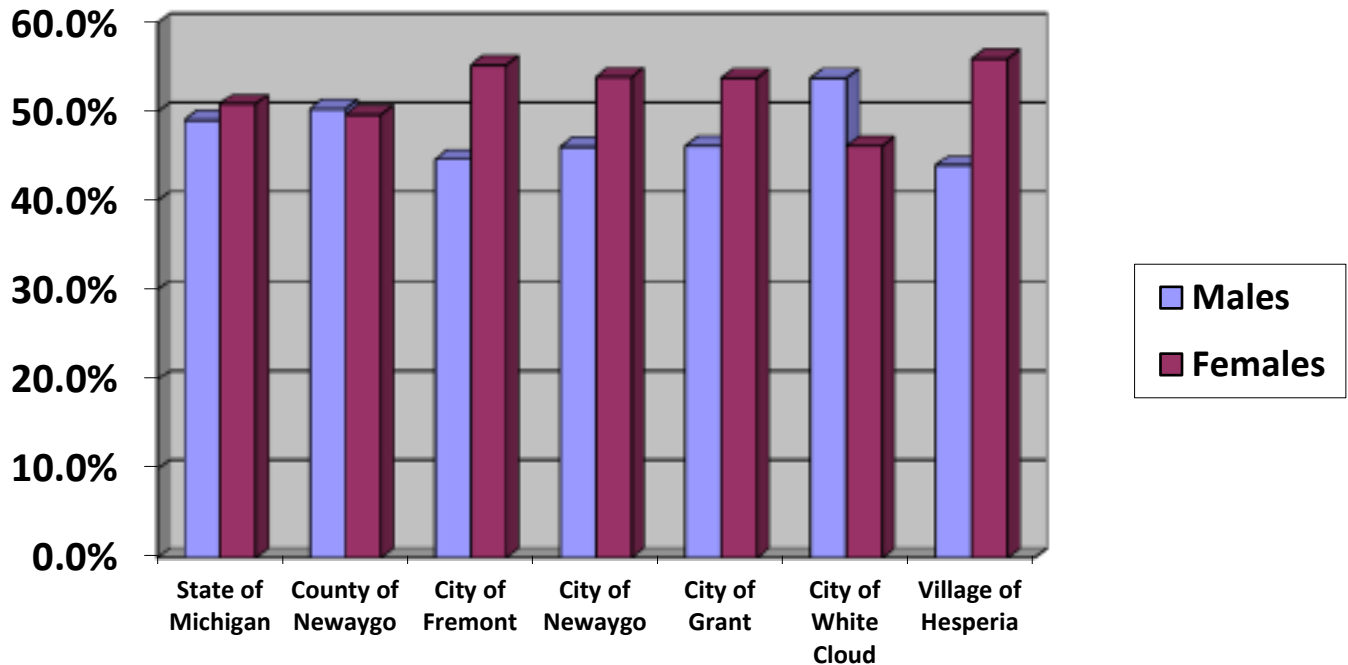


Table 29: Gender Distribution within Newaygo County and the State of Michigan
Source: 2010 U.S. Census, American Fact Finder

NEWAYGO COUNTY GENDER DISTRIBUTION				
COMMUNITY	# Males	% Total Population	# Females	% Total Population
State of Michigan	4,848,114	49.1%	5,035,526	50.9%
Newaygo County *	24,390	50.3%	24,070	49.7%
City of Fremont	1,825	44.7%	2,256	55.3%
City of Newaygo	910	46.1%	1,066	53.9%
City of White Cloud	758	53.8%	650	46.2%
City of Grant	413	46.2%	481	53.8%
Village of Hesperia	420	44.0%	534	56.0%

Racial Distribution

The racial distribution of Newaygo County is different than Michigan's distribution. Overall, Newaygo County is less diverse than the state as a whole. Newaygo County is predominantly a White Community, with a small percentage of African American, American Indian, and Asian.

Table 30: Racial Characteristics of Newaygo County and the State of Michigan
Source: 2010 U.S. Census

	Newaygo County		Michigan	
RACE	Total	Percentage	Total	Percentage
Total Population	48,460		9,883,640	
One race	47,632	98.3%	9,653,321	97.7%
White	45,625	94.1%	7,803,120	78.9%
Black or African American	495	1.0%	1,400,362	14.2%
American Indian and Alaska Native	372	0.8%	62,007	0.6%
Asian	187	0.4%	238,199	2.4%
Asian Indian	28	0.1%	77,132	0.8%
Chinese	47	0.1%	44,496	0.5%
Filipino	33	0.1%	22,047	0.2%
Japanese	11	0.0%	10,911	0.1%
Korean	23	0.0%	24,186	0.2%
Vietnamese	10	0.0%	16,787	0.2%
Other Asian ¹	35	0.1%	42,640	0.4%
Native Hawaiian and Other Pacific	11	0.0%	2,607	0.0%
Native Hawaiian	1	0.0%	753	0.0%
Guamanian or Chamorro	4	0.0%	521	0.0%
Samoan	0	0.0%	359	0.0%
Other Pacific Islander ²	6	0.0%	791	0.0%
Some other race	942	1.9%	147,029	1.3%
Two or more races	828	1.7%	230,319	2.3%

Primary Language

The primary language spoken at home is less diverse than Michigan as a whole. A higher percentage of Newaygo County households speak English at home compared to the State of Michigan. Data for Newaygo County was not collected in the 2010 census, therefore data from the 2000 census was utilized.

Primary Language Spoken at Home

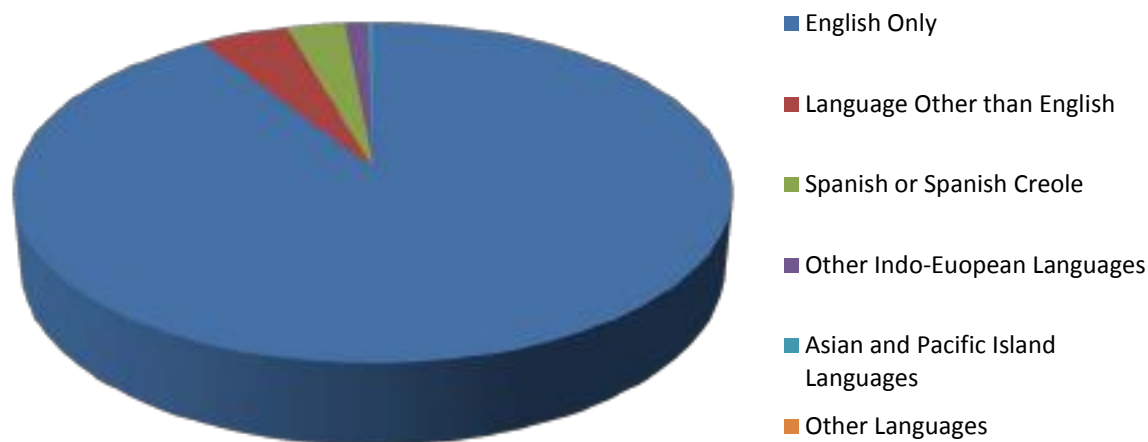


Table 31: English Speaking Households
Source: 2000 and 2010 U.S. Census

LANGUAGE SPOKEN AT HOME	Newaygo County		Michigan	
	Total	Percentage	Total	Percentage
Population 5 years and over	44,614	100%	9,305,604	96.8%
English only	42,488	95.2%	8,477,438	91.1%
Language other than English	2,126	4.8%	828,202	8.9%
Speak English less than 'very well	785	1.8%	298,153	36.0%
Spanish or Spanish Creole	1,418	3.2%	266,659	2.9%
Speak English less than "very well"	536	1.2%	99,197	37.2%
Other Indo-European languages	570	1.3%	277,618	3.0%
Speak English less than "very well"	172	0.4%	81,620	29.4%
Asian and Pacific Island languages	118	0.3%	133,973	1.4%
Speak English less than "very well"	70	0.2%	58,397	43.6%
Other Languages			148,942	1.6%
Speak English less than "very well"			58,683	39.4%

Physical Disabilities

Special needs populations or individuals with physical disabilities can require additional assistance in the event of certain emergencies such as power outages or severe weather. Compared to the State of Michigan, Newaygo County has a higher percentage of people with a physical disability.

*Table 32: Population with Physical Disabilities
Source: 2010 US Census of Population*

	Newaygo County			Michigan		
	Total	With a Disability	Percent	Total	With a Disability	Percent
Total civilian non-institutionalized Population	47,900	8,186	17.1%	9,790,070	1,308,397	13.4%
Population under 5 Years	3,041	88	2.9%	603,086	4,324	0.7%
With a hearing difficulty		39	1.3%		2,536	0.4%
With a vision difficulty		67	2.2%		2,450	0.4%
Population 5 to 17 Years	9,182	863	9.4%	1,767,900	110,408	6.2%
With a hearing difficulty		84	0.9%		12,464	0.7%
With a vision difficulty		223	2.4%		13,954	0.8%
With a cogitative difficulty		641	7.0%		87,782	5.0%
With an ambulatory difficulty		22	0.2%		11,993	0.7%
With a self care difficulty		84	0.9%		16,903	1.0%
Population 18 to 64 Years	28,497	4,384	15.4%	6,116,348	706,577	11.6%
With a hearing difficulty		1,263	4.4%		139,393	2.3%
With a vision difficulty		612	2.1%		108,330	1.8%
With a cogitative difficulty		1,903	6.7%		304,685	5.0%
With an ambulatory difficulty		2,245	7.9%		360,804	5.9%
With a self care difficulty		726	2.5%		133,872	2.2%
With an independent living difficulty		1,575	5.5%		263,123	4.3%
Population 65 years and over	7,180	2,851	39.7%	1,302,736	284,088	37.4%
With a hearing difficulty		1,533	21.4%		207,241	15.9%
With a vision difficulty		594	8.3%		82,493	6.3%
With a cogitative difficulty		697	9.7%		124,106	9.5%
With an ambulatory difficulty		1,713	23.9%		305,953	23.5%
With a self care difficulty		562	7.8%		109,123	8.4%
With an independent living difficulty		1,011	14.1%		212,508	16.3%

Education

Educational attainment is important for several reasons, many of which lead to quality of life issues. Newaygo County has a slightly higher population 3 years and over enrolled in school.

Table 33: School Enrollment, Newaygo County and the State of Michigan
Source: 2010 U.S. Census, 2008 – 2010 American Community Survey 3 Year Estimates

	Newaygo County			Michigan		
SCHOOL ENROLLMENT	Total	Public	Private	Total	Public	Private
Population 3 years and over enrolled in school	11,941	87.0%	13.0%	2,737,830	86.7%	13.3%
Nursery school, preschool	858	88.3%	11.7%	149,336	65.7%	34.3%
Kindergarten	694	93.7%	6.3%	130,865	88.1%	11.9%
Elementary School (grades 1-4)	2,555	89.0%	11.0%	515,725	89.2%	10.8%
Elementary School (grades 5-8)	2,893	91.4%	8.6%	544,035	90.1%	9.9%
High School (grades 9-12)	3,138	90.5%	9.5%	598,414	91.7%	8.3%
College, Undergraduate	1,563	68.3%	31.7%	669,881	83.8%	16.2%
Graduate, Professional School	240	64.2%	35.8%	129,574	76.0%	24.0%

Newaygo County School Districts Enrollment

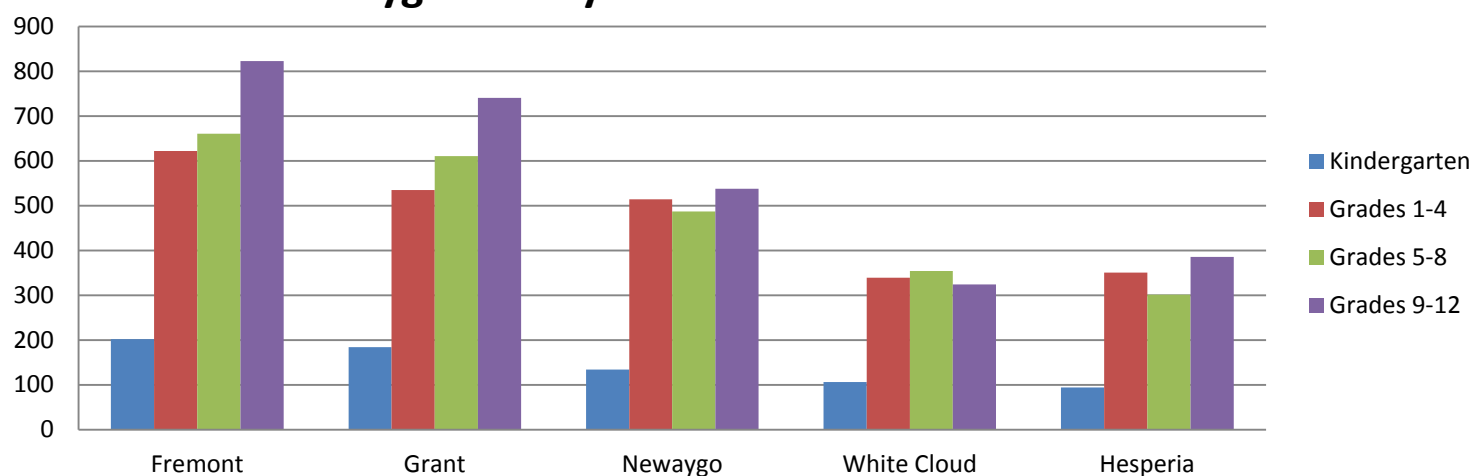
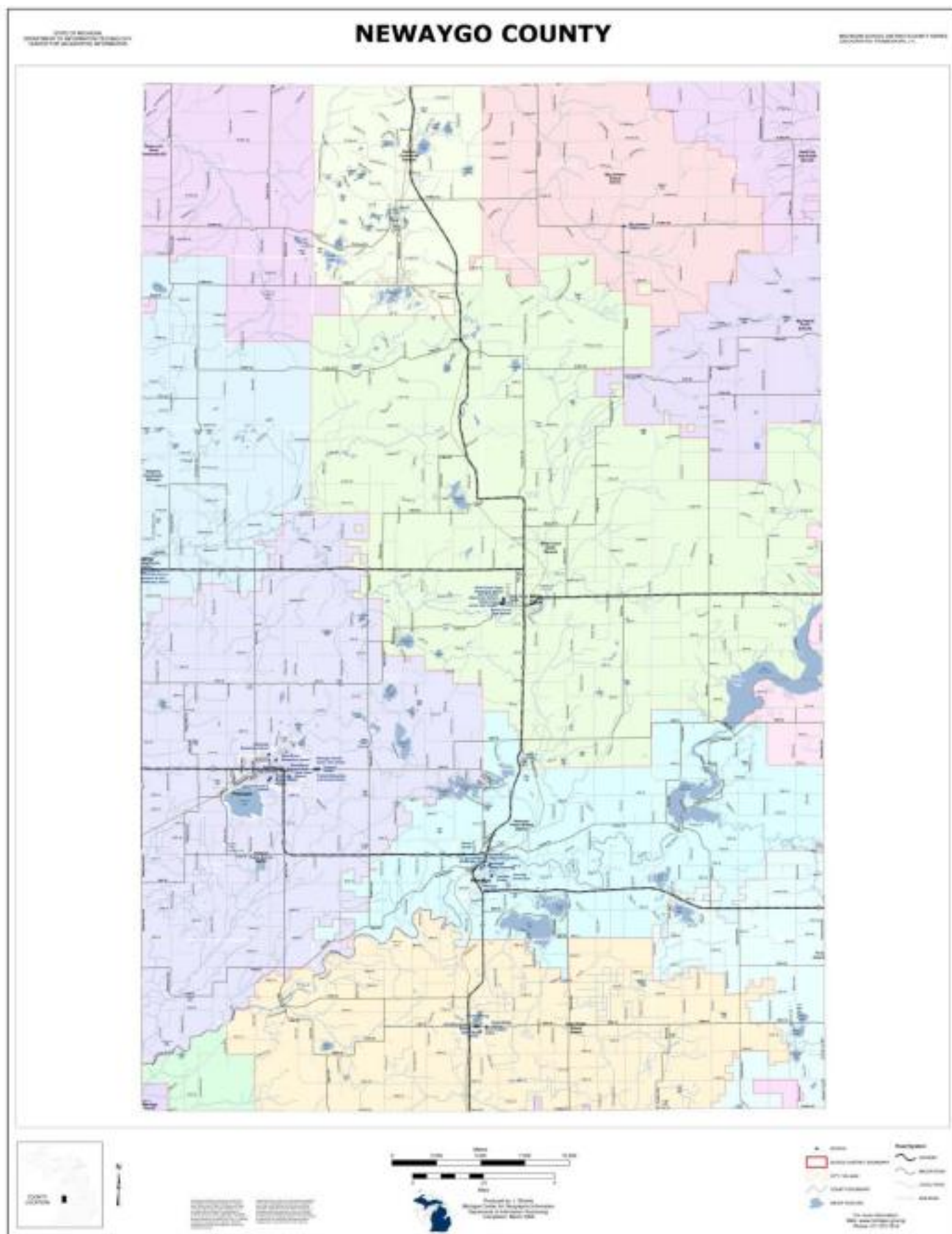


Table 34: Newaygo County School Districts Enrollment
Source: MI School Data from the Michigan Department of Education 2011-2012 School Year

	Newaygo County					
SCHOOL ENROLLMENT	Fremont	Grant	Newaygo	White Cloud	Hesperia	Big Jackson
Population enrolled in school	2,308	2,071	1,718	1,123	1,132	38
Kindergarten	202	184	134	106	94	
Elementary School (grades 1-4)	622	535	514	339	351	
Elementary School (grades 5-8)	661	611	487	354	301	
High School (grades 9-12)	823	741	583	324	386	



In Newaygo County in 2000, there was 10.6% of the population 18 and over enrolled in College or Graduate School. In 2010, there was 4.9% of the population 18 and over enrolled in College or Graduate School. The percentage of the population enrolled in College or Graduate School is low due to several contributing factors. First, there are seven universities located within two hour of Newaygo County. These Universities offer a wide variety of two-four year degrees as well as Master's and Doctorate Degrees.

University Name	Location	Type
Cornerstone University	Grand Rapids, Michigan	Private
Central Michigan University	Mount Pleasant, Michigan	Public
Ferris State University	Big Rapids, Michigan	Public
Grand Valley State University	Allendale, Michigan	Public
Michigan State University	East Lansing, Michigan	Public
Western Michigan University	Kalamazoo, Michigan	Public
Davenport University	Grand Rapids, Michigan	Private

In addition, Newaygo County is also within two hours of eighteen Colleges and Community Colleges.

College Name	Location	Type
Alma College	Alma, Michigan	Private
Aquinas College	Grand Rapids, Michigan	Private
Calvin College	Grand Rapids, Michigan	Private
Hope College	Holland, Michigan	Private
Kalamazoo College	Kalamazoo, Michigan	Private
Baker College	Muskegon, Michigan	Private
Grace Bible College	Grand Rapids, Michigan	Private
Great Lakes Christian College	Lansing, Michigan	Private
Kuyper College	Grand Rapids, Michigan	Private
Grand Rapids Community College	Grand Rapids, Michigan	Public
Kalamazoo Valley Community College	Kalamazoo, Michigan	Public
Kellogg Community College	Grand Rapids, Michigan	Public
Lansing Community College	Lansing, Michigan	Public
Mid Michigan Community College	Harrison, Michigan	Public
Montcalm Community College	Sidney, Michigan	Public
Muskegon Community College	Muskegon, Michigan	Public
North Western Community College	Traverse City, Michigan	Public
West Shore Community College	Ludington, Michigan	Public

Many of the Colleges and all of the Universities offer student housing in dorms and apartment complexes. Due to being at school for an extended period of time, many students often change their residency to the city when they are going to school, decreasing the population enrolled in College or Graduate School in areas that do not have large educational facilities with housing.

A review of data from the 2010 United States Census shows that Newaygo County has a slightly higher percentage of high school graduates than the State of Michigan but a lower percentage of population has higher education (Some college with no degree, Associate's Degree, Bachelor's Degree, or a graduate or professional degree).

Table 35: Educational Attainment, Newaygo County and the State of Michigan
Source: 2010 U.S. Census, 2008 – 2010 American Community Survey 3 Year Estimates

	Newaygo County		Michigan	
EDUCATIONAL ATTAINMENT	Total	Percentage	Total	Percentage
Population 18 to 24	3,842	100%	973,162	100%
Less than high school graduate	1,099	28.6%	150,840	15.5%
High School graduate or GED	1,541	40.1%	276,378	28.4%
Some college or associate's degree	1,076	28.0%	467,118	48.0%
Bachelor's degree or higher	126	3.3%	77,853	8.0%
Population 25 years and over	32,667	100%	6,560,571	100%
Less than 9 th grade	1,241	3.8%	236,180	3.6%
9 th to 12 th grade, no diploma	3,528	10.8%	531,406	8.1%
High School Graduate or GED	12,936	39.6%	2,033,777	31.0%
Some college, no degree	8,101	24.8%	1,587,658	24.2%
Associate's Degree	2,515	7.7%	537,967	8.2%
Bachelor's Degree	2,744	8.4%	1,016,888	15.5%
Graduate or Professional Degree	1,568	4.8%	629,815	9.6%
Percent High School graduate or higher		85.4%		88.4%
Percent bachelor's degree or higher		13.3%		25.0%

Economic Characteristics

Current and Projected Economic Activity

Data from the US Census Economic Characteristics, Census of Agriculture, and Newaygo County Economic Development office were used to describe Newaygo County's current and projected economy. Newaygo County is unique in that it has both an agricultural and manufacturing economic base, and employment in the county's retail sector is increasing.

Employment Sectors and Major Employers

County Business Patterns, published by the U.S. Census Bureau, provide a snapshot view of the employment pattern within a community. As stated earlier, it is important to remember that County Business Patterns do not account for self-employed individuals, railroad employees, many governmental employees, and probably most important in Newaygo County's situation, agricultural production employees.

*Table 36: 2010 Employment Status in Newaygo County compared to the State of Michigan
Source: 2008 – 2010 American Community Survey, and 2011 American Community Survey*

	Newaygo County		Michigan	
EMPLOYMENT INDUSTRY	Estimated number employed	Percentage	Estimated number employed	Percentage
Civilian employed population 16 years and over	19,039	100%	4,191,878	100%
Agriculture, forestry, fishing, hunting, and mining	1,077	5.7%	56,829	1.4%
Construction	1,399	7.3%	194,973	4.7%
Manufacturing	3,595	18.9%	712,636	17.0%
Wholesale Trade	386	2.0%	103,602	2.5%
Retail Trade	2,186	11.5%	494,540	11.8%
Transportation and warehousing and utilities	1,223	6.4%	173,714	4.1%
Information	271	1.4%	65,919	1.6%
Finance and insurance, and real estate and rental leasing	1,001	5.3%	221,325	5.3%
Professional, scientific, and management, and administrative, and waste management services	1,166	6.1%	381,172	9.1%
Educational services, and health care and social assistance	3,591	18.9%	1,023,530	24.4%
Arts, entertainment, and recreation, and accommodation, and food services	1,297	6.8%	400,644	9.6%
Other services, except public administration	1,165	6.1%	206,364	4.9%
Public Administration	682	3.6%	156,630	3.7%

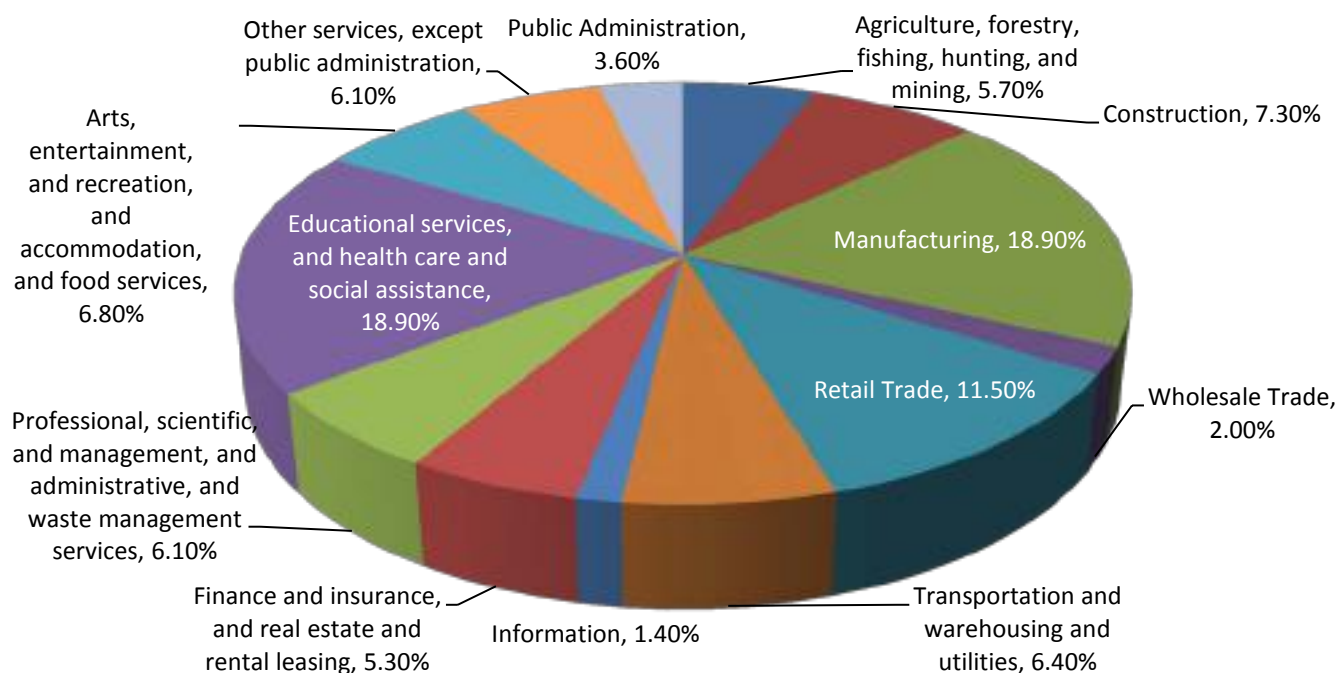


Table 37: 2010 County Business Patterns – Newaygo County
Source: 2010 US Census Economic Characteristics

	Newaygo County	
INDUSTRY	Number of Establishments	Number of Paid Employees
Total for all sectors	816	8,705
Agriculture, forestry, fishing and hunting, and mining	8	20 - 99
Mining, quarrying, and oil and gas extrication	1	0 - 19
Utilities	4	20 - 99
Construction	84	232
Manufacturing	40	1 778
Wholesale Trade	36	242
Retail Trade	147	1,459
Transportation and warehousing	14	100 - 249
Information	7	20 - 99
Finance and insurance	40	625
Real estate and rental and leasing	22	66
Professional, scientific, and technical services	56	358
Management of companies and enterprises	3	100 - 249
Administrative and support and waste management and remediation services	33	322
Educational Services	4	38
Health care and social assistance	78	1,663
Arts, entertainment, and recreation	10	20 - 99
Accommodation and food services	80	866
Other services (except public administration)	123	515
Industries not classified	26	20 - 99

Major Employers

Newaygo County has limited major employers throughout the county. All major employers are located within the Cities of Fremont, Grant, Newaygo, and White Cloud. A majority of the employers within the county are under 100 employees.

Table 38, Newaygo County Employers with Over 100 Employees

Source: Michigan Works! West Central 2012

Company	Location	Approximate # Of Employees	Product/Service
Gerber Products Company	Fremont	1,200	Baby Food
Magna Mirrors	Newaygo	550	Automotive doors and mirrors
Spectrum Health Gerber Memorial	Fremont	550	Health Care Services
Dura Automotive Systems, Inc	Fremont	375	Metal Stampings and Assemblies
Fremont Public Schools	Fremont	275	School/Education
Grant Public Schools	Grant	297	School/Education
County of Newaygo	White Cloud	247	County Government
Newaygo Public Schools	Newaygo	200	School/Education
Gerber Life Insurance Company	Fremont	200	Life Insurance
Wal-Mart	Fremont	195	Retail Department Store
Family Health Care	Grant and White Cloud	137	Health Care Services
North American Refractory	White Cloud	125	Refractory Products/Furnace Linings
Pine Medical Group	Fremont	110	Health Care Services
Transitional Health Services	Fremont	105	Health Care Services

Unemployment Data

Newaygo County has historically experienced a higher unemployment rate than the State of Michigan. These facts are illustrated in Table 39, Newaygo County Employment Statistics, 2002-2011.

Table 39: Newaygo County Employment Statistics, Annual Jobless Rate 2002-2011

Sources: Michigan Department of Energy, Labor, and Economic Growth, Labor Market Information Data Explorer

Unemployment Rate	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Newaygo County	7.9%	8.8%	7.9%	7.4%	7.1%	7.8%	9.0%	13.6%	12.7%	10.3%
Michigan	6.2%	7.1%	7.1%	6.8%	6.9%	7.1%	8.3%	13.4%	12.7%	10.3%

Agriculture

According to the 2007 Census of Agriculture, Newaygo County is ranked within the top 25 counties within the state for total market value of agriculture products sold. In addition, Newaygo County is ranked within the top 10 for Value of livestock, poultry, and their products, vegetables, melons, potatoes, and sweet potatoes, cut Christmas trees and short rotation woody crops, horses, ponies, mules, burros, and donkeys, and corn for silage. In addition, Newaygo County is ranked number 1 for Deer.

*Table 40: Newaygo County Farming Facts- Ranking
Source: 2007 Census of Agriculture County Profile*

ITEM	Quantity	State Rank
Market Value of Agricultural Products Sold (\$1,000)		
Total Value of Agriculture Products Sold	101,170	21
Value of Crops including Nursery and greenhouse	31,741	34
Value of Livestock, poultry, and their products	69,429	8
Value of Sales by Commodity Group (\$1,000)		
Grains, oilseeds, dry beans, and dry peas	6,635	38
Tobacco	-	-
Cotton and Cotton Seed	-	-
Vegetables, Melons, Potatoes, and sweet potatoes	13,839	8
Fruits, tree nuts, and berries	5,105	12
Nursery, greenhouse, floriculture, and sod	2,682	26
Cut Christmas Trees and short rotation woody crops	(D)	5
Other crops and hay	(D)	(D)
Poultry and eggs (Turkeys)	2,934	9
Cattle and Calves	10,785	11
Milk and other dairy products from cows	51,901	8
Hogs and pigs	1,985	22
Sheep, goats, and their products	(D)	11
Horses, ponies, mules, burros, and donkeys	710	10
Aquaculture	(D)	11
Other animals and other animal products	788	8
Top Livestock inventory items		
Turkeys	(D)	6
Cattle and Calves	27,275	10
Hogs and Pigs	6,104	26
Deer	3,625	1
Layers	2,790	30
Top Crop Items (Acres)		
Forage – land used for all hay and haylage, grass silage, and greenchop	28,079	9
Corn for Grain	20,895	34
Corn for Silage	10,328	8
Vegetables Harvested for Sale	6,574	10
Soybeans for Beans	3,592	39

Table 41: Newaygo County Farming Facts Economic Characteristics
Source: 2007 Census of Agriculture County Profile

Economic Characteristics	Quantity
Farms by Value of Sales	Total
Less than \$1,000	313
\$1,000 to \$2,499	109
\$2,500 to \$4,999	100
\$5,000 to \$9,999	111
\$10,000 to \$19,999	91
\$20,000 to \$24,999	22
\$25,000 to \$39,999	31
\$40,000 to 49,999	13
\$50,000 to \$99,999	41
\$100,000 to \$249,999	57
\$250,000 to \$499,999	14
\$500,000 or more	49
Total Farm Production Expenditures (\$1,000)	80,097
Average Per farm (\$)	84,224
Net Cash Farm Income of Operation (\$1,000)	24,796
Net Average per farm (\$)	26,074

Table 42: Newaygo County Farming Facts Operator Characteristics
Source: 2007 Census of Agriculture County Profile

Operator Characteristics	Quantity
Principal operators by primary occupation:	951
Farming:	391
Other:	560
Principal Operators by Gender:	
Male	826
Female	125
Average Age of Principal Operator in Years	54.9
All Operators by Race	
White	1,391
Black or African American	2
American Indian or Alaska Native	12
Native Hawaiian or other Pacific Islander	-
Asian	1
More than One Race	7
All operators of Spanish, Hispanic, or Latino Origin	15

Socio-Economic Levels

Socio-Economic statistics such as median household income, per capita income, and the number of individuals living below poverty level all indicate that Newaygo County closely resembles the State of Michigan. In 2010, Newaygo County's Median Household Income was \$40,874, which is slightly lower than Michigan's Median Household Income of \$46,847. The County also has a lower per capita income than the State. In addition, the percentage of residents below the poverty level in the County, 19.5% is higher than Michigan's rate of 16.7%. Table 43, Socio-Economic Levels provides both Newaygo County data, and for comparison purposes, data for the State of Michigan as a whole.

Table 43: Socio-Economic Levels, Newaygo County and Michigan
Source: 2010 U.S. Census

	Newaygo County		Michigan	
INCOME IN 2010	Total	Percentage	Total	Percentage
Households	18,692	100%	3,803,957	100%
Less than \$10,000	1,568	8.4%	316,593	8.3%
\$10,000 to \$14,999	1,378	7.4%	228,217	6.0%
\$15,000 to \$24,999	3,032	16.2%	462,501	12.2%
\$25,000 to \$34,999	2,233	11.9%	430,994	11.3%
\$35,000 to \$49,999	2,931	15.7%	565,538	14.9%
\$50,000 to \$74,999	3,851	20.6%	710,581	18.7%
\$75,000 to \$99,999	1,902	10.2%	444,684	11.7%
\$100,000 to \$149,999	1,034	5.5%	411,284	10.8%
\$150,000 to \$199,999	401	2.1%	130,037	3.4%
\$200,000 or more	362	1.9%	103,847	2.7%
Median household income (dollars)	\$40,874		\$46,847	
Per Capita Income	\$20,161		\$24,624	
Percentage of all people whose income in the past 12 months is below the poverty level	19.5%		16.7%	

Key Community Facilities and Organizations

Key Private and Non-Profit Service Organizations

In Newaygo County there are 182 registered non-profit organizations, many of which may prove to be beneficial in both the mitigation and recovery phases of disaster response. In addition, due to consolidation of services, some organizations serve a multi-county geographic area and are located outside of Newaygo County. Table 44, Key Private and Non-Profit Service Organizations Serving Newaygo County lists some of primary organizations benefiting the entire county.

Table 44, Key Private and Non-Profit Service Organizations Serving Newaygo County

Organization & Location	Primary Focus
American Red Cross Muskegon Office 313 West Webster Avenue Muskegon, MI 49440 Phone: (231) 726-3555 Phone: (800) 813-8111 Fax: (231) 722-4126 Website: http://www.arcmon.org	The American Red Cross is a humanitarian organization, led by volunteers, that provides relief to victims of disaster and helps people prevent, prepare for, and respond to emergencies. It does this through services that are consistent with its Congressional Charter and the Fundamental Principles of the International Red Cross and Red Crescent Movement. The American Red Cross is the foremost volunteer emergency service organization in the United States, with more than 1,300 chapters nationwide, 38 Blood Services regions, 18 Tissue Services centers, plus hundreds of stations on U.S. military installations around the world.
Salvation Army 1215 Fulton Street E Grand Rapids, MI 49503 Phone: (616) 459-3433 Fax: (616) 356-1009 Website: http://www.sawmni.org	The Salvation Army is an international non-profit church based organization that houses programs such as youth programs, missing persons, emergency disaster relief, adult rehabilitation, elderly services, utility assistance, and donations centers.
Commission on Aging 93 Gibbs Street, PO Box 885 White Cloud, MI 49349 Phone: (231) 689-2100 Fax: (231) 689-0871 Website: http://www.countyofnewaygo.com/COA/COAHome.htm	The mission of the Commission on Aging is to address critical needs of the Newaygo County elderly (age 60 and older) and to make their lives more comfortable, more meaningful, and to make every attempt to assist them in remaining in their homes as long as possible. Services provided include adult day care, older adult respite services, health and wellness, homemaker, home repair, meals, Medicare and Medicaid Assistance Program, transportation, and information.
TrueNorth Community Services 6308 S Warner Ave, PO Box 149 Fremont, MI 49412 Phone: (231) 924-0641 Fax: (231) 924-5594 Website: http://www.truenorthservices.org	TrueNorth Community Services is a private, nonprofit organization supported through individual donations, foundations and grants, and funding from the federal government and the State of Michigan. A majority of their programs are available to Newaygo County residents only but direct or fiduciary support is also provided to a total of 15 Michigan counties. TrueNorth Community Services offer more than 60 comprehensive programs and services that fall within four core areas of focus including addressing rural poverty, ensuring youth thrive, building vibrant communities, and providing innovative rural nonprofit leadership.

<p>Fremont Area Community Foundation 4424 W 48th Street, PO Box B Fremont MI 49412 Phone: (231) 924-5350 Fax: (231) 924-5391 Website: http://www.tfacf.org</p>	<p>The Fremont Area Community Foundation is a public charity and community foundation serving the Newaygo County, Michigan area. The mission of the Foundation is to improve the quality of life for the people of Newaygo County. Since 1972, the Foundation has received \$60 million in gifts and made \$166 million in grants to benefit the Newaygo County area, a 276% return on donors' gifts. The net value of the Foundation's endowment funds was \$171 million as of December 2009.</p>
<p>Love Inc of Newaygo County 11 W 96th Street Grant, MI 49327 Phone: (231) 652-4099 Fax: (231) 652-4079 Website: http://www.loveincnewaygo.com</p>	<p>Love INC is a national ministry carried out by more than 9,000 churches in over 150 affiliates across the United States. Love INC reaches out to vulnerable community members living in poverty and provides tangible assistance, encouragement, and hope. Services include money management classes, resale store, food pantry, delivery truck, ramp ministry, and the Clearinghouse.</p>
<p>Newaygo County Community Development 1087 Newell Street, PO Box 885 White Cloud, MI 49349 Phone: (231) 689-7091 Fax: (231) 689-7087 Website: http://www.countyofnewaygo.com/commdevelopment.aspx</p>	<p>Community Development is a department of Newaygo County Government responsible for planning and implementing housing programs to improve and preserve the County's existing housing. It is the goal to provide a safer, healthier home environment for homeowners in Newaygo County. The housing programs are funded through federal, state, and local resources. Community Development also offers funds for Homeowner Rehabilitation and Emergency Repair as low interest loans and grants.</p>
<p>Newaygo County Community Emergency Response Team and Medical Reserve Corps 306 North Street, PO Box 885 White Cloud, MI 49349 Phone: (231) 689-7354 Fax: (231) 689-7305 Website: http://www.countyofnewaygo.com/emergencyservices.aspx</p>	<p>The CERT and MRC programs are partner programs with Citizen Corps, a national network of volunteers dedicated to ensuring hometown security. The Community Emergency Response Team (CERT) Program educates people about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills. The Medical Reserve Corps (MRC) Program coordinates the skills of practicing and retired physicians, nurses and other health professionals as well as other citizens interested in health issues, who are eager to volunteer to address their community's ongoing public health needs and to help their community during large-scale emergency situations. Both volunteer programs are managed by the Newaygo County Emergency Services Department.</p>
<p>Bellwether Harbor 7645 West 48th Street Fremont, MI 49412 Phone: (231) 924-9230 Fax: (231) 924-2012 Website: http://www.bellwetherharbor.org</p>	<p>Bellwether Harbor is a non-profit organization helping animals and people make a connection through education, training, and adoption.</p>

Lake Haven Rescue 551 Pickerel Lake Drive Newaygo, MI 49337 Phone: (231) 652-7507 Website: http://www.lakehavenrescue.org	Lake haven is an all-volunteer private, non-profit animal rescue shelter dedicated to the care and adoption of homeless and or injured dogs, cats, kittens, and puppies in the West Michigan Area. Services include animal rescue, necessary medical care, temporary shelter, adoption, and low-cost spay/neuter program.
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Public Safety Serving Newaygo County

Like most rural communities with limited resources, Newaygo County has adapted its public safety systems to meet local needs. The existing strength of local public safety has been a focus toward advancement of services provided to the public, resulting in progressive and advanced capabilities compared to jurisdictions of comparable size.

Emergency Services

The purpose of the Emergency Services Department is to direct the jurisdiction's efforts in the prevention of, preparedness for, response to, and recovery from emergencies, disasters, and threats within the County of Newaygo with the goal of saving lives, preventing property damage, and minimizing damage to the environment. In January of 2007, Newaygo County Emergency Services began a dedicated, full-time emergency management program. Under direction of the Chairperson of the Newaygo County Board of Commissioners, the Emergency Services Department provides support to the jurisdiction's emergency services system by coordinating necessary planning, training, exercising, and resource management.

Newaygo County Emergency Services Department 306 S North Street, PO Box 885, White Cloud, MI 49349 Phone: (231) 689-7354 Fax: (231) 689-7305 Website: http://www.countyofnewaygo.com/emercencyservices.aspx
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Central Dispatch

Newaygo County Central Dispatch is the central point of contact for all public warning and responder communications within Newaygo County. All County emergency response agencies are served by Newaygo County Central Dispatch, which has been a great benefit to mutual aid ventures within the County.

Newaygo County Central Dispatch 1018 Newell Street, PO Box 885, White Cloud, MI 49349 Phone: (231) 689-5288 Fax: (231) 689-7348 Website: http://www.countyofnewaygo.com/dispatch
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Law Enforcement

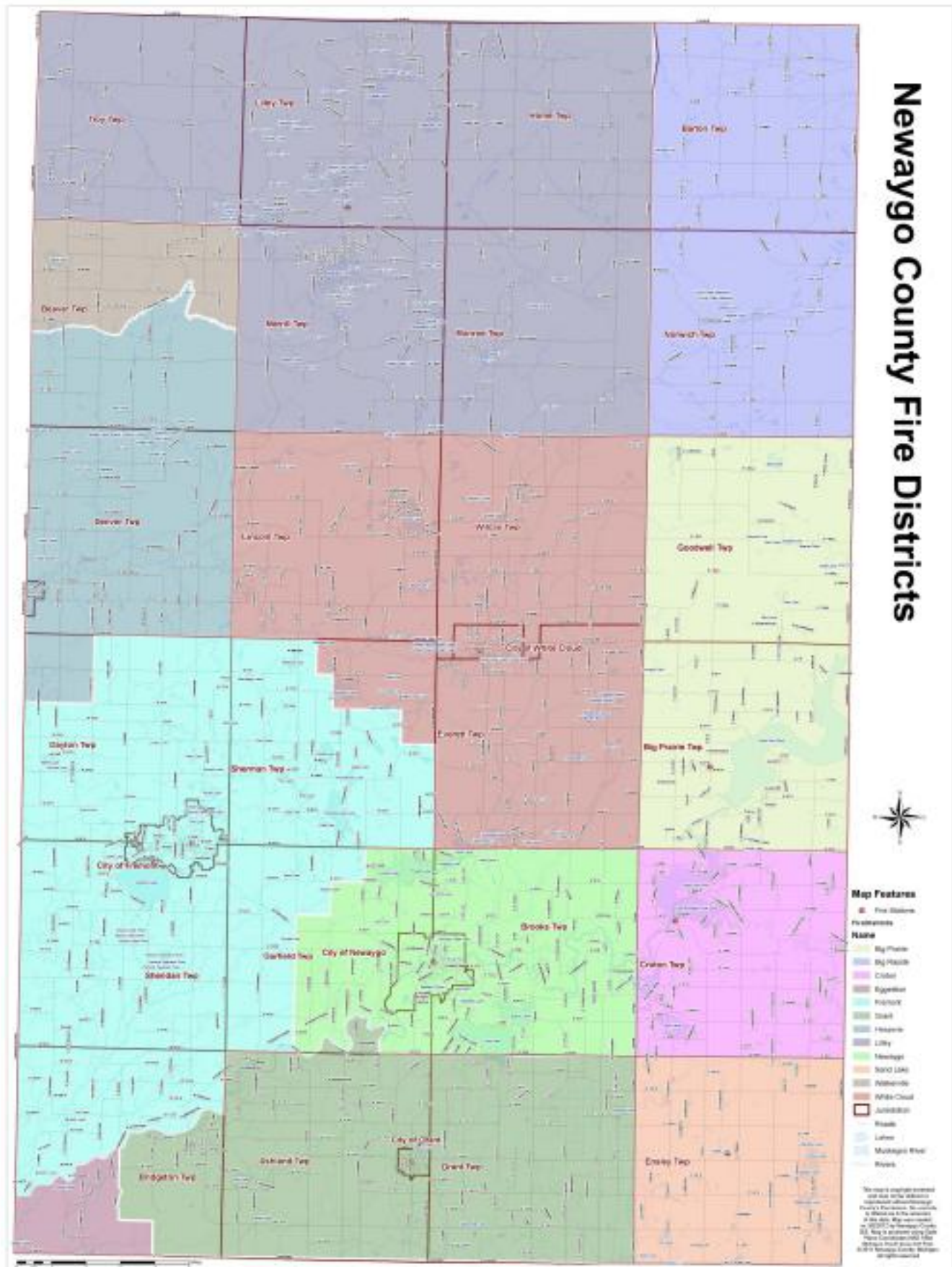
Newaygo County is served entirely by both, the Newaygo County Sheriff's Department and Michigan State Police Post 62. Their efforts are supported by 5 municipal police departments serving the communities of Fremont, Grant, Newaygo, White Cloud, and Hesperia.

Michigan State Police – Hart Post No. 62 3793 W Polk Road, Hart, MI 49420 Phone: (231) 873-2171 Fax: (231) 8737700 Website: http://www.michigan.gov/msp
Newaygo County Sheriff Department 1035 James Street, White Cloud, MI 49349 Phone: (231) 689-6623 Fax: (231) 689-7273 Website: http://www.countyofnewaygo.com/Sheriff
City of Fremont Police Department 101 E Main Street, Fremont, MI 49413 Phone: (231) 924-2100 Fax: (231) 924-2400 Website: http://www.cityoffremont.net/web/police.htm
City of Newaygo Police Department 28 State Road, PO Box 308, Newaygo, MI 49337 Phone: (231) 652-1655 Fax: (231) 652-6589 Website: http://www.newaygocity.org/index.php/government/94
City of Grant Police Department 280 South Maple St, PO Box 435, Grant, MI 49327 Phone: (231) 834-7212 Fax: (231) 834-9288 Website: http://www.cityofgrantmi.com/policedept.html
City of White Cloud Police Department 12 S Charles Street, White Cloud, MI 49349 Phone: (231) 689-1696 Fax: (231) 689-2001 Website: http://www.cityofwhitecloud.org
Hesperia Police Department 33 E Michigan St, PO Box 366, Hesperia, MI 49421 Phone: (231) 854-6205 Fax: (231) 854-0263 Website: http://www.hesperiami.com/police.htm

Fire Services

Newaygo County is served by twelve volunteer Fire Departments. Capabilities among departments are similar in provision of fire suppression and technical rescue capabilities. Due to limited manpower and equipment, all departments have an existing mutual aid system which is regularly utilized.

Station 11: Fremont Fire Department 101 E Main Street Fremont, MI 49412 Phone: (231) 924-2103 Fax: (231) 924-2015	Station 12: Newaygo Fire Department 177 Cooperative Dr, PO Box 243 Newaygo, MI 49337 Phone: (231) 652-7788 Fax: (231) 652-7077
Station 13: Ashland Grant Fire Department 62 W State Road, PO Box 422 Grant, MI 49327 Phone: (231) 834-5733 Fax: (231) 652-5753	Station 14: Croton Fire Department 6431 S Elm Ave Newaygo, MI 49337 Phone: (231) 652-3757 Fax: (231) 652-3750
Station 15: Big Prairie Fire Department 2815 S Elm Ave White Cloud, MI 49349 Phone: (231) 689-1494 Fax: (231) 652-5518	Station 17: Lilley Township Fire Department 10730 Prospect Ave Bitely, MI 49309 Phone: (231) 745-4741 Fax: (231) 745-4741
Station 18: White Cloud Area Fire Department 1020 Wilcox Street, PO Box 911 White Cloud, MI 49349 Phone: (231) 689-6830 Fax: (866) 866-0611	Station 19: Hesperia Fire Department 8320 E M 20 Hesperia, MI 49421 Phone: (231) 854-3965 Fax: (231) 854-9539
Walkerville Fire Department (Oceana County) 134 S East Street Walkerville, MI 49459 Phone: (231) 873-4540 Fax: (231) 873-7088	Sand Lake Fire Department (Kent County) 2 Maple Street Sand Lake, MI 49343 Phone: (616) 799-5538 Fax: (616) 636-8444
Big Rapids City Fire Department (Mecosta County) 435 N Michigan Ave Big Rapids, MI 49307 Phone: (231) 527-0005 Fax: (231) 592-5570	Egelston Township Fire Department (Muskegon County) 5428 E Apple Ave Muskegon, MI 49442 Phone: (231) 788-2254 Fax: (231) 788-5248



Emergency Medical Services (EMS)

Newaygo County is served by two private EMS services, Life EMS and Pro Med, and one county owned EMS Agency, Mecosta County EMS. Troy Township, Beaver Township, and Denver Township are serviced by Pro Med. Barton Township and Norwich Township are serviced by Mecosta County EMS. The remaining jurisdictions are serviced by Life EMS who maintains ambulance bases in Fremont, Grant, and White Cloud.

<p align="center">Life EMS</p> <p align="center">33 N Westwood Ave, Fremont MI 49412 Phone: (231) 928-5433 Fax: (231) 924-2218 Website: http://www.lifeems.com</p>
<p align="center">Pro Med (Professional Med Team, Inc)</p> <p align="center">965 Fork Street, Muskegon, MI 49442 Phone: (231) 720-1804 Fax: (231) 720-1805 Website: http://www.promed.org</p>
<p align="center">Mecosta County EMS</p> <p align="center">14485 Northland Drive, Big Rapids, MI 49307 Phone: (231) 796-2626 Fax: (231) 796-0231 Website: http://www.co.mecosta.mi.us/ambulance.asp</p>

Medical First Responder Services (MFR)

Newaygo County is serviced by seven medical first responder departments, all of which are fire departments except Lilley First Responders. These departments are trained to provide advanced first aid and can administer oxygen.

<p>Station 11: Fremont Fire Department 101 E Main Street, Fremont, MI 49412 Phone: (231) 924-2103 Fax: (231) 924-2015</p>	<p>Station 12: Newaygo Fire Department 177 Cooperative Dr, PO Box 243, Newaygo, MI 49337 Phone: (231) 652-7788 Fax: (231) 652-7077</p>
<p>Station 13: Ashland Grant Fire Department 62 W State Road, PO Box 422, Grant, MI 49327 Phone: (231) 834-5733 Fax: (231) 652-5753</p>	<p>Station 14: Croton Fire Department 6431 S Elm Ave, Newaygo, MI 49337 Phone: (231) 652-3757 Fax: (231) 652-3750</p>
<p>Station 15: Big Prairie Fire Department 2815 S Elm Ave, White Cloud, MI 49349 Phone: (231) 689-1494 Fax: (231) 652-5518</p>	<p>Lilley First Responders 7708 Comstock Ave, Bitely, MI 49309 Phone: (231) 873-5012 Fax: (231) 349-9773</p>
<p>Sand Lake Fire Department (Kent County) 2 Maple Street, Sand Lake, MI 49343 Phone: (616) 799-5538 Fax: (616) 636-8444</p>	

Health Care

Newaygo County has one hospital, Spectrum Health Gerber Memorial Hospital, serving the community. Spectrum Health Gerber Memorial Hospital is a 49-bed not-for-profit community hospital that offers a complete range of medical and surgical services. Medical providers for Spectrum Health Gerber Memorial include physicians in Newaygo County who have practicing privileges at Spectrum Health Gerber Memorial Hospital, consultants who are the specialists from practices in Grand Rapids and Muskegon, emergency staff who are board certified in emergency medicine and contracted from Spectrum Health in Grand Rapids, mid-level practitioners (physician assistants, certified registered nurse anesthetists, nurse practitioners and psychologists), and occupational medicine physicians who focus on illness and injury related to the workplace. SHGM is among an elite group of hospitals to receive the Governor's Award of Excellence for Improving Care in the Hospital Setting and in the Emergency Department – 2003, 2004, 2007 and 2009.

Spectrum Health Gerber Memorial Hospital 212 S Sullivan Street, Fremont MI 49412 Phone: (231) 924-3300 Website: http://www.spectrumhealth.org/gerber	
Spectrum Health Internal Medicine and Pediatrics 204 W Main Street, Fremont, MI 49412 Phone: (231) 924-1800	Spectrum Health Rural Health Clinic – Hesperia 78 N Division Ave, Hesperia, MI 49421 Phone: (213) 854-6415
Spectrum Health Rural Health Clinic – Grant 230 S Maple Street, Grant, MI 49327 Phone: (231) 834-5995	Spectrum Health Gerber Memorial Obstetric and Gynecology 212 S Sullivan Ave, Fremont, MI 49412 Phone: (231) 924-1212
Spectrum Health Medical Group - Fremont 230 W Oak Street, Fremont, MI 49412 Phone: (231) 924-4200 Fax: (231) 924-4064 Website: http://www.shmq.org	Spectrum Health Medical Group - Newaygo 211 W Pine Lake Drive, Newaygo, MI 49337 Phone: (231) 652-1631 Fax: (231) 652-2566 Website: http://www.shmq.org
Family Health Care - Grant Clinic 11 North Maple, Grant, MI 49327 Phone: (231) 834-0444 Website: Http://www.familyhealthcare.org	Family Health Care White Cloud Clinic 1035 E Wilcox, White Cloud, MI 49349 Phone: (231) 689-5943 Website: Http://www.familyhealthcare.org

Road Commission and Department of Public Works

Newaygo County Road Commission services all state and county roads within Newaygo County. All municipal Department of Public Works services only municipal roads and infrastructure.

Newaygo County Road Commission

935 One Mile Road, White Cloud MI 49349

Phone: (231) 689-6682 Fax: (231) 689-5994

Website: <http://www.newaygoroads.org>

Fremont Department of Public Works

101 E main Street, Fremont, MI 49412

Phone: (231) 924-2101

Fax: (231) 924-2888

Website: <http://www.cityoffremont.net>

Newaygo Department of Public Works

8233 South Mundy Ave, Newaygo, MI 49337

Phone: (231) 924-2101

Website: <http://www.newaygocity.org>

Grant Department of Public Works

280 South Maple St, PO Box 435, Grant, MI 49327

Phone: (231) 834-7462

Website: <http://www.cityofgrantmi.com/cityoffices/publicworksdepartment.html>

White Cloud Department of Public Works

12 N Charles Street, PO Box 607, White Cloud,
MI 49349

Phone: (231) 689-1194

Website: <http://www.cityofwhitecloud.org>

Hesperia Department of Public Works

33 E Michigan Ave, Hesperia, MI 49421-0366

Phone: (231) 854-6205 Fax: (231) 854-0263

Website: <http://www.hesperiami.com/services.htm>

Government Offices and Facilities

Government facilities provide services to the public, such as the distribution of Public Information and the continuity of governmental operations including supporting the Incident Command System and key decision making processes. There are four cities, one village, and twenty-four township governments within Newaygo County.



County of Newaygo 1087 E Newell Street, PO Box 885, White Cloud, MI 49349 Phone: (231) 689-7200 Fax: (231) 689-7205 Website: http://www.countyofnewaygo.com	
City of Fremont 101 E Main Street, Fremont, MI 49412 Phone: (231) 924-2101 Fax: (231) 924-2888 Website: http://www.cityoffremont.net	City of Newaygo 28 N State Road, PO Box 308, Newaygo, MI 49337 Phone: (231) 652-1657 Fax: (231) 652-1650 Website: http://www.newaygocity.org
City of White Cloud 12 N Charles Street, PO Box 607, White Cloud, MI 49349 Phone: (231) 689-1194 Fax: (231) 689-2001 Website: http://www.cityofwhitecloud.org	City of Grant 280 S. Maple Street, PO Box 435, Grant, MI 49327 Phone: (231) 834-7904 Fax: (231) 834-5984 Website: http://www.cityofgrantmi.com
Village of Hesperia 33 E Michigan Ave, Hesperia, MI 49421-0366 Phone: (231) 854-6205 Fax: (231) 854-0263 Website: http://www.hesperiami.com	
Ashland Township	Barton Township

2019 W 120 th St, Po Box 457, Grant, MI 49327 Phone: (231) 834-7535 Fax: (231) 834-0446 Website: http://www.ashtwp.com	12110 N Beech Ave, Paris, MI 49338 Phone: (231) 796-6867
Beaver Township 7991 N Dickerson Ave, Bitley, MI 19309 Phone: (231) 837-2425	Big Prairie Township 2815 S Elm Street, White Cloud, MI 49349 Phone: (231) 689-1385 Fax: (231) 652-7930 Website: http://www.bigprairietownship.org
Bridgeton Township 11830 S Warner Ave, Grant, MI 49327 Phone: (231) 834-0014 Fax: (231) 924-2457 Website: http://www.bridgetoncommunity.com	Brooks Township 490 Quarterline Rd, PO Box 625, Newaygo, MI 49337 Phone: (231) 652-6763 Fax: (231) 652-6721 Website: http://www.brookstownship.org
Croton Township 5833 E Division Street, Newaygo, MI 49337 Phone: (231) 652-4301 Fax: (231) 652-7250 Website: http://www.crotontownship.org	Dayton Township 3215 S Stone Road, Fremont, MI 49412 Phone: (231) 924-9509 Fax: (231) 924-9509 Website: http://www.daytontownship.com
Denver Township 8333 W 1 Mile Road, Hesperia MI 49421 Phone: NA	Ensley Township 7163 E 120 th Street, Sand Lake, MI 49343 Phone: (616) 636-8510 Fax: (616) 636-4773 Website: http://www.ensleytownship.org
Everett Township 1516 E 8 th Street, PO Box 979 White Cloud, MI 49349 Phone: (231) 689-1082 Fax: (231) 689-1519	Garfield Township 7190 S Bingham Ave, Newaygo, MI 49337 Phone: (231) 652-4251 Fax: (231) 652-4207 Website: http://www.garfieldtownship.org
Goodwell Township 2465 N Cypress Ave, White Cloud, MI 49349 Phone: NA Fax: (231) 689-1289	Grant Township 1617 E 120 th Street, Grant, MI 49327 Phone: (231) 834-8033 Fax: (231) 834-0241 Website: http://www.granttownship.net
Home Township 11253 N Walnut Ave, Bitely, MI 49309 Phone: NA	Lilley Township 10722 N Bingham Ave, Bitely, MI 49309 Phone: (231) 745-9658 Fax: (231) 745-4179
Lincoln Township 1988 N Wisner Ave, PO Box 593 White Cloud, MI 49349 Phone: (231) 689-2070 Fax: (231) 689-8924	Merrill Township 1585 W 11 Mile Road, Bitely, MI 49309 Phone: (231) 745-7661 Fax: (231) 745-4105 Website: http://www.merrilltownship.com
Monroe Township 4141 E Fillmore Street, White Cloud, MI 49349 Phone: (231) 689-6958 Fax: (231) 689-6958	Norwich Township 7213 N Cypress Ave, Big Rapids, MI 49307 Phone: NA Fax: (231) 796-3363
Sheridan Charter Township 6360 Township Pkwy, PO Box 53 Fremont, MI 49412 Phone: (231) 924-2566 Fax: (231) 924-8734	Sherman Township 2410 S Wisner Ave, PO Box 153, Fremont, MI 49412 Phone: (231) 924-7164 Website: http://www.shermantownship.org
Troy Township 10350 N Dickerson Ave, Walkerville, MI 49459 Phone: (231) 873-9000	Wilcox Township 1795 Evergreen Dr, PO Box 728 White Cloud, MI 49349 Phone: (231) 689-1825 Fax: (231) 689-1828

Local Units of Government and Services Provided

The quality and availability of services varies widely within the County as the result of being mostly rural communities. Table 45, Local Units of Government and Municipal Services, identifies all local units of government within Newaygo County and the municipal services that are available.

*Table 45, Local Units of Government and Municipal Services
Compiled by: Newaygo County Emergency Services*

Utility Service	City of Fremont	City of Newaygo	City of White Cloud	City of Grant	Village of Hesperia
Natural Gas	DTE Energy	DTE Energy	DTE Energy	DTE Energy	DTE Energy
Electricity	Consumers Energy	Consumers Energy	Consumers Energy	Consumers Energy	Consumers Energy
Sanitary Sewer System	City of Fremont	City of Newaygo	W.C.Sherman Utilities	City of Grant	Village of Hesperia
Water Supply System	City of Fremont	City of Newaygo	W.C.Sherman Utilities	City of Grant	Village of Hesperia
Central Stormwater Control	City of Fremont	City of Newaygo	City of White Cloud	City of Grant	Village of Hesperia
Local Telephone Service	AT&T	AT&T	AT&T	AT&T	Frontier
Cellular Phone Service	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T
Fiber Optic Cable TV and Internet Access	Comcast NCATS	Charter NCATS	MI Cable Partners Inc NCATS	Charter NCATS	NCATS
Waste Services	Republic Services	A-Waste	Yes	A-Waste	Yes
Recycling	Weekly Curb Side	Recycling for Newaygo Co.	Recycling for Newaygo Co.	Weekly Curbside available	Recycling for Newaygo Co
Refuse	City of Fremont	City of Newaygo	None	City of Grant	Village of Hesperia
Snow Removal (Roads)	City of Fremont	City of Newaygo (Except M-37)	City of White Cloud (Except M-37)	City of Grant (Except M-37)	Village of Hesperia (Except M-20)
Emergency Services					
Law Enforcement	City of Fremont	City of Newaygo	City of White Cloud	City of Grant	Village of Hesperia
Fire Department	Station 11	Station 12	Station 18	Station 13	Station 19
Medical First Responder	Station 11	Station 12	None	Station 13	None
EMS	Life EMS	Life EMS	Life EMS	Life EMS	Pro Med EMS
Zoning					
Local Ordinances	Yes	Yes	Yes	Yes	Yes
Master Plan	Yes	Yes	Yes	Yes	Yes

Utility Service	Ashland Township	Barton Township	Beaver Township	Big Prairie Township	Bridgeton Township
Natural Gas	DTE Energy	None	None	DTE Energy	None
Electricity	Consumers Energy	Consumers Energy	Consumers Energy	Consumers Energy	Consumers Energy
Sanitary Sewer System	None	None	None	None	None
Water Supply System	None	None	None	None	None
Central Stormwater Control	None	None	None	None	None
Local Telephone Service	AT&T	AT&T	Frontier	AT&T and Frontier	AT&T and Frontier
Cellular Phone Service	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T
Fiber Optic Cable TV and Internet Access	NCATS Broadband	None	None	None	Partial NCATS Broadband
Waste Services	5 Corners Transfer Station	Private	Private	Private	Private
Recycling	None	None	None	None	None
Refuse	None	None	None	None	None
Snow Removal (Roads)	Road Commission	Road Commission	Road Commission	Road Commission	Road Commission
Emergency Services					
Law Enforcement	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP
Fire Department	Station 13	Big Rapids City	Station 19 Walkerville Fire	Station 15	Station 11 Station 13 Egelston Twp
Medical First Responder	Station 13	None	None	Station 15	Station 11 Station 13 Egelston Twp
EMS	Life EMS	Mecosta EMS	Pro Med EMS	Life EMS	Life EMS
Zoning					
Local Ordinances	Yes	Yes	Yes	Yes	Yes
Master Plan	Yes	Yes	Yes	Yes	Yes

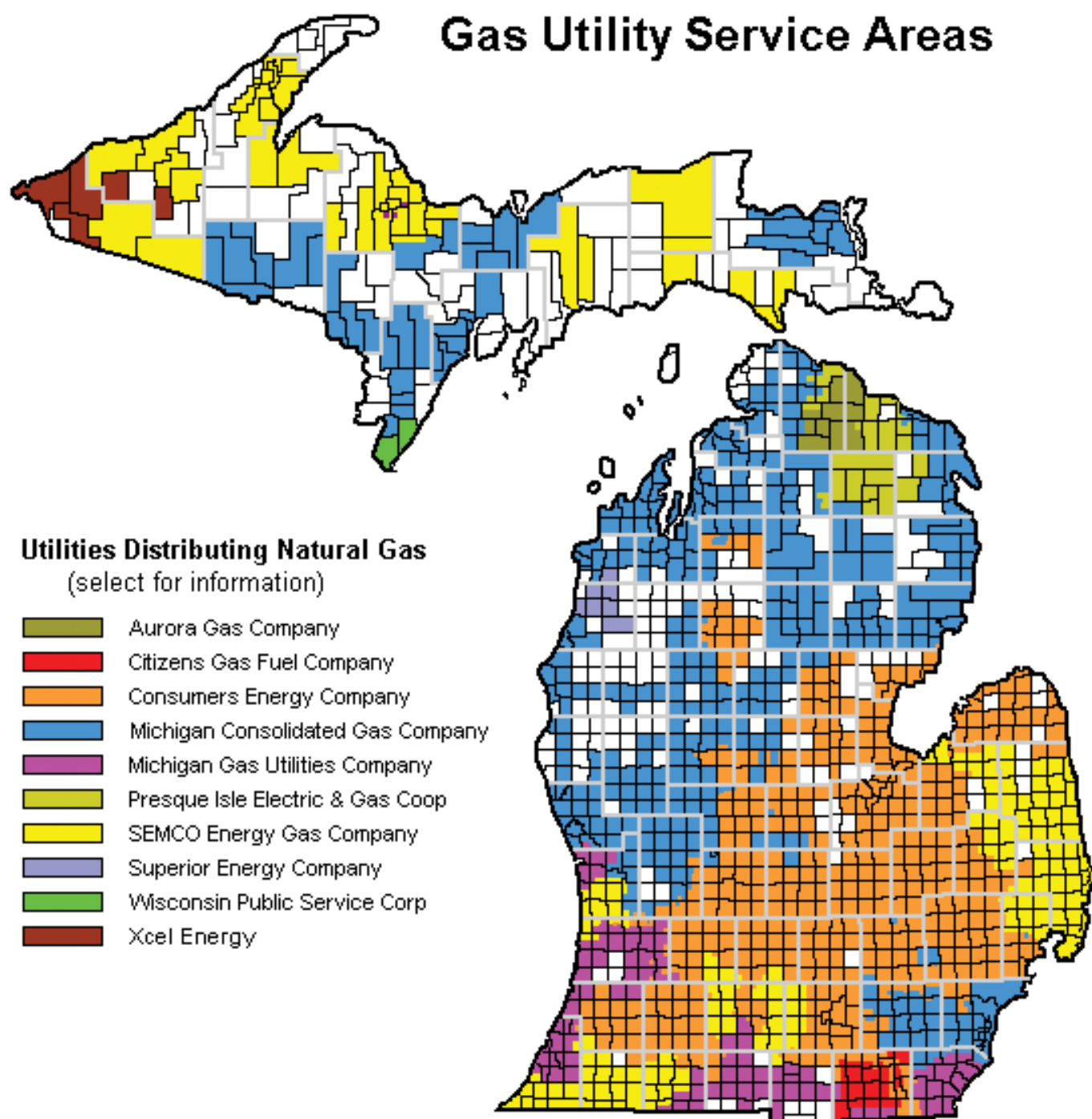
Utility Service	Brooks Township	Croton Township	Dayton Township	Denver Township	Ensley Township
Natural Gas	DTE Energy	DTE Energy	DTE Energy	DTE Energy	DTE Energy
Electricity	Consumers Energy	Consumers Energy	Consumers Energy	Consumers Energy	Consumers Energy
Sanitary Sewer System	Small portion City of Newaygo and COLA	None	None	None	None
Water Supply System	Small portion City of Newaygo and COLA	None	None	None	None
Central Stormwater Control	None	None	None	None	None
Local Telephone Service	AT&T	AT&T and Frontier	AT&T and Frontier	AT&T and Frontier	AT&T and Frontier
Cellular Phone Service	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T
Fiber Optic Cable TV and Internet Access	Partial Charter and NCATS Boradband	None	NCATS Broadband	NCATS Broadband	NCATS Broadband
Waste Services	Private	Transfer Station	Private	Private	Private
Recycling	Recycling for Newaygo Co.	Transfer Station	Recycling for Newaygo Co.	Recycling for Newaygo Co.	None
Refuse	None	None	None	None	None
Snow Removal (Roads)	Road Commission	Road Commission	Road Commission	Road Commission	Road Commission
Emergency Services					
Law Enforcement	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP
Fire Department	Station 12	Station 14	Station 11	Station 19	Sand Lake Fire
Medical First Responder	Station 12	Station 14	Station 11	None	Sand Lake Fire
EMS	Life EMS	Life EMS	Life EMS	Pro Med EMS	Life EMS
Zoning					
Local Ordinances	Yes	Yes	Yes	Yes	Yes
Master Plan	Yes	Yes	Yes	Yes	Yes

Utility Service	Everett Township	Garfield Township	Goodwell Township	Grant Township	Home Township
Natural Gas	DTE Energy	DTE Energy	None	DTE Energy	None
Electricity	Consumers Energy and Great Lakes Energy	Consumers Energy	Consumers Energy	Consumers Energy	Consumers Energy
Sanitary Sewer System	Small Portion COLA	Small portion COLA	None	Small portion City of Grant	None
Water Supply System	Small Portion COLA	Small Portion COLA	None	Small portion City of Grant	None
Central Stormwater Control	None	None	None	None	None
Local Telephone Service	AT&T	AT&T	AT&T and Frontier	AT&T	AT&T
Cellular Phone Service	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T
Fiber Optic Cable TV and Internet Access	Small portion NCATS Broadband	NCATS Broadband	None	NCATS Broadband	None
Waste Services	Private	Private	Private	Private	Private
Recycling	Recycling for Newaygo Co.	Recycling for Newaygo Co.	None	Recycling for Newaygo Co.	None
Refuse	None	None	None	None	None
Snow Removal (Roads)	Road Commission	Road Commission	Road Commission	Road Commission	Road Commission
Emergency Services					
Law Enforcement	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP
Fire Department	Station 18	Station 11 Station 12	Station 15	Station 13	Station 17
Medical First Responder	None	Station 11 Station 12	Station 15	Station 13	Lilley First
EMS	Life EMS	Life EMS	Life EMS	Life EMS	Life EMS
Zoning					
Local Ordinances	Yes	Yes	Yes	Yes	Yes
Master Plan	Yes	Yes	Yes	Yes	Yes

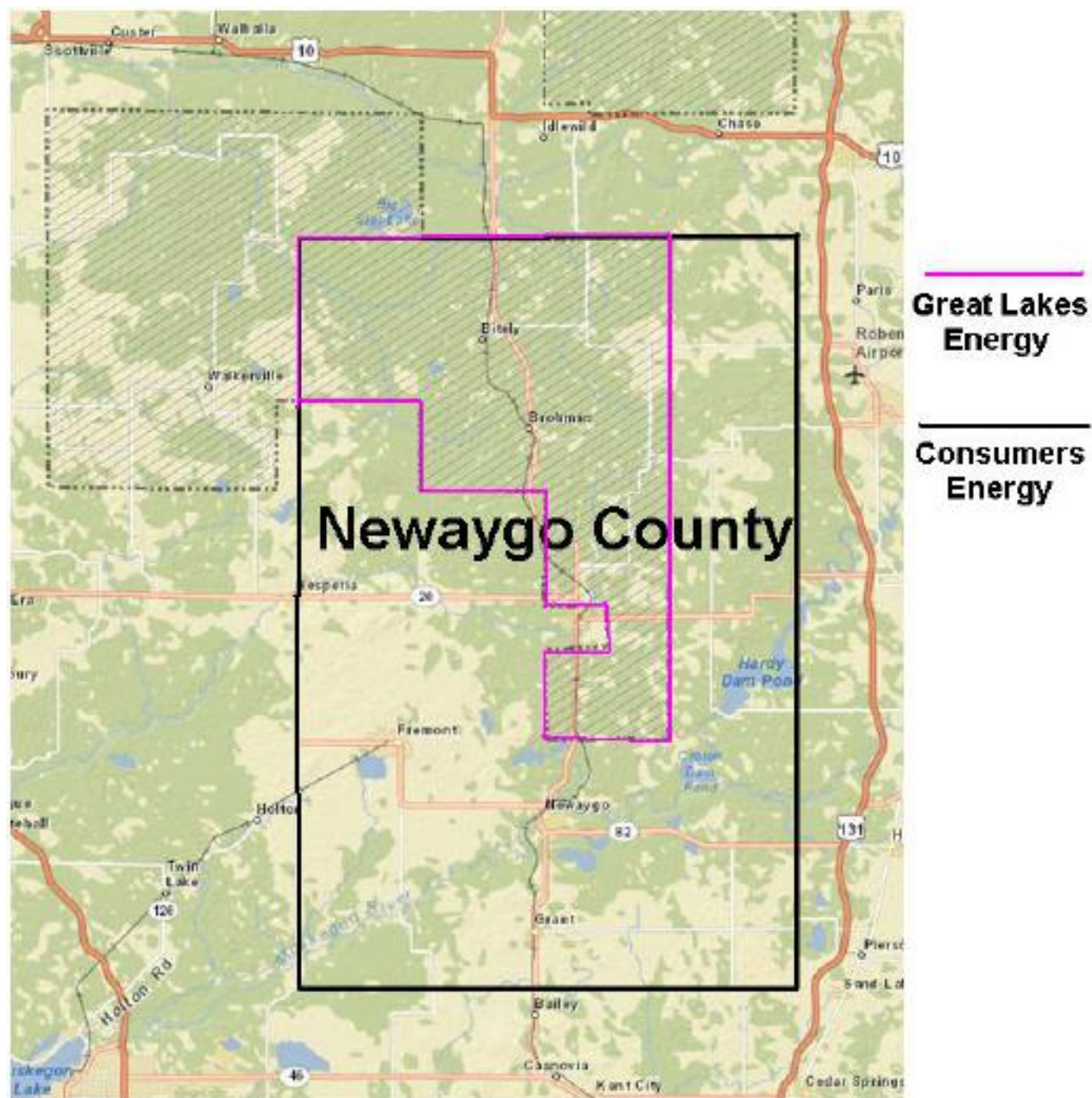
Utility Service	Lilley Township	Lincoln Township	Merrill Township	Monroe Township	Norwich Township
Natural Gas	None	None	None	DTE Energy	DTE Energy
Electricity	Great Lakes Energy	Consumers Energy	Great Lakes Energy	Great Lakes Energy	Consumers Energy
Sanitary Sewer System	None	None	None	None	None
Water Supply System	None	None	None	None	None
Central Stormwater Control	None	None	None	None	None
Local Telephone Service	AT&T	AT&T	AT&T	AT&T	AT&T
Cellular Phone Service	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T
Fiber Optic Cable TV and Internet Access	None	None	None	None	None
Waste Services	Transfer Station	Private	Transfer Station	Private	Private
Recycling	None	None	None	None	None
Refuse	None	None	None	None	None
Snow Removal (Roads)	Road Commission	Road Commission	Road Commission	Road Commission	Road Commission
Emergency Services					
Law Enforcement	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP
Fire Department	Station 17	Station 18	Station 17	Station 17	Big Rapids City
Medical First Responder	Lilley First	None	Lilley First	Lilley First	None
EMS	Life EMS	Life EMS	Life EMS	Life EMS	Mecosta EMS
Zoning					
Local Ordinances	Yes	Yes	Yes	Yes	Yes
Master Plan	Yes	Yes	Yes	Yes	Yes

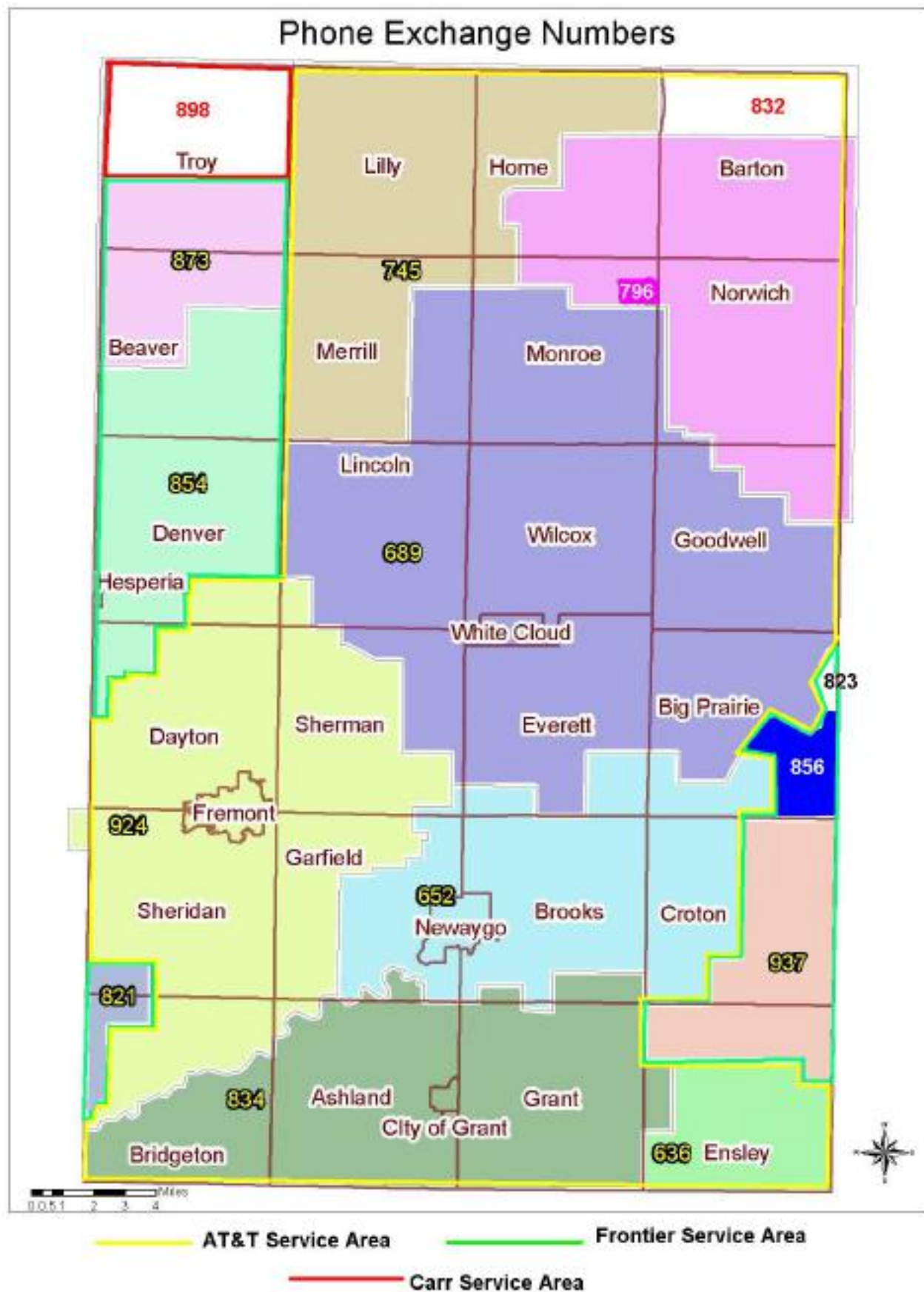
Utility Service	Sheridan Township	Sherman Township	Troy Township	Wilcox Township
Natural Gas	DTE Energy	DTE Energy	None	DTE Energy
Electricity	Consumers Energy	Consumers Energy	Great Lakes Energy	Great Lakes Energy
Sanitary Sewer System	Small portion City of Fremont	W.C.Sherman Utilities	None	None
Water Supply System	Small portion City of Fremont	W.C.Sherman Utilities	None	None
Central Stormwater Control	None	None	None	None
Local Telephone Service	AT&T and Frontier	AT&T	Frontier and Carr	AT&T
Cellular Phone Service	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T	Verizon, Sprint, and AT&T
Fiber Optic Cable TV and Internet Access	NCATS Broadband and partial Comcast	NCATS Broadband and partial Comcast	None	None
Waste Services	Private	Private	Private	Transfer Station
Recycling	Recycling for Newaygo Co.	Recycling for Newaygo Co.	None	Recycling for Newaygo Co.
Refuse	None	None	None	None
Snow Removal (Roads)	Road Commission	Road Commission	Road Commission	Road Commission
Emergency Services				
Law Enforcement	Sheriff MSP	Sheriff MSP	Sheriff MSP	Sheriff MSP
Fire Department	Station 11	Station 11 Station 18	Station 17	Station 18
Medical First Responder	Station 11	Station 11	Lilley First	None
EMS	Life EMS	Life EMS	Pro Med EMS	Life EMS
Zoning				
Local Ordinances	Yes	Yes	Yes	Yes
Master Plan	Yes	Yes	No	Yes

Utilities for Newaygo County



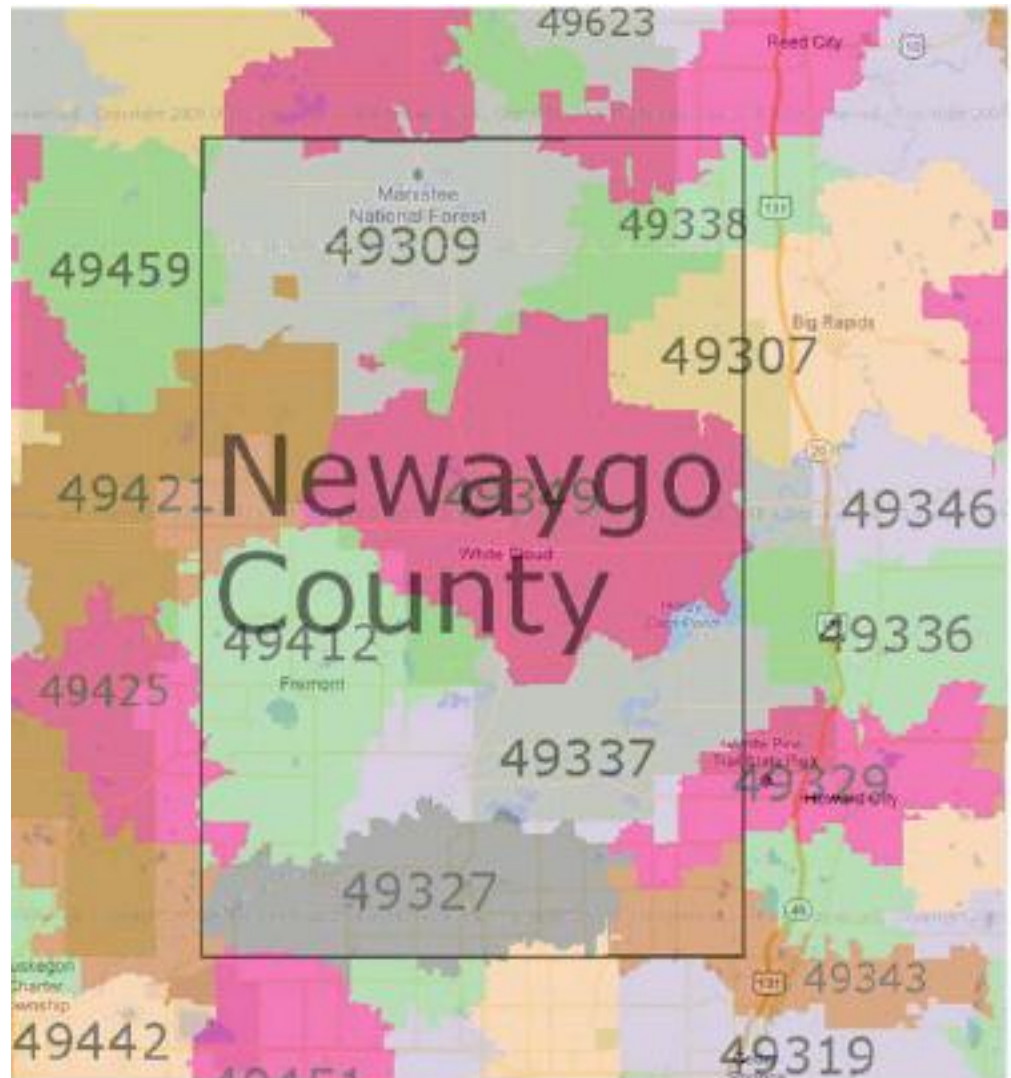
Electric Company Service Area for Newaygo County





Zip Codes for Newaygo County

<u>Zip Code</u>	<u>City</u>
49309	BITELY
49312	BROHMAN
49327	GRANT
49337	NEWAYGO
49349	WHITECLOUD
49412	FREMONT
49413	FREMONT
49304	BALDWIN
49421	HESPERIA
49459	WALKERVILLE
49677	REED CITY
49338	PARIS
49307	BIG RAPIDS
49336	MORLEY
49329	HOWARD CITY
49343	SAND LAKE



Media Resources Serving Newaygo County

TELEVISION STATIONS	
<p>WWZM TV 13 (ABC Affiliate) Phone: (616) 599-1300 Fax: (616) 784-8367 Website: http://www.wzzm13.com</p> <p>Primary service point for Newaygo County. Weekly news consists of 4 hours of Local daily news at 5:00 am, 6:00 am, 12:00 pm, 5:30 pm, 6:00 pm and 11:00 pm. Deadlines are at least 1 hour before broadcast.</p>	<p>WOOD TV 8 (NBC Affiliate) Phone: (616) 771-9633 Fax: (616) 456-5755 Website: http://www.woodtv.com</p> <p>Primary service point for Newaygo County. Weekly news consists of 4 ½ hours of Local daily news at 5:00 am, 6:00 am, 12:00 pm, 5:00 pm, 6:00 pm and 11:00 pm. Deadlines are at least 1 hour before broadcast.</p>
<p>WWMT TV 3 (CBS Affiliate) Phone: (269) 388-8322 Phone: (269) 388-4302 Website: http://www.wwmt.com</p> <p>Tertiary service point for Newaygo County. Weekly news consists of 5 ½ Hours of Local daily news at 5:00am, 6am, 7am, 12pm, 5pm, 5:30 pm, 6:00 pm, and 11pm. Deadlines are at least 1 hour before broadcast</p>	<p>FOX 17 WXMI (FOX Affiliate) Phone: (616) 364-1717 Fax: (616) 364-6018 Website: Http://www.fox17online.com</p> <p>Secondary service point for Newaygo County. Weekly news consists of 3 hours of Local daily news at 6:00 am and 10:00 pm. Deadlines are at least 1 hour before broadcast.</p>
<p>WWTV TV 9 &10 (CBS Affiliate) Phone: (231) 775-3478 x 3301 Fax: (231) 775-2731 Website: http://www.9and10news.com</p> <p>Secondary service point for Newaygo County. The station transmits to 249,450 households. Weekly news consists of 5 Hours of Local daily news at 5:00am, 6:00 am, 12pm, 5pm, 6:00 pm and 11pm. Deadlines are at least 1 hour before broadcast.</p>	<p>WPBN TV 7 & 4 (NBC Affiliate) Phone: (231) 946-2504 Fax: (231) 947-0354 Website: http://www.upnorthlive.com</p> <p>Tertiary service point for Newaygo. Weekly news consists of 3 ½ Hours of Local daily news at 5:00am, 6:00 am, 11am, 5pm, 6:00 pm, and 11pm. Deadlines are at least 1 hour before broadcast.</p>
RADIO STATIONS	
<p>WOOD RADIO (STAR 105.7 FM Grand Rapids) Phone: (616) 459-1919 Fax: (616) 732-3330 Website: http://www.westmichiganstar.com</p> <p>Primary Emergency Alert System Radio Station.</p>	<p>WLNT RADIO (95.7 FM Grand Rapids) Phone: (616) 451-4800 Website: http://www.mychannel957.com</p> <p>Secondary Emergency Alert System Radio Station.</p>
<p>WKAR RADIO (90.5 FM East Lansing) Phone: (517) 432-9527 Fax: (517) 353-7124</p> <p>Statewide Emergency Alert System Radio Station.</p>	<p>WYBR & WBRN Radio (102.3 FM / 109.0 FM / 1460 AM Big Rapids) Phone: (231) 796-7000 Fax: (231) 796-7951 Website: http://www.wybr.com</p> <p>Tertiary service point for Newaygo County (small audience).</p>

NEWSPAPERS**TIMES INDICATOR (Fremont)**

44 West Main Street, PO Box 7 Fremont MI 49412

Phone: (231) 924-4400**Fax: (231) 924-4066****Website:** <http://www.timesindicator.com/>

Primary service point for Newaygo County. Weekly publication on Wednesdays. Deadlines are by Friday at noon.

Hi Lites Shoppers Guide

1212 Locust Street, Fremont MI 49412

Phone: (231) 924-0630**Fax: (231) 924-5580****Website:** <http://www.hi-lites.net>

Serving the Area since 1947, the Hi-lites shoppers guide only publishes advertisements/notices, sales, and classified ads. Weekly publication on Sundays. Deadlines are Thursday by 5:30 PM.

PIONEER NEWS (Big Rapids / Paris)

115 North Michigan Ave, Big Rapids MI 49307

Phone: (231) 592-8360**Fax: (231) 796-1152****Website:** <http://www.bigrapidsnews.com>

The Pioneer is a 6-day a week newspaper covering Big Rapids, greater Mecosta County, Osceola County and parts of Lake and Newaygo Counties. The Pioneer is a division of the Pioneer Group.

LAKE COUNTY STAR

851 Michigan Ave, Baldwin MI 49304

Phone: (231) 745-4635**Fax: (231) 745-7733****Website:** <http://www.lakecountystar.com>

The Lake County Star is a weekly newspaper based in Baldwin, the county-seat of Lake County. The Lake County Star is a division of the Pioneer Group. The Thursday publication has been serving the news and advertising needs of Lake County since 1873. (Northern Newaygo County)

MUSKEGON CHRONICLE (Muskegon)**Phone: (800) 783-3161 X 3****Fax: (231) 722-2552****Email:** news@muskegonchronicle.com

City of Muskegon and Muskegon County with a section for Newaygo and Oceana County News. Daily publications. Deadlines are due by 9 am.

Grand Rapids Press (Grand Rapids)**Phone: (616) 222-5455****Fax: (616) 222-5269****Email:** localnews@grpress.com

Secondary service point for Newaygo County, Daily publications.

SOCIAL MEDIA**Facebook**[Http://www.facebook.com](http://www.facebook.com)

Is a free Social Networking website that allows users to send messages and post information in their personal profiles. The information is shared quickly and is a convenient way to distribute press releases, Amber Alerts, road closings, and other emergency information. In addition, it allows for two way communications with other users to allow for better situational awareness.

MySpace[Http://www.myspace.com](http://www.myspace.com)

Similar to Facebook, MySpace is a free Social Networking website that allows users to send messages and post information in their personal profiles.

Twitter[Http://www.twitter.com](http://www.twitter.com)

Is a free Social Networking website enabling it users to send and receive messages known as tweets. Tweets are text based posts up to 140 characters displayed on the author's profile page and delivered to the author's subscribers who are known as followers. All users can send and receive tweets via the Twitter website, Short Message Service (SMS), or external applications.

Websites[Http://www.coutnyofnewaygo.com](http://www.coutnyofnewaygo.com)

Newaygo County Information and Technology Department can post press releases on the home page of the County of Newaygo's Website.

Special Events

Throughout the United States, at any given time of year, there are festivals, concerts, fairs, sporting events, and many other large and small events that gather or have the potential to gather large crowds. Communities often use these festivals and special events as a way of generating large income and promoting themselves to potential visitors. As of February 2012, Pure Michigan has 860 registered special events for the 2012 Calendar Year. In Newaygo County, there are annual special events which occur in each community bringing in large crowds. Table 46 is a list of the primary special events occurring in Newaygo County.

*Table 46, Newaygo County Festivals and Events
Compiled by: Newaygo County Emergency Services*

City of Fremont	Month	Approximate Date
Fremont Snow Bash	February	First week
Community and Business Expo	March	Third weekend
National Baby Food Festival	July	Third week, Wednesday - Saturday
Newaygo County Agricultural Fair	August	First full week, Saturday - Saturday
Fremont Harvest Festival	October	First weekend, Saturday - Sunday
Fremont Farmers Market	June – September	Saturdays and Tuesdays
City of Newaygo	Month	Approximate Date
Winterfest	January	Last Weekend, Tuesday - Saturday
Troutfest	April	Fourth Weekend
Memorial Day Festival	May	Memorial Day Weekend
PowerPaddle Canoe and Kayak Races	June	Father's Day Weekend
Newaygo County Kids Day	June	Father's Day Weekend, Saturday
Newaygo Farm Market	July – October	
July 4 th Celebration	July	July 4 th timeframe
Riverstock Festival	August	Second Weekend, Friday - Sunday
Logging Festival	September	Labor Day Weekend
Holiday Festival	December	First Weekend, Friday - Sunday
City White Cloud	Month	Approximate Date
Winter Carnival	March	First Saturday
Kids Free Fishing Day	June	First Saturday
White Cloud Homecoming	June	Father's Day weekend, Friday - Sunday
Airport Fly-in and Pancake Breakfast	June	Father's Day
Pow Wow Days	August	First weekend, Saturday - Sunday
City of Grant	Month	Approximate Date
Grant Festival	August	Third weekend, Friday - Saturday
Community Christmas	December	Second Saturday
Village of Hesperia	Month	Approximate Date
Hesperia Family Fun Festival	July	July 4 th Holiday, 4 days
Croton Township	Month	Approximate Date
Dam to Dam Ice Fishing Contest	February	DNR Free Fishing Weekend
Hooking Up Heroes	June	Second Saturday
Croton Dam Annual 4 th Celebration	July	July 4 th Holiday, 4 days
Hot Boat Weekend	September	First weekend after Labor Day

Hazard Analysis Introduction

Purpose

The hazard analysis is the foundation upon which all emergency planning efforts in the community are built. In fact, preparing a good hazard analysis and community profile is the first step that the community's emergency planning team should take in building an effective emergency management program. A hazard analysis provides an understanding of the potential threats facing the community. By pinpointing the location, extent and magnitude of past disasters or emergency situations, and by examining knowledge of new or emerging risks, it is possible to determine the probability of such events occurring and the vulnerability of people and property. Coupled with relevant land use, economic and demographic information from a well prepared "community profile," Emergency Management Directors/Coordinators can make assumptions about those segments of the community that might be impacted by various types of incidents. This, in turn, allows them to set priorities and goals for resource allocation and response, recovery and mitigation activities prior to an incident occurring. Collectively, these decisions are the cornerstone of the community's emergency management program and should guide all decisions pertaining to community emergency management activities.

Hazard Analysis Development

One of the most effective methods of developing a community hazard analysis is to divide the task into three distinct, but equally important tasks. The first step is to identify those hazards to which the community is susceptible. The second step is to develop a community profile of the community's major land use, demographic and economic trends and patterns to determine which segments of the community might be impacted. The third and final step is the actual analysis of the information, that is, determining the level of community vulnerability based on the identified hazards and existing community trends and patterns. Coupling this information with the results of the community's Capability Assessment can help identify the community's strengths and weaknesses, and provides the basis for the community emergency management program.

Step 1: Hazards Identification

All local hazard analysis in the State of Michigan should be based on EMHSD PUB - 103, "Michigan Hazard Analysis." This document presents a comprehensive study of the various types of disasters and emergencies that have confronted the State of Michigan, as well as those hazards that have the potential to occur. From this document, it is possible to identify potential community hazards and gather information about the community's potential exposure and vulnerability to those hazards. Although this provides an excellent overview of hazards from a statewide perspective, it is important to build upon this information to more specifically focus on the local jurisdiction. This requires local research conducted through

local libraries, historical organizations, newspapers, broadcast media, chambers of commerce, insurance companies and other community entities (even private citizens) that may be able to provide insight and information about past disaster events and local hazard areas. The Emergency Management Director/Coordinator must also review previous hazard analysis and identify changes in the community. The information should be recorded on a map or maps to provide an accurate geographic portrayal of the community's hazard base.

Step 2: Community Profile

A community profile provides information about key segments or elements of the community's makeup. It examines the land use pattern, the transportation network, demographic breakdown of the population, key industries, locations of key community facilities, major community organizations, and other information that is relevant to the community's existence. Simply put, preparing a community profile requires answers to the 5 W's of the jurisdiction. Who are we, where are we located, what do we do, and when, and why do we exist, what is the community's main "reason for being"? Answers to many of these questions have already been prepared by other community agencies, such as the planning department, chamber of commerce, economic development authority, aging office, community college or university, school district, etc. In most cases, this information can be utilized from information acquired from those organizations after adaptation into the proper format. As initially locating the information is critical, broadening the search for information also helps complete the job faster and generates support and "buy-in" for the end product from agencies assisting in the information gathering. This information is recorded on a map or maps (as per the hazard identification step outlined above) to indicate the geographic relationship of key facilities, population distributions and land use patterns to the identified hazards.

Step 3: Analysis of Hazards and Vulnerability

The third step in the process, the actual "analysis" portion of the hazard analysis, comes when the hazard identification information is combined with the community profile. At this point, it is possible to determine and "analyze" the potential impact of these hazards on the community, or vulnerability. This requires a lot of "what ifs" to be asked. It is in answering the "what ifs" that the community can determine where its strengths and weaknesses lie in its capability to respond to, recover from and mitigate the consequences of the hazards to which it is susceptible. When matched with the community's Capability Assessment this analysis allows the community to determine its strengths and weaknesses, and then design an emergency management program that is tailored to its needs and resources.

Hazard Identification

The Newaygo County Hazard Analysis has been developed by Newaygo County Emergency Services, the Local Emergency Planning Team, and community officials to provide a documented description of the community's identified hazard's, possible risk, and potential vulnerabilities to support local emergency planning and mitigation activities. The 2012 Michigan Hazard Analysis (MSP EMHSD Publication 103) was utilized as the guiding document in the development of each of the Hazard Sections. This Hazard Analysis has been extensively revised from the previous 2007 edition to mirror the revised 2012 Michigan Hazard Analysis. These changes make the plan not only compliant with FEMA planning standards, but with larger EMAP standards as well, with a full consideration of natural hazards, technological hazards, human-related hazards, as well as greater linkages between hazard mitigation and the other phases of emergency management—preparedness, response, and recovery.

Although addressing more than 30 identified types of hazards within the 2012 Michigan Hazard Analysis, local planning considerations have resulted in Newaygo County's existing hazards being organized into 12 major hazard classes. This method has allowed for an effective planning approach for a variety of reasons. First, the Newaygo County Emergency Operations Plan is an all-hazard document dependent on implementation of emergency functions, not related to specific hazard response. In example, many flood hazards require similar planning, response, and mitigation measures despite their specific type. Second, Newaygo County is a moderately sized jurisdiction with its population and resources concentrated in villages and cities, creating a need to generalize hazards. Concentrating on the primary local considerations for the entire hazard class allows for a more efficient planning process than otherwise analyzing each of the individual hazards.

The following relates Newaygo County's Hazard Classes to the Michigan Hazard Analysis 2012 Document.

Newaygo County Hazard Analysis	Michigan Hazard Analysis	
Natural Hazards		
Thunderstorm	⬆ Thunderstorm ⬆ Lightning	⬆ Hail
Tornados	⬆ Tornadoes	⬆ Severe Winds
Severe Winter Weather	⬆ Extreme Temp (Cold) ⬆ Snowstorms	⬆ Ice and Sleet Storms ⬆
Flooding	⬆ Riverine Flooding ⬆ Great Lakes Shoreline Hazards	⬆ Dam Failures ⬆
Drought	⬆ Drought	⬆ Extreme Temperatures (Heat)

Newaygo County Hazard Analysis	Michigan Hazard Analysis	
Wildfires	♣ Wildfires	
Technological Hazards		
Fires	♣ Structural Fires	♣ Scrap Tire Fires
Hazardous Materials	♣ Fixed Site (Industrial Accidents)	♣ Nuclear Power Plant Emergencies
	♣ Transportation	♣ Petroleum and Natural Gas Pipeline Accidents
	♣ Oil and Natural Gas Well Accidents	
Infrastructure Failure	♣ Infrastructure Failures	♣ Energy Emergencies
Transportation	♣ Transportation Accidents	♣
Human Related Hazards		
Public Health	♣ Public Health Emergencies	♣
Criminal Incidents	♣ Civil Disturbances	♣ Terrorism and Similar Criminal Activities

Non-significant Hazards

Earthquakes

In the early 1800s there were several mild earthquakes reported in Southern Lower Michigan. With limited documentation the exact number is difficult to determine, however, no severely destructive earthquakes have ever been documented in Michigan. According to the Michigan Hazard Analysis, Michigan is not located in an area subject to major earthquake activity. Although there are fault lines in the bedrock of Michigan, they are now considered relatively stable. Based on recent scientific studies, portions of southern lower Michigan could be expected to receive minor damage were such an earthquake to occur. Newaygo County is outside the earthquake threat zone.

Nuclear Power

Currently, Michigan has three operational commercial nuclear power plants which include The Enrico Fermi 2 Plant near Monroe just south of Wayne County, The Donald C. Cook plant near Bridgman in Berrien County, and the Palisades Plant near Covert in Van Buren County. A fourth plant, the Big Rock Point plant near Charlevoix, was closed in 1997 and is now decommissioned, but spent fuel is still stored on-site in dry casks which will probably remain there a while. The Davis-Besse nuclear power station near Toledo, Ohio has several Michigan Counties within its Secondary Emergency Planning Zone, requiring coordination between Michigan and Ohio. In addition, nuclear research facilities can produce / use radioactive materials, as well as other hazardous substances. Newaygo County is outside of the Emergency Planning Zone for all Nuclear Power Plants located in Michigan.

Hazard Section Organization

Each of the following hazard sections are formatted to contain similar information as described below:

Hazard Definition

This section briefly defines the hazard.

Hazard Description

This section provides a general description summary of each hazard taken from a statewide perspective. This portion has been utilized from information provided by MSP-EMHSD Pub 103 2012 Michigan Hazard Analysis and MSP-EMD Pub207 Local Hazard Mitigation Planning Workbook.

Hazard Analysis

This section provides information on threats, vulnerabilities, historical occurrences, and key points of concerns as it relates to both the State of Michigan and Newaygo County. This allows for planners to focus mitigation, planning, and response efforts on specific areas of vulnerabilities, risk, resources, etc. that have been identified through the hazard analysis process.

THUNDERSTORM AND TORNADES

Thunderstorm and Tornadoes

Severe Thunderstorms are weather systems accompanied by strong winds, lightning, heavy rain, and possibly hail and tornadoes. Tornadoes are a violently whirling column of air extending downward to the ground from a cumulonimbus cloud.

Hazard Description

Thunderstorms form when a shallow layer of warm, moist air is overrun by a deeper layer of cool, dry air. Cumulonimbus clouds, frequently called “thunderheads,” are formed in these conditions. These clouds are often enormous (up to six miles or more across and 40,000 to 50,000 feet high) and may contain tremendous amounts of water and energy. That energy is often released in the form of high winds, excessive rains, lightning, and possibly hail and tornadoes.

Thunderstorms are typically short-lived (often lasting no more than 30-40 minutes) and fast moving (30-50 miles per hour). Strong frontal systems, however, may spawn one squall line after another, composed of many individual thunderstorm cells. Severe thunderstorms may also cause severe flood problems because of the torrential rains that they may bring to an area. Thunderstorms sometimes move very slowly, and can thus dump a tremendous amount of precipitation onto a location. Flooding can result, including flash floods, “urban flooding,” and riverine flooding.

The following are specific thunderstorm hazards:

Severe Winds (Windstorms):

According to the National Weather Service, winds 58 miles per hour or greater are classified as a windstorm. Windstorms are a fairly common occurrence in many areas in Michigan. Along the Great Lakes shoreline, strong winds occur with regularity, and gusts of over 74 miles per hour (hurricane velocity) do occasionally occur in conjunction with a storm front. Severe windstorms can cause damage to homes and businesses, power lines, trees and agricultural crops, and may require temporary sheltering of individuals without power for extended periods of time. Windstorms occur in all areas of Michigan, although more often along the lakeshore and in central and southern lower Michigan.

Hail:

A condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth. Hail is a product of the strong thunderstorms that frequently move across the state. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Sometimes, however, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred in the most severe thunderstorms. Hail is formed when strong

updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger, until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. Large hail is a characteristic of severe thunderstorms, and it often precedes the occurrence of a tornado.

Lightning:

The discharge of electricity from within a thunderstorm. Although lightning is often perceived as a minor hazard, it damages many structures and kills and injures more people in the U.S. 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 that lightning presents. Michigan ranks second in the nation in both lightning-related deaths and lightning-related injuries.

Tornadoes

A violently whirling column of air extending downward to the ground from a cumulonimbus cloud. The funnel cloud associated with a tornado may have winds up to 300 miles per hour and an interior air pressure that is 10-20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks much longer than that - some even up to 200 miles - have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in the greatest loss of life of any natural hazard, with the mean national annual death toll being 111 persons. Property damage from tornadoes is in the hundreds of millions of dollars every year. Michigan averages approximately 18 tornadoes per year, most occurring in the southern Lower Peninsula.

Hazard Analysis:

Severe thunderstorms can occur anytime in Michigan, although they are most frequent during the warm spring and summer months from April through September. Severe thunderstorms have some degree of predictability and are closely monitored by the National Weather Service. In addition to daily forecasts, which predict the probability of rainy or stormy weather, the NWS system of Watches and Warnings helps communities understand when there is a potential risk of severe thunderstorms, or if severe thunderstorms are imminent. When the NWS issues a "Severe Thunderstorm Watch," it means that thunderstorms with large hail and damaging winds are possible in your area. When the NWS issues a "Severe Thunderstorm Warning," it signifies that severe thunderstorms (with the damaging winds and hail) are in your area or are imminent.

The NWS has five offices that serve Michigan and are responsible for monitoring and providing predictions and bulletins for the entire state. The five offices are in Grand Rapids, Detroit, Gaylord, Marquette, and North Webster (Indiana). These stations provide information on severe weather watches and warnings, but also provide useful Doppler Radar images that track the movement of thunderstorms in your area. The North Webster office covers portions of southwest Michigan (www.weather.gov/iwx); the Grand Rapids station covers the remainder of southwest Michigan

(www.weather.gov/grr); the Detroit station covers Southeast Michigan (www.weather.gov/dtx); the Gaylord station covers the north central portion of the Lower Peninsula and the eastern edge of the Upper Peninsula (www.weather.gov/apx); and the Marquette station examines the majority of the Upper Peninsula (www.weather.gov/mqt).

Figures from the National Weather Service indicate that severe winds occur more frequently in the southern-half of the Lower Peninsula than any other area of the state. On average, severe wind events can be expected 2-3 times per year in the Upper Peninsula, 3-4 times per year in the northern Lower Peninsula, and 5-7 times per year in the southern Lower Peninsula. It must be emphasized that this refers to winds from thunderstorms and other forms of severe weather, but **not** tornadoes.

The property damage from straight line winds can be just as extreme as that of a tornado, since the damage from straight line winds is more widespread and usually affects multiple counties. In addition to property damage to buildings (especially less sturdy structures such as storage sheds, outbuildings, etc.), there is a risk for infrastructure damage from downed power lines due to falling limbs and trees. Large-scale power failures, with hundreds of thousands of customers affected, are common during straight-line wind events.

Another dangerous aspect of straight line winds is that they occur more frequently beyond the April to September time frame than is seen with the other thunderstorm hazards. It is not rare to see severe winds ravage parts of the state in October and November. Stark temperature contrasts seen in colliding air masses along swift-moving cold fronts occur regularly during those months.

Tornadoes in Michigan are most frequent in the 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 the violently rotating columns of wind known as funnel clouds. Michigan lies at the northeastern edge of the nation's primary tornado belt, which extends from Texas and Oklahoma through Missouri, Illinois, Indiana, and Ohio. Most of a tornado's destructive force is exerted by the powerful winds that knock down walls and lift roofs from buildings in the storm's path. The violently rotating winds then carry debris aloft that can be blown through the air as dangerous missiles.

A tornado may have winds up to 300+ miles per hour and an interior air pressure that is 10-20% below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks much longer than that – even up to 200 miles – have been reported. Tornado path widths are generally less than one-quarter mile wide. Typically, tornadoes last only a few minutes on the ground, but those few minutes can result in tremendous damage and devastation. Historically, tornadoes have resulted in tremendous loss of life, with the mean national annual death toll being 87 persons. Property damage from tornadoes is in the hundreds of millions of dollars every year.

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 damaged caused, not by its size. It is important to remember that the size of a tornado is not necessarily an indication of its intensity. Large tornadoes can be weak, and small tornadoes can be extremely strong, and vice versa. 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, using the Enhanced Fujita Scale as the measuring stick. The Enhanced Fujita Scale is presented in the table below.

The Enhanced Fujita Scale of Tornado Intensity

EF-Scale Number	Intensity Descriptor	Wind Speed (mph)	Type/Intensity of Damage
EF0	Gale tornado	65-85	Light damage. Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
EF1	Weak tornado	86-110	Moderate damage. The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Strong tornado	111-135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe tornado	136-165	Severe damage. Roof and some walls torn off well-constructed houses; trams overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.
EF4	Devastating tornado	166-200	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	Incredible tornado	Over 200	Incredible damage. Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged; incredible phenomena will occur.

NOTE: When describing tornadoes, meteorologists often classify the storms as follows:

EF0 and EF1 = weak tornado; EF2 and EF3 = strong tornado; EF4 and EF5 = violent tornado

(Source: The Tornado Project; Storm Data, National Climatic Data Center)

According to the National Weather Service (NWS), since 1950 the vast majority of tornadoes that occurred in the United States (approximately 74%) were classified as weak tornadoes (EF0 or EF1 intensity). Approximately 24% were classified as strong tornadoes (EF2 or EF3 intensity), and only 3% were classified as violent tornadoes (EF4 or EF5 intensity). Unfortunately, those violent tornadoes, while few in number, caused about 65% of all tornado-related deaths nationally. Strong tornadoes accounted for another 33% of tornado-related deaths, while weak tornadoes caused only 1% of tornado-related deaths. If the data prior to 1950 is examined, the percentage of deaths attributable to violent tornadoes climbs drastically. That is largely due to the fact that tornado forecasting and awareness programs were not yet established. As a result, it was much more likely for death tolls from a single tornado to reach several hundred.

Severe Thunderstorms and Tornadoes in Michigan

National Weather Service data indicates that Michigan has experienced 923 tornadoes and 242 related deaths during the period from 1950 to 2009, an average of 15 tornadoes, 4 tornado-related deaths per year, and property damages averaging more than \$15 million per year. The greatest number of tornadoes per year during that period occurred in 1974, with 39 tornadoes (8 of which occurred on April 3). The least number occurred in 1959, with only 2 tornadoes.

The following are brief synopses of these severe thunderstorm and tornado events from the 2012 Michigan Hazard Analysis;

Case: June 8, 1953 – Flint (Genesee County)

The June 8, 1953 Flint tornado, Michigan's worst storm to date (and classified as F5), is ranked 10th on the top ten list of single killer tornadoes that have occurred in the United States. It was also the last single tornado, until the May 2011 Joplin, MO EF5 tornado, to cause over 100 deaths in the U.S. The storm began its destructive path approximately two miles north of Flushing, moved east-northeast and devastated the north part of Flint before ending two miles north of Lapeer. The tornado obliterated homes on both sides of Coldwater Road for about one mile. It was there that most of the deaths occurred and the damage swath was over one-half mile wide. There were multiple deaths in at least 20 families. The final death toll stood at 115 in Flint alone, along with 785 injuries and total damage estimated at \$19 million. Several tornadoes touched down in other locations in Michigan on that day as well, resulting in an additional six deaths and 129 injuries statewide.

Case: April 3, 1956 – Hudsonville/Standale (Ottawa and Kent Counties)

In 1956, a category F5 tornado struck first at Hudsonville, then traveled northeast and plowed through both Ottawa and Kent Counties, killing 14 and injuring 200. (Some sources cite 17 deaths and 300 injuries.) Over 700 homes were destroyed. Numerous other tornadoes classified as F4 took their toll on other counties such as Manistee (2 killed, 24 injured), Grand Traverse, Benzie, and Allegan.

Case: April 11, 1965 - Southern and Central Michigan

The April 11, 1965 Palm Sunday tornado outbreak, which affected many other states in the Midwest, had a particularly devastating impact on Michigan. As the following table indicates, a total of 23 tornadoes touched down in 14 southern and central Michigan counties, resulting in 53 fatalities, 798 injuries, and \$51 million in damage to public and private property. Many of the tornadoes were rated F3 and F4 in intensity (strong and violent tornadoes), which undoubtedly contributed to the high death and injury tolls. Across the Midwest, this storm system spawned over 50 tornadoes that collectively killed 256 people and caused an estimated \$200 million in property damage. In addition to Michigan, the other states that were affected by the storms included Indiana, Illinois, Ohio and Wisconsin.

Case: March 27, 1991 – Central and Southern Lower Michigan

On March 27, 1991 severe thunderstorms and accompanying high winds caused considerable damage across a large portion of central and southern Lower Michigan, damaging homes, businesses, farms, and some public facilities. A total of three deaths and 27 injuries were attributed to the storms, and power was lost to 450,000 electrical customers (many for up to one week). The storms also produced numerous tornadoes across many Northern Lower Peninsula counties. Ogemaw, Iosco, and Alcona Counties were particularly hard-hit, and suffered a total of more than \$5 million in property damage from F3 tornadoes that traveled dozens of miles. Damage to homes and businesses was estimated at over \$30 million, with almost all of those losses covered by private insurance.

Case: July 13-15, 1995 – Statewide

From July 13-15, 1995 severe thunderstorms damaged numerous areas of Michigan. These storms, which produced winds up to 100 miles per hour with damaging golf ball-sized hail and severe lightning, damaged hundreds of structures and downed thousands of trees and power lines statewide. Damage was widespread, but the impacts were not severe or extensive enough in any one location to require supplemental disaster assistance. The strong winds produced widespread power outages. More than 400,000 electrical customers in southeast Michigan lost power due to the storms. In Roscommon County, over 100,000 trees were toppled by the winds. Wind gusts in that area were estimated in the 85-100 miles per hour range. One person was killed when her pontoon boat flipped over while attempting to return to its dock. One person was killed in Huron County when a barn collapsed between Bad Axe and Harbor Beach.

Case: July 2, 1997 – South-Central and Southeast Michigan

On July 2, 1997 a series of intense thunderstorms went through south-central and southeast Michigan, spawning severe straight-line winds, several tornadoes, and heavy rainfall. In some areas, the straight-line winds reached speeds of 70-100 miles per hour, causing significant structural damage and massive amounts of debris. The severe storms and the associated impacts caused a total of 16 deaths and 120 injuries. The tornadoes and straight-line winds downed thousands of trees and power lines, which knocked out power to 350,000 electrical customers. A Presidential Major Disaster Declaration was granted for the five county area most severely impacted by the storm event. (See the Tornadoes section for additional details on the tornadoes associated with these severe thunderstorms.)

Case: May 31, 1998 – Southern Lower Peninsula

On May 31, 1998 a derecho raced across the Lower Peninsula around 4:30am, producing widespread 60 to 90 mph wind gusts that caused extensive tree and structural damage and left over 861,000 homes and businesses without electricity. Consumers Energy reported the derecho as the most destructive weather event in its history, leaving over 600,000 of its customers without power. There were four storm-related fatalities and 146 injuries (mostly minor) reported in the state. Statewide, approximately 250 homes and 34 businesses were destroyed and 12,250 homes and 829 businesses were damaged. Damage estimates totaled over \$166 million. The highest wind gusts reached 120 to 130 mph in Spring Lake (Ottawa County) and Walker (Kent County), 100 mph in portions of Montcalm County (including Cody Lake and Stanton), and 90 mph in Rockford (Kent County) and Zeeland (Ottawa County). It took up to 10 days to fully restore power to certain areas, including the City of Walker and portions of Montcalm and Gratiot Counties. A Presidential Disaster Declaration was declared for 13 counties.

Case: October 6, 1998 - Big Rapids (Mecosta County)

On October 6, 1998 a series of strong thunderstorms traveled through several counties in central Lower Michigan. The City of Big Rapids, in Mecosta County, was hardest hit by the storms. Officials from the National Weather Service determined that an “F-1 mini tornado,” with winds reaching 80-90 miles per hour, had struck the Ferris State University campus, damaging several buildings and

numerous surrounding residences and vehicles. The storm also downed trees and power lines in the area, and injured seven persons. The storm track was approximately 150 feet wide and one mile long. The storm dumped nearly 3 inches of rain in the Big Rapids area, flooding many streets and parking areas. In nearby Clare County, the storm destroyed one home, damaged ten others, and injured three persons.

Case: July 18, 2010 – Kent County

On July 18, 2010 a NWS storm survey team concluded that a series of wet micro bursts across southwestern Kent County had produced wind gusts ranging from 60 up to 80 mph, brought down several trees and power lines in the Wyoming and Cutlerville areas, and flipped over and destroyed 8 wood and metal sheds at a store near Cutlerville. A tornado damaged a home and broke or uprooted several trees just northeast of Wayland. A roof was lifted off of a garage in Wyoming, a shed was destroyed, and some structural damage occurred to one home, due to wind gusts estimated to be as much as 80 mph.

Severe Thunderstorms and Tornadoes in Newaygo County

From 1950 – 2014, there have been over 75 Thunderstorm events or wind storms in Newaygo County causing five deaths, over \$2 million in property damage and \$50,000 in crop damage. With severe thunderstorms, there is also the threat of hail and lightning. Since 1950, there has been 42 hail events reported with \$295,000 in property damage and \$200,000 in crop damage, and there has been 1 lightning storm with \$4,000 in property damage when lightning struck a house and ignited a fire that damaged the upper story in the Fremont area.

Based on historical occurrence, Newaygo County experiences an estimated average of 4 or more thunderstorm events causing wind or lightning damage per year. Most severe thunderstorms within Newaygo County bring down trees, do minor damage to homes (siding, shingles, windows, etc) and bring down power poles. However, several significant storms include:

Case: April 6, 1997

An intense early spring low pressure system moving across the Great Lakes brought gale force westerly winds to all of Lower Michigan behind a strong cold front. Winds increased to sustained speeds of 35 to 45 miles per hour out of the west shortly after a frontal passage. Frequent wind gusts of 50 to 70 miles per hour were common. Damage estimates from the storm reached \$5.0 million. The winds downed trees and power lines and resulted in roof damage to area homes and businesses. Between 180,000 and 200,000 Consumers Energy customers lost power across the state Sunday evening. Nearly 70,000 customers were still without power Monday morning at 5 AM EDT.

Case: May 31, 1998

A strong line of thunderstorms moved through west and central Michigan. Michigan State Police EMD's Damage and Injury Assessment Report indicated \$1,237,000 in public damage costs, 48 homes destroyed, 690 homes damaged, and 15 businesses damaged across Newaygo County. Newaygo County declared a local state of emergency and was granted a Governor's disaster declaration to activate state assistance for the county. On June 24th, President Clinton granted a Major Disaster Declaration for Newaygo County, making federal disaster assistance available. The widespread and severe damage which occurred with the fast-moving line of thunderstorms during the

early morning hours of Sunday, May 31st, was caused primarily by strong straight-line winds and isolated wet microburst winds. This particular derecho, a widespread and long-lived, violent convectively induced straight-line windstorm that is associated with a fast-moving band of severe thunderstorms, formed in South Dakota on the evening of Saturday, May 30th, and raced eastward at 70 mph across Minnesota, Iowa, and Wisconsin, before striking Michigan's Lower Peninsula around 4:30 am EDT Sunday morning, May 31st. The derecho event produced widespread 60 to 90 mph wind gusts, which caused extensive tree and structural damage and left over 861,000 homes and businesses without electricity across Michigan's Lower Peninsula. Consumers Energy reported the derecho event was the most destructive weather event in its history, leaving over 600,000 of its customers without power

Case: April 11, 2001

Severe thunderstorms produced extensive damage across Newaygo County including roof damage from blown off shingles on a home 5 miles north of White Cloud at 11:57 p.m. It was reported to the National Weather Service that numerous trees were blown down along M-37 between Newaygo and White Cloud. Minor roof damage to a house occurred 3 miles northeast of Fremont. In White Cloud, 8 trees were blown down, each of which was 2 feet in diameter. Overall, the storm caused \$100,000 of property damage in Newaygo County.

Case: March 9, 2002

A very strong area of low pressure produced numerous reports of wind gusts over 60 m.p.h. across southern lower Michigan, with sustained winds of 30 to 40 m.p.h. High wind damage across the area ranged from downed trees and power lines to property damage. The storm caused \$485,000 of property damage across 19 counties including Newaygo County.

Case: October 30, 2004

A high wind event caused scattered downed trees and power lines due to gusty winds of around 58 to 60 m.p.h. The wind knocked out power to about 100,000 people statewide. Overall, the high winds caused \$1.2 million in property damage across 23 counties including Newaygo County.

Case: July 17, 2006

A Severe Thunderstorm with 60 mph winds knocked down numerous power lines and trees causing \$110,000 in property damage and \$10,000 in crop damage.

Case: October 4, 2006

A slow moving low pressure system and it's attendant cold front brought an early October severe thunderstorms episode with numerous reports of large hail and high winds of 52 m.p.h causing \$30,000 in property damage and \$10,000 in crop damage.

Case: June 8, 2008

Trained spotters reported that estimated wind gusts to 70 mph blew down many trees around the intersection of Peach and 120th. NWS storm survey teams determined that one EF1 tornado struck Osceola County. Another EF1 tornado struck Eaton County and continued into extreme western Ingham County before dissipating. Extensive damage was documented in association with both tornadoes. Severe thunderstorms also produced numerous reports of wind damage and large hail.

Case: July 11, 2011

Two separate bow echoes moved across western lower Michigan during the morning hours of July 11, producing numerous reports of wind damage. The first bow echo moved onshore north of

Muskegon shortly after daybreak. The second bow echo proved to be more destructive as it raced east from northern Illinois across far southern Lake Michigan and southern lower Michigan, resulting in numerous reports of downed trees and power lines. One person lost his life in Cutlerville when a tree fell in the garage he was in. Several trees and power lines were blown down in Grant, Croton and east of White Cloud. There was a 40 mile path of intermittent downburst win damage. Winds were estimated to be from 40-70 mph.

Case: July 30, 2012

Severe thunderstorms produced several reports of damaging wing gusts across portions of Newaygo County. Large trees fell on a home. Other large trees were also blown over. Two deaths were reported with this storm.



Case: April 12, 2014

Severe thunderstorms with damaging wind gusts developed near a warm front during the mid-afternoon hours of April 12th and continued through the late afternoon and evening hours. There were numerous reports of straight line wind damage with wind gusts of up to 75 to 85 mph. Hail as large as the size of quarters was also reported. Roofs were blown off multiple structures and campers were blown over. Hundreds of trees were blown down across southern and northern Newaygo County. This storm caused damage to hundreds of homes in Ashland, Grant, Ensley, Lilley, Home, and Barton Townships.



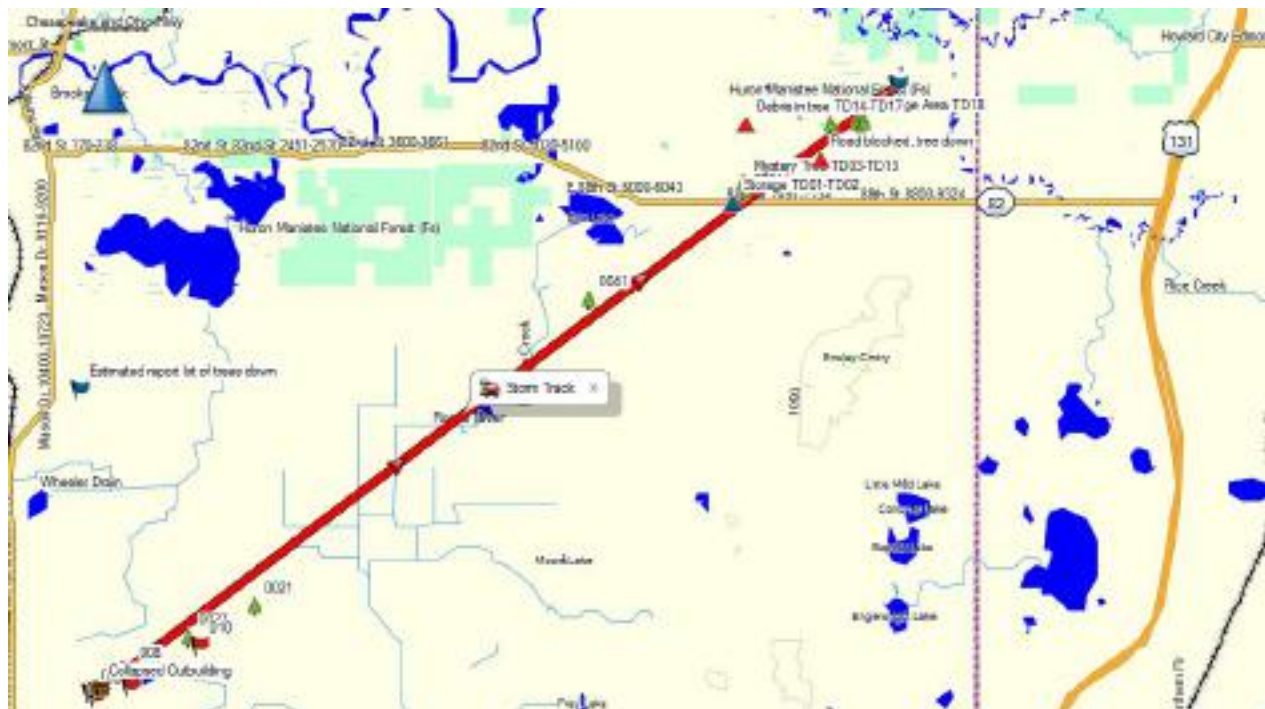
Since 1950, Newaygo County has experienced 13 tornadoes causing 3 injuries and 2 deaths, \$190,000 property damage, and \$10,000 crop damage from tornadoes since 1950. Two significant tornadoes in Newaygo County include a F2 Tornado that struck Newaygo on September 26, 1951 at 2100, injuring three and killing one. On June 17, 1975 another F2 Tornado struck the County killing one person.

Case: November 17, 2013

A severe thunderstorm produced multiple brief EF-0 tornadoes along a more than 50 mile path from Muskegon county northeast through Newaygo county into Mecosta county. The tornadoes were on the ground for very short periods of time. Mostly tree damage was incurred but there was also damage to several buildings and fences.



Damage path from November 17, 2013 EF0 Tornado



Other Tornado Events include:

F1 on 4/28/1964 at 1415 causing \$25,000 of property damage
 F1 on 8/10/1971 at 1410 causing \$3,000 of property damage
 F1 on 4/12/1979 at 1820 causing \$25,000 of property damage
 F1 on 5/25/1989 at 0043 causing \$25,000 of property damage
 F1 on 6/2/1990 at 1759 causing \$25,000 of property damage
 F1 pm 9/14/1990 at 0805 causing \$25,000 of property damage
 F0 on 3/27/1991 at 1702 causing no property damage
 F0 on 7/1/1999 at 1300 causing \$10,000 of property damage
 F0 on 8/1/2002 at 2105 causing \$2,000 of property damage in Grant
 F0 on 6/29/2005 at 1620 causing \$10,000 of crop damage
 EF0 on 11/17/13 at 1500 causing \$50,000 property of damage

The most limited capability with severe thunderstorms and high winds is local warning systems. Warning systems in Newaygo County are currently very limited in their ability to alert the major populace to an emergency of widespread potential. Outdoor warning sirens are designed to warn the public of a specific hazard such as tornado. They are only designed for outdoor notification and cover a 1-2 mile radius around the siren. In Newaygo County there are nine Tornado Sirens.

NEWAYGO TORNADO SIREN LOCATIONS

Location	Address	Activation	Population
Fremont DPW	805 Oak Street, Fremont	Tornado Only	4,224
Newaygo (North)	40 Centerline Road, Newaygo	Tornado Only	1,670
Newaygo (South)	355 Clay Street, Newaygo	Tornado Only	
Grant Fire Department	62 W State Street, Grant	Fire and Tornado	881
Croton Township	6464 S Croton-Hardy Drive, Newaygo	Fire and Tornado	1,200
Big Prairie Fire Department	2815 S Elm Street	Fire and Tornado	600
Lilley Fire Department	10730 N Prospect, Bitely	Fire and Tornado	400
White Cloud Fire Department	1020 Wilcox Ave, White Cloud	Fire and Tornado	1,420
Hesperia Village Hall	33 E Michigan Street, Hesperia	Tornado Only	954

Additional systems implemented to augment warning consisting of strategically placed tone alert monitors and Citywatch Alert and Notification System, similarly are of limited effectiveness. As such, the primary mass population warning system remains the media outlets of television and radio media coverage which covers a large percentage of the population, however, is limited due to requiring the target audience's to be already monitoring those channels. Adding to their limitation, these systems are reliant on fully functioning local infrastructure such as communications systems, electrical power, and telephone service.

The combination of high population concentrations, limited warning, and temporary/unfamiliar facilities results in increased vulnerability from thunderstorm hazards to the high number of people who attend any one of Newaygo County's popular special seasonal events. It is impractical to list and detail all of Newaygo County's facilities and resources that could significantly limit local response should they become a casualty of a severe thunderstorm effect. However, it is important to note that many of the vulnerabilities identified in other hazard sections are equally vulnerable to the effects of severe thunderstorm hazards due to its unpredictability, limited mitigation potential, and large magnitude. Three primary areas of vulnerability for Severe Thunderstorms within Newaygo County are:

1. Local Special Events
2. Campgrounds
3. Mobile Home Communities

Local Special Events within Newaygo County vulnerable for Severe Thunderstorms

City of Fremont	Month	Approximate Date	Daily Attendance
National Baby Food Festival	July	Third week, Wed – Sat	4,000
Newaygo County Agricultural Fair	August	First full week, Sat – Sat	1,200
Fremont Harvest Festival	October	First weekend, Sat - Sun	2,000
Fremont Farmers Market	June – Sept	Saturdays and Tuesdays	200
City of Newaygo	Month	Approximate Date	
Troutfest	April	Fourth Weekend	400
Memorial Day Festival	May	Memorial Day Weekend	1,000
PowerPaddle Canoe and Kayak Races	June	Father's Day Weekend	300
Newaygo County Kids Day	June	Father's Day Weekend, Sat	1,200
Newaygo Farm Market	July – Oct		500
July 4 th Celebration	July	July 4 th timeframe	1,000
Riverstock Festival	August	Second Weekend, Fri - Sun	1,000
Logging Festival	September	Labor Day Weekend	2,000
City White Cloud	Month	Approximate Date	
Winter Carnival	March	First Saturday	500
Kids Free Fishing Day	June	First Saturday	800
White Cloud Homecoming	June	Father's Day weekend, Fri - Sun	500
Pow Wow Days	August	First weekend, Sat - Sun	1,000
City of Grant	Month	Approximate Date	
Grant Festival	August	Third weekend, Fri - Sat	1,200
Village of Hesperia	Month	Approximate Date	
Hesperia Family Fun Festival	July	July 4 th Holiday, 4 days	1,500
Croton Township	Month	Approximate Date	
Hooking Up Heroes	June	Second Saturday	300
Croton Annual 4 th Celebration	July	July 4 th Holiday, 4 days	1,200
Hot Boat Weekend	September	First weekend after Labor Day	4,000

Campgrounds within Newaygo County

Name of Establishment	Address	City, State, Zip	Number of Sites
Big Bend Park	2000 Beech Avenue	White Cloud, MI 49349	230
Brooks Lake M.H. Club	2263 Spruell	Newaygo, MI 49337	15
Camp Calvary	7500 Pettit Drive	Newaygo, MI 49337	22
Chinook Campground	5471 W 112 th Street	Grant, MI 49327	168
Cindy Lou's Hide A Way	6245 N Comstock Road	Hesperia, MI 49421	22
Croton Dam Float Trips	5355 Croton Drive	Newaygo, MI 49337	24
Croton Township Campground	7683 Croton Hardy Drive	Newaygo, MI 49337	167
Dan Raymond Park	6971 W 112 th Street	Grant, MI 49327	164
Diamond Lake (aka Camp Swampy)	3351 N Mundy Road	White Cloud, MI 49349	51
Ed Henning County Park	500 Croton Drive	Newaygo, MI 49337	64
Fremont Lake Park	933 Cottage Grove	Fremont, MI 49412	66
Full Salvation Union Camp	879 E Yoder Lane	White Cloud, MI 49349	15
Green Jug Resort	1190 Bingham Avenue	White Cloud, MI 49349	15
Heights Hide A Way	4424 Parson Road	Fremont, MI 49412	13
Hess Lake Mobile Home	825 E 88 th Street	Newaygo, MI 49337	34
Leisure Time RV Park	4799 South Spruce	White Cloud, MI 49349	94
Little Switzerland Resort	254 Pickeral Lake Drive	Newaygo, MI 49337	80
Lonesome Lake Campground	318 W 18 Mile Road	Bitely, MI 49309	50
Mystery Creek Campground	9570 S Wisner Avenue	Newaygo, MI 49337	85
Newaygo State Park	2793 Beech Street	Newaygo, MI 49337	99
Oxbow Park	2973 Cottonwood	Newaygo, MI 49337	197
Pettibone Lake Park	490 W Pettibone Drive	Bitely, MI 49309	16
Pickeral Lakeside Campground	12666 N Woodbridge	Bitely, MI 49309	46
Salmon Run Campground	8845 Felch Avenue	Grant, MI 49327	80
Sandy Beach Campground	6926 30 th Avenue	White Cloud, MI 49349	200
Shi Lo Cum	2940 N Felch Avenue	White Cloud, MI 49349	35
Sportsman Park Campground	2500 Sportsman Drive	White Cloud, MI 49349	86
Timbers Edge Campground	4345 North Warner	Hesperia, MI 49421	50
White Cloud City Campground	680 Wilcox	White Cloud, MI 49349	98
Wolverine Service Club Recreation Area	Whitney Bridge Road	Newaygo, MI 49337	10
Woods and Water Campground	4495 South Spruce	White Cloud, MI 49349	334

Newaygo County has a high volume of wind vulnerable structures such as manufactured homes, trailers, and poorly constructed homes, they are spread over a significant distance due to the jurisdiction's rural nature.

NEWAYGO COUNTY MOBILE HOMES DISTRIBUTION		
COMMUNITY	# Mobile Homes	% Mobile Homes
Newaygo County *	5,284	100%
City of Fremont	254	4.8%
City of Newaygo	109	2.1%
City of White Cloud	56	1.1%
City of Grant	39	0.7%
Village of Hesperia	15	
Ashland Township	256	4.8%
Barton Township	145	2.7%
Beaver Township	116	2.2%
Big Prairie Township	807	15.3%
Bridgeton Township	296	5.6%
Brooks Township	394	7.5%
Croton Township	401	7.6%
Dayton Township	63	1.2%
Denver Township	272	5.1%
Ensley Township	222	4.2%
Everett Township	299	5.7%
Garfield Township	119	2.3%
Goodwell Township	77	1.5%
Grant Township	275	5.2%
Home Township	62	1.2%
Lilley Township	185	3.5%
Lincoln Township	154	2.9%
Merrill Township	172	3.3%
Monroe Township	86	1.6%
Norwich Township	43	0.8%
Sheridan Township	6	0.1%
Sherman Township	108	2.0%
Troy Township	85	1.6%
Wilcox Township	183	3.5%

* total of cities and townships; village total
already included with township totals

source:
U.S. Census
Bureau



SEVERE WINTER WEATHER

Severe Winter Weather

A storm that generates sufficient quantities of snow, ice, or sleet to result in hazardous conditions and/or property damage. These storms are often accompanied by high winds, cold temperatures, and low visibility. Severe winter weather hazards include snowstorms, blizzards, extreme cold, ice, and sleet storms.

Hazard Description

While the danger from winter weather varies across the country, nearly all Americans, regardless of where they live, are likely to face some type of severe winter weather at some point in their lives. Winter storms can range from a moderate snow over a few hours to a blizzard with blinding, wind-driven snow that lasts for several days. Many winter storms are accompanied by dangerously low temperatures and sometimes by strong winds, icing, sleet and freezing rain.

Heavy snows can shut down towns and cities for a period of a few days if snow is persistent and cannot be cleared in a timely fashion. Roof failures may occur as the weight and volume of snow cause damage to homes and buildings. Urban areas are especially susceptible to outages and problems with snow removal, while rural areas may have inaccessible roads for some time but have residents that are more prepared to handle power outages and temporary isolation. Motorists and passengers in cars can be stranded in rural areas and die of exposure because of inadequate preparation for conditions. One of the primary concerns is the winter weather's ability to knock out heat, power and communications services to your home or office, sometimes for days at a time. Heavy snowfall and extreme cold can immobilize an entire region.

The following are specific severe winter weather hazards:

Snowstorms and Blizzards:

Snowstorms are defined as a period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility. Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles of snow which 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. 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. Since winter storms tend to move from west to east, the western parts of the state usually have greater amounts of snow than the eastern parts.

Ice and Sleet Storms:

An ice storm is 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 small frozen rain drops (ice pellets) that 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 a surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, power may be out for several days, resulting in significant economic losses and the disruption of essential services in affected communities. Often times, ice storms are accompanied by snowfall, in which the ice is camouflaged and covered up by snow, creating treacherous transportation conditions. Both storms occur when the temperature is close to 32°F, but are far more severe when the temperature is in the 20s.

Extreme Cold

Prolonged periods of very low temperatures, often accompanied by other extreme meteorological conditions such as high winds, etc. 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.

Hazard Analysis

Most of the severe winter weather events that occur in Michigan have their origin as Canadian and Arctic cold fronts that move across the state from the west or northwest, although some of the most significant winter storms have their origins from the southwest, in combination with Arctic air masses. Winter storm hazards plague Michigan annually from November to March, with the state being vulnerable to snowstorms and ice and sleet storms. No area of the state is immune to severe winter conditions that can clog or paralyze the transportation network, cause widespread power outages, and slow normal daily activities to a standstill. Each community should be prepared for the harsh landscape created by snow and ice extremes.

Severe Winter Weather in Michigan

Michigan sees a major regional or statewide snowstorm approximately every 5 years. Local events are more frequent. There is an average of about 1.6 major storm events in Michigan each year. Many ice storm deaths are actually caused by automobile accidents, heart attacks from overexertion, downed power lines, carbon monoxide poisoning, and other secondary effects that may be difficult to distinguish from other causes. In terms of property damage, major ice storm events have, according to NCDC records, caused more than \$200 million in damages since 1993 (averaging \$16.4 million per year), and the April 2003 ice storm was particularly severe, reportedly causing \$161 million in damage.

The following are brief synopses of significant severe winter weather events in Michigan since 1976 as outlined from the 2012 Michigan Hazard Analysis;

Case: January 26-28, 1967 – Mid-Michigan

From January 26-28, 1967 a snowstorm dumped 24 inches of snow in Mid-Michigan, causing Lansing and other area communities to virtually come to a standstill. The storm contributed to 17 deaths across the region. Hundreds of motorists were stranded in their cars and had to be rescued by the National Guard and local law enforcement. The heavy snowfall caused the collapse of roofs on numerous homes and businesses, and shut down public transportation services. Several public shelters were opened to accommodate those stranded by the snow or without heat or electricity due to downed power lines.

Case: March 2-7, 1976 - Central Lower Michigan

During the period from March 2-7, 1976 an ice storm with accompanying high winds and tornadoes struck a 29 county area in the central Lower Peninsula. This storm, one of the worst to ever hit the state, caused over \$56 million in damage, and widespread power outages. The storm impacts were so severe that a Presidential Major Disaster Declaration was granted for the 29 affected counties, to assist in the recovery from the storm.

Case: January 26-27, 1978 – Statewide

On January 26-27, 1978 a severe snowstorm struck the Midwest, and Michigan was at the center of the storm. Dubbed a “white hurricane” by some meteorologists, the storm measured 2,000 miles by 800 miles and produced winds with the same strength as a small hurricane and tremendous amounts of snow. In Michigan, up to 34 inches of snow fell in some areas, and winds of 50-70 miles per hour piled the snow into huge drifts. At the height of the storm, it was estimated that over 50,000 miles of roadway were blocked, 104,000 vehicles were abandoned on the highways, 15,000 people were being cared for in mass care shelters, and over 390,000 homes were without electric power. In addition, 38 buildings suffered partial or total roof collapse. Two days after the storm, over 90% of the state's road system was still blocked with snow, 8,000 people were still being cared for in shelters, 70,000 vehicles were stranded, and 52,000 homes were still without electricity. This storm resulted in a Presidential Emergency Declaration for the entire state, to provide assistance with snow clearance and removal operations.

Case: January 1, 1985 - Southern Lower Michigan

On January 1, 1985 a severe ice storm struck a 13 county area in the southern Lower Peninsula. Freezing rain accumulating up to one inch in thickness downed tree limbs, trees and power lines, blocked roads, and caused widespread power outages. There were three deaths and eight injuries directly related to the ice storm. Approximately 13,000 homes and 260 businesses sustained damage or were destroyed, with losses estimated at nearly \$25 million. Another 160 businesses lost inventory as a result of the storm damage and power outages. Over 430,000 electrical customers were without power, some for as long as 10 days. At the height of the power outage, 28 public shelters were opened to provide shelter to nearly 1,000 residents without power or heat. Several nursing homes and adult foster care facilities had to be evacuated due to the loss of power and heat. Total public and private damage from this ice storm was estimated at nearly \$50 million. A Governor's Disaster Declaration was issued to mobilize state resources to assist in the storm response and recovery.

Case: January 2-3, 1999 – Southern Lower Michigan

In the early morning hours of January 2, 1999 a severe winter storm moved across the western and southern portions of Michigan. The storm grew in intensity and size, producing record or near-record snowfall that affected much of the southern two-thirds of the Lower Peninsula by the late evening hours of January 3. High winds and frigid temperatures created blizzard conditions that lasted until late in the day on January 4 in some areas. Subsequent storms over the next several days dumped an additional foot of snow in many areas of the state, resulting in snowfall of historic proportions in several Michigan communities. Combined, these winter storms produced the worst winter conditions to hit Michigan since the statewide blizzard that occurred in January 1978 (see description above). The effects of the blizzard on the city of Detroit were the focus of national media attention. Detroit and surrounding communities received nearly two feet of snow during the blizzard. The unusually intense snowfall, coupled with the frigid temperatures and blowing and drifting snow, severely hampered snow removal operations within Detroit. The City's inability to plow residential streets created public health and safety concerns in many areas due to lack of access for police, fire, and other emergency vehicles. The unplowed streets and sidewalks also forced the Detroit school system to close for several days, idling more than 180,000 students. The heavy snowfall collapsed numerous commercial building roofs in Detroit and throughout southeast Michigan. In addition, ice dams on residential roofs were a widespread problem, damaging tens of thousands of structures. The record snowfall also hampered mail delivery, affected the ability of residents to travel to and from work, and negatively impacted business activity and tourism. At Detroit Metropolitan Airport, the severe winter conditions forced the cancellation of hundreds of flights over the three-day period from January 2-4, stranding thousands of travelers without adequate accommodations. Numerous planes landed at the airport, only to sit on the runway apron for hours at a time – unable to unload passengers because the snow could not be cleared from the gates fast enough or there simply were not enough open gates or personnel to handle the large influx of planes. This situation also drew the attention of the national media and cast a negative shadow over the airline and airport operations. A Presidential Emergency Declaration was granted for the 31 Michigan counties that received record or near-record snowfall, making available Federal snow removal assistance under the Federal Emergency Management Agency's (FEMA) Public Assistance Grant Program.

Case: April 3-5, 2003 - West and Central Lower Michigan

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 trees and limbs and hundreds of power lines. Many people across the area lost power for several days and some who lived in outlying areas were without power for a week. The ice storm resulted in several million dollars worth of damage across the area. Up to an inch of ice was reported in the Lansing area, and numerous reports of a quarter to one inch of ice were received in the vicinity of I-96. It was one of the biggest ice storms to affect lower Michigan in the last 50 years.

Case: February 16, 2006 – Central Lower Michigan

A major ice storm affected much of central Lower Michigan. There were numerous reports of ice accumulations up to one inch. This glazing caused widespread tree damage and thousands of power outages. Some people were without power for several days, resulting in the opening of numerous temporary shelters due to the extreme cold in the wake of the ice storm. Total damages were in excess of \$2 million.

Severe Winter Weather in Newaygo County

Newaygo County is frequently faced with severe snow and/or ice storms, and periods of extremely low temperatures. Based on historical occurrence, Newaygo County experiences an estimated average of 4 or more events per year. Although the majority of the population has grown accustomed to these emergencies and prepare appropriately, the hazards still pose significant risk to the jurisdiction due to its frequency, intensity, wide area effect, and long duration. The combination of these health and economic factors have resulted in snow and ice storms emergencies and account for 4 of Newaygo County's 7 Presidential Declarations of Emergency/Disaster since 1953.

- ◆ March 20, 1976, Ice Storm
- ◆ January 26-31, 1977, Blizzard
- ◆ January 26-27, 1978, Blizzard
- ◆ January 2-15, 1999, Blizzard

From 1950 - 2008, there has been 70 total winter weather events totaling \$12,325,000 in property damage. Several significant storms include:

Case: January 12, 1993

Snow began across central Lower Michigan late in the evening of the 12th and quickly spread north across northern Lower Michigan during the early morning hours of Wednesday the 13th. The combination of heavy snow, northeast winds of 15 to 25 mph and temperatures in the lower to mid 20s created near blizzard conditions at times most of Wednesday. The snow tapered to flurries by early evening hours of Wednesday with total snowfall ranging from six to twelve inches. The heavy snow led to downed power, telephone and cable T.V lines across this area. Almost 20,000 people lost power from the heavy snow. Numerous traffic accidents occurred with one serious injury. Most of the schools were closed over central Lower Michigan due to the heavy snowfall. This storm resulted in \$50,000 in damage.

Case: April 2, 1993

A late season winter storm was tracked across central Indiana during the evening hours of March 31st and through central Ohio during the overnight hours of April 1st. This storm brought a wintry mix to Lower Michigan on April 1st and 2nd. Rain began across most of lower Michigan during the evening hours of March 31st with only flurries reported across northeastern Lower Michigan. Rain changed to freezing rain across central Lower Michigan from Bay City, Saginaw and Midland to Lansing, and Flint after midnight on the 1st. All the rain and freezing rain across east central and southeast Lower Michigan changed to snow after sunrise on the 1st as the precipitation remained all snow across northeast lower Michigan. By the time the snow ended on the 2nd, a general 4 to 7 inch snowfall occurred across the eastern one-third of Lower Michigan. The combination of wind gusts to 40 mph and ice accumulations of up to 0.25 inches caused numerous power outages in central lower Michigan in the Tri-city area of Bay City, Midland and Saginaw. Up to 57,000 customers were without power. Numerous schools also were closed across these areas due to the icy road conditions. This storm resulted in \$50,000 in damage.

Case: January 29, 1994

Snow developed over southwest Lower Michigan just after Midnight on the 27th. The snow mixed with, then changed to, sleet and freezing rain. Overnight on the 27th and into the morning hours of the 28th, occasional rain continued over the southern half of Lower Michigan while occasional

freezing rain continued over the north half of Lower Michigan. During the rest of the 28th, the area of freezing rain changed to snow across Lower Michigan. Over central and northern Lower Michigan the snow became heavy by mid afternoon. Snowfalls of six to eight inches were common over the north half of Lower Michigan. As for ice accumulations over Lower Michigan during the freezing rain, around a quarter inch accumulated over the south third of lower Michigan, from 0.50 to 0.80 inches accumulated over central and northeast Lower Michigan. This resulted in numerous outages. Detroit Edison reported 50,000 people affected by power outages. Consumers Power reported 2,000 customers without power. More than 150 schools canceled classes across the state. This storm resulted in \$5 Million in damage across the State.

Case: October 26, 1997

An early season winter storm which tracked south of Michigan, across Indiana and Ohio, produced a band of heavy, wet snow across much of southwest, south central, and central Lower Michigan. This was the first measurable snowfall of the season and because of significant foliage still left on the trees, limbs and branches were more vulnerable to bending and snapping under the added weight of the heavy snow. This resulted in numerous power outages and reports of property damage from downed trees. At the height of the storm, which occurred late Sunday evening, October 26th into early Monday morning, October 27th, power outages affected 333,000 utility customers statewide. Of these, approximately 195,000 occurred in the Grand Rapids metropolitan area alone. Total property damage was estimated at \$1.2 million area-wide. The hardest hit areas included the northwest and northeast sections of the city of Grand Rapids, northern Kent County including Sparta and Rockford, and the city of Kalamazoo. Because of widespread power outages, some of which lasted between 36 and 72 hours, the American Red Cross opened emergency shelters to take care of senior citizens and others vulnerable to the cold. The storm closed many area schools and businesses on Monday, October 27th. Many remained closed on October 28th due to power still being out. Many weather-related traffic accidents were reported during the storm, with many cars in ditches and skidding off the road. Large tree limbs falling on vehicles resulted in significant property damage, much of which was not available in damage cost estimates. No injuries were directly related to the storm, however several injuries and one fatality occurred in traffic accidents judged to be weather-related. Snowfall accumulations ranged from 2 to 8 inches. The heaviest snow fell in a band from northeast Ottawa County across northwest Kent County, western Montcalm County, eastern Mecosta County, into eastern Osceola County. This storm resulted in \$1.5 million in damage across the State.

Case: April 5, 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 trees and limbs and hundreds of power lines. Many people across the area lost power for several days and some people who live in outlying areas were without power for a week. The ice storm resulted in several million dollars worth of damage across the area. The ice storm came in three stages. The first period of freezing rain during the afternoon hours of the 3rd resulted in up to a quarter of an inch of ice across Osceola and Isabella counties, in central lower Michigan. The second period of freezing rain came during the nighttime hours of the 3rd into the morning hours of the 4th, when ice accumulations of a quarter to three quarters of an inch occurred across much of central lower Michigan, north of Grand Rapids. The heaviest period of freezing rain with thunderstorms came during the very late afternoon and evening hours, with the counties in the vicinity of I-96 receiving the heaviest ice accumulation. Up to an inch of ice was reported in the Lansing area, and numerous reports of a quarter to as much as an inch of ice were received in the vicinity of I-96. This was one of the biggest ice storms to affect lower Michigan in the last 50 years. When all was said and done, most counties across central and southern lower Michigan ended up receiving a total of at least a half an inch of ice, with reports of total ice

accumulation of an inch quite common, and even up to near an inch and a half of ice in some locations. This storm resulted in \$4.9 million in damage across the State.

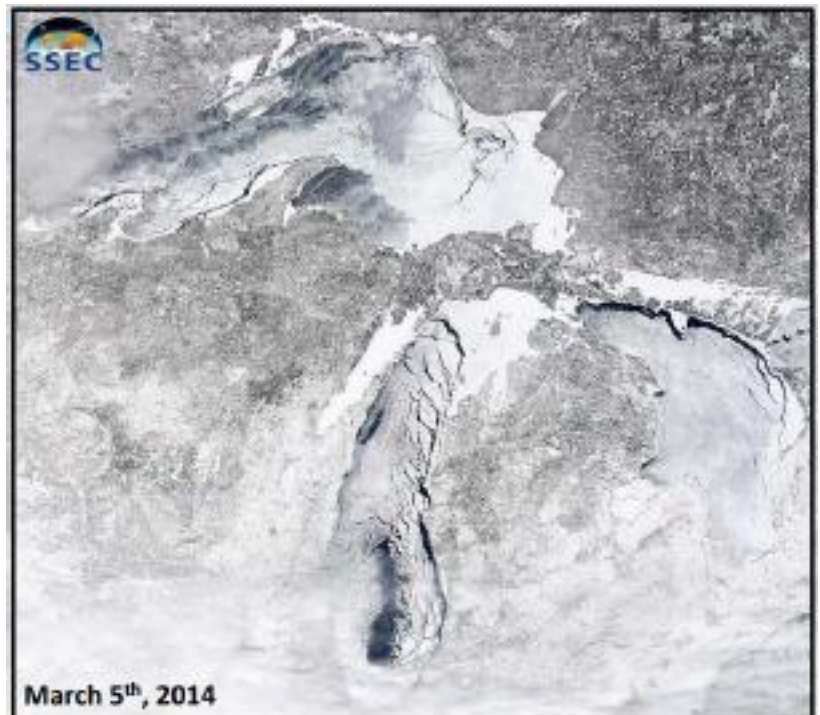
Case: February 16, 2006

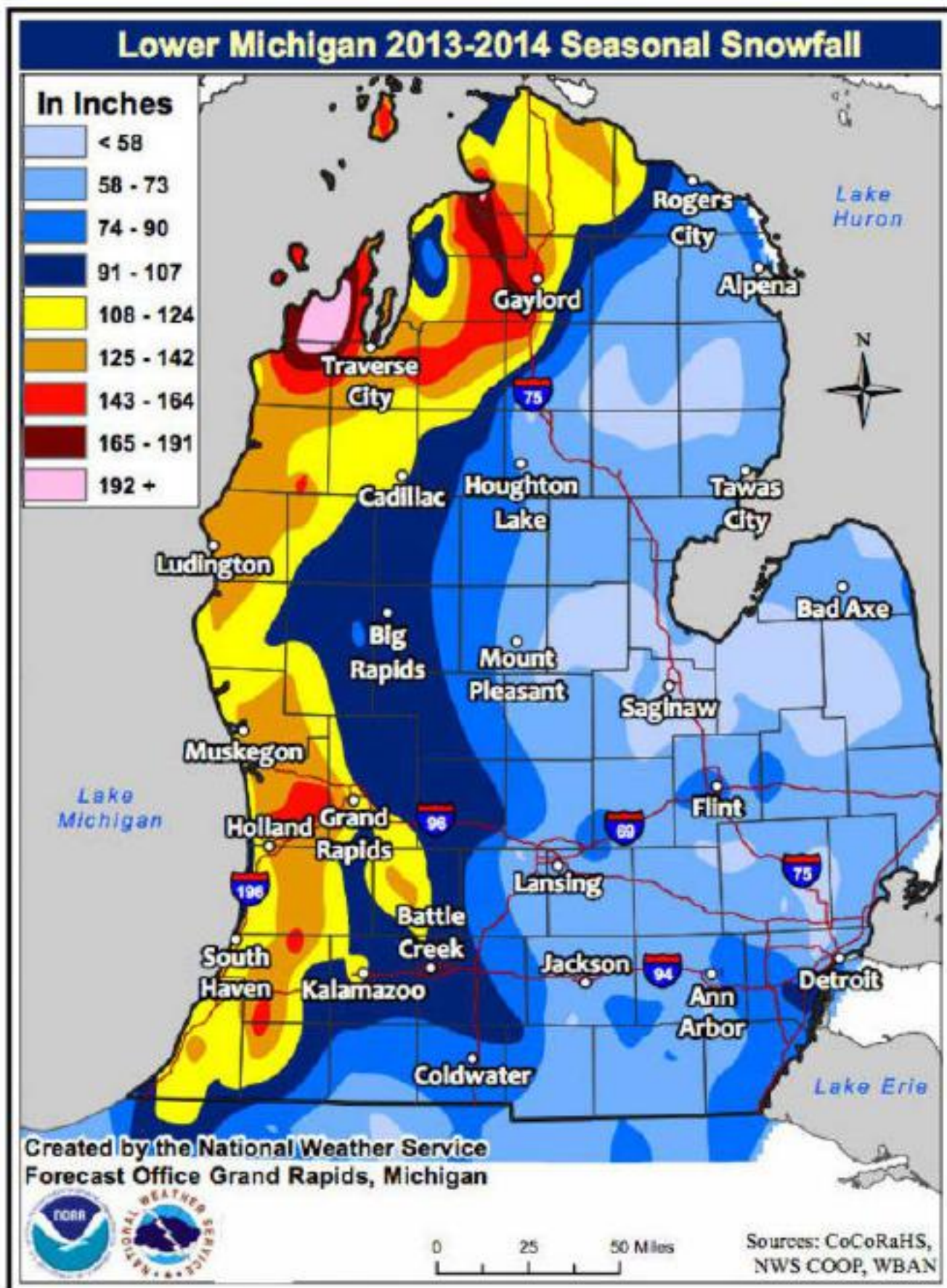
A major ice storm developed across much of central lower Michigan producing around a quarter to half inch of ice accumulation between Route 10 and I-96. Thousands of homes lost power from just north of Grand Rapids to Lansing north to Route 10 and many areas did not have power for three to five days. There were numerous reports of downed trees and power lines all across that area. Just north and northwest of that area precipitation mainly fell in the form of snow, and six to eight inches of snow fell across northern Mason and Lake counties. This storm resulted in \$1 million in damage across the State.

Case: Winter of 2013-2014

The winter of 2013-2014 broke many temperature and snow records for Western Michigan. Overall, Grand Rapids had its second snowiest winter in records dating back to the late 1800s with 110.7 inches of snowfall. This winter season also went down on the record books for being one of the coldest winters. According to Wikipedia the 2013–14 North American cold wave was an extreme weather event extending from December 2013 to April 2014, and was also part of an unusually cold winter affecting parts of Canada and the Eastern United States. The event consisted of 2 episodes, the first one in December 2013 and the second in early 2014, both caused by southward shifts of the North Polar Vortex. Record cold temperatures also extended well into March.

From December 6–10, the first wave of record-breaking cold air pushed into the Eastern U.S., before the temperatures returned to a more stable range. On January 2, an Arctic cold front initially associated with a nor'easter, tracked across Canada and the United States, resulting in heavy snowfall. Temperatures fell to unprecedented levels, and low temperature records were broken across the United States. Business, school, and road closures were common, as well as mass flight cancellations. Altogether, more than 200 million people were affected, in an area ranging from the Rocky Mountains to the Atlantic Ocean and extending south to include roughly 187 million residents of the Continental United States.





Although not as dramatic, smaller and more frequent events also cause regular concern to Newaygo County due to their immediate effects on the jurisdiction and its infrastructure.

First, the county's rural nature makes travel limitations an immediate and major concern. Even relatively small amounts of snow and ice can quickly limit travel on main routes, make secondary routes difficult to navigate, and render private roads virtually impassible. Emergency units such as ambulance, fire services, and law enforcement resources are often overwhelmed due to the response challenges resulting from the slower and more hazardous emergency responses to the dramatically increased number of weather related emergency calls.

M-37, M-20, and M-82 are utilized as the main trunklines and primary traffic routes through Newaygo County by commuters and to/from its major communities by residents. These highways are heavily relied upon for routine and emergency travel. During severe winter events, it becomes even critical that these routes remain navigable for emergency services and travelers. As state highways, primary responsibility for maintenance of these roadways fall upon the Michigan Department of Transportation who has contracted with Newaygo County Road Commission to maintain these roads.

Although not primary routes for commuters, primary county roads are heavily relied upon by citizens and emergency agencies for inter-county travel and access to the primary highways. During severe winter emergencies, these become critical as many secondary roads can easily become impassible by passenger and emergency vehicles. As county roadways, the responsibility for maintenance of these routes belongs to the Newaygo County Road Commission. When severe winter weather occurs, these routes are no longer maintained and focus turns to keeping the main trunklines open.

Secondary roads through Newaygo County provide critical traffic routes for citizens from the various communities and areas to access the primary and secondary routes. As emergency locations are unpredictable, it becomes a priority to maintain these roads during severe winter events to the best resources allow as many tertiary roads become unusable to passenger and emergency vehicle traffic.

Secondly, the nature of snow and ice storms frequently results in equally severe secondary emergencies. These include infrastructure failures, transportation accidents, and structure fires. Although these secondary effects are discussed in their independent sections, it is important to note that their response severity would be magnified by the primary existing snow and ice conditions.

Finally, the extended duration and large area of effect can easily strain the community's economic and financial resources due to travel route maintenance, loss of work and school days, and limited consumer activity. Periods of extremely low temperatures often accompany snow and ice storms, however, are also an independent hazard of unique nature. Of primary concern is the immediate health potential to lethally affect vulnerable persons such as the elderly, disabled or ill, and young children. This is complicated due to the fact, that during such periods, many fixed income families begin to rely on auxiliary and unsafe heating devices resulting in increases in residential structural fires and carbon monoxide poisonings. Longer duration events can additionally overcome local human services agencies such as the American Red Cross, Department of Human Services (formally FIA), and local churches who provide heating assistance to needing families.

*Age Distribution within Newaygo County and the State of Michigan**Source: 2010 U.S. Census, American Fact Finder*

AGE CATEGORY	Newaygo County		Michigan	
	Total	Percentage	Total	Percentage
	48,460		9,883,640	
Under 5 years	3,018	6.2%	596,286	6.0%
5 to 9 years	3,230	6.7%	637,784	6.5%
10 to 14 years	3,533	7.3%	675,216	6.8%
15 to 19 years	3,594	7.4%	739,599	7.5%
20 to 24 years	2,616	5.4%	669,072	6.8%
25 to 29 years	2,453	5.1%	589,583	6.0%
30 to 34 years	2,509	5.2%	574,566	5.8%
35 to 39 years	2,712	5.6%	612,493	6.2%
40 to 44 years	3,120	6.4%	665,481	6.7%
45 to 49 years	3,897	8.0%	744,581	7.5%
50 to 54 years	3,821	7.9%	765,452	7.7%
55 to 59 years	3,438	7.1%	683,186	6.9%
60 to 64 years	2,991	6.2%	568,811	5.8%
65 to 69 years	2,415	5.0%	418,625	4.2%
70 to 74 years	1,954	4.0%	306,811	5.8%
75 to 79 years	1,345	2.8%	244,085	2.0%
80 to 84 years	958	2.0%	200,855	2.0%
85 years and over	856	1.8%	191,881	1.9%
Median Age	40.9		38.9	

Skilled Nursing and Assisted Living Facilities

Facility Name:		<u>Fountain View Retirement Village Fremont</u>
Phone Number:		(231) 924-5050
Address:		102 Hillcrest Ave, Fremont MI 49412
Contact Name:		<u>Director of Resident Care-Mary DuBious</u>
After Hours Number:		<u>(231) 924-5050</u>
Capacity:		20 Beds
Services:		Aged - Physically Handicapped
Notes:		Generated Facility

Facility Name:		<u>Transitional Health Services</u>
Phone Number:		(231) 924-3990
Address:		4554 West 48 th Street, Fremont MI 49412
Contact Name:		<u>Tina Kramer</u>
After Hours Number:		<u>616-690-0632</u>
Capacity:		129 Beds
Services:		Skilled Nursing and Secured Dementia Facility
Notes:		Generated Facility, Connected to Fire Department Alarm

Facility Name:		<u>Newaygo County Medical Care Facility</u>
Phone Number:		(231) 924-2020
Address:		4465 West 48 th Street, Fremont MI 49412
Contact Name:		<u>Donna Jacobs, Administrator</u>
After Hours Number:		
Capacity:		116 Beds
Services:		Skilled Nursing and Assisted Living Facility
Notes:		

Facility Name:		<u>Fountain View Retirement Village Grant</u>
Phone Number:		(231) 834-8202
Address:		50 South Maple Street, Grant MI 49327
Contact Name:		<u>Admin-Sue Kruithoff</u>
After Hours Number:		<u>231-629-7018</u>
Capacity:		38 Beds
Services:		Aged – Alzheimer's. Assisted Living
Notes:		

Newaygo County AFC Homes and Nursing Homes

AFC Homes	Phone	Address	City	Capacity
Countryside	(231) 924-3352	6116 W Pat Street	Fremont	6
Deerfield	(231) 924-6790	209 Meadow Hill Lane	Fremont	12
Rex Street Home	(231) 924-5268	1034 Rex Street	Newaygo	6
Dallas Darling Home	(231) 924-4775	7003 Baldwin Road	Newaygo	12
Fishers AFC	(231) 652-9201	1032 E 88th Street	Newaygo	2
Kilchermans AFC	(231) 834-2936	7 Aurthur Street	Grant	6
Peaceful Acres AFC	(616) 636-4777	6135 112 th Street	Howard City	12
Oakview AFC	(231) 689-6832	979 S Oakview St	White Cloud	6
Purdy's AFC	(231) 689-0620	2930 1 Mile Road	White Cloud	6
Morgan Street	(231) 689-0034	104 Morgan Street	White Cloud	6
Tender Care Manor III	(231) 793-6014	1086 Court Street	White Cloud	4
Pinewood Manor	(231) 745-7061	8919 North 26 th St	Bitely	6
The Masters Home AFC	(231) 689-0022	240 N Webster	White Cloud	6
Woodland Park Manor	(231) 745-7374	8835 North 21 st Ave	Bitely	6
				96

Apartment

Facility Name: <u>Greenfield Manor</u>	
Phone Number:	(231) 924-9219 or (231) 924-2960
Address:	228 Dewitt Ave, Fremont MI 49412
Contact Name:	Greg Johnson
After Hours Number:	(800) 225-7982
Capacity:	26 Total Units
Unit Description:	22 one bedroom, 4 two bedroom
Notes:	Max: 60 People,

Facility Name: <u>Meadow Hills North Apartments</u>	
Phone Number:	(231) 924-3729
Address:	216 Meadow Hills Lane, Fremont MI 49412
Contact Name:	
After Hours Number:	(231) 924-3729-Will go into answering service after hours
Capacity:	48 Total Units
Unit Description:	4 three bedroom, 24 one bedroom, 20 2 bedroom
Notes:	Family Population

Facility Name: <u>Peachtree Village Apartments</u>	
Phone Number:	(231) 924-5447
Address:	1102 State Street #10, Fremont MI 49412
Contact Name:	Adam Peterson
After Hours Number:	(800) 225-7982
Capacity:	20 Total Units
Unit Description:	12 one bedroom, 8 two bedroom
Notes:	Max: 56 People, Family Population

Facility Name: <u>Apple Ridge Apartments</u>	
Phone Number:	(231) 924-9219 or (231) 924-2960
Address:	318 DeWitt Ave, Fremont MI 49412
Contact Name:	Greg Johnson
After Hours Number:	(800) 225-7982
Capacity:	32 Total Units
Unit Description:	16 one bedroom, 16 two bedroom
Notes:	Max: 96 People

Facility Name: Oak Creek Apartments	
Phone Number:	(231) 924-5447
Address:	1101 W Main Street, Fremont MI 49412
Contact Name:	Adam Peterson
After Hours Number:	(800) 225-7982
Capacity:	32 Total Units
Unit Description:	20 one bedroom, 12 two bedroom
Notes:	Max: 88 People

Facility Name: Locust Hill Apartments	
Phone Number:	(231) 924-5283
Address:	1047 State Street, Fremont MI 49412
Contact Name:	Dan (Resident Manager)
After Hours Number:	
Capacity:	40 Total Units
Unit Description:	40 two bedroom
Notes:	Max: 160 People, Family Population

Facility Name: Stoney Pillars Apartments	
Phone Number:	(231) 519-2170
Address:	305 N Stone Road, Fremont MI 49412
Contact Name:	Charles Dekryger
After Hours Number:	924-5665
Capacity:	15 Total Units
Unit Description:	15 two bedroom
Notes:	

Facility Name: Wedgewood Apartments	
Phone Number:	(231) 924-3729
Address:	216 Meadowhills Lane, Fremont, MI (Managed at Meadowhills North Apartments)
Contact Name:	
After Hours Number:	(231) 924-3729
Capacity:	20 Total Units
Unit Description:	20 one bedroom
Notes:	Elderly & Disabled

Facility Name: <u>Daisybrook Apartments</u>	
Phone Number:	(616) 675-5574
Address:	512 N Darling, Fremont MI 49412
Contact Name:	Richard or Wanda Kent
After Hours Number:	(616) 437-3798
Capacity:	12 Units Total
Unit Description:	4 two bedroom apartments, 4 two bedroom townhouse, 4 houses
Notes:	3 buildings

Facility Name: <u>Autumn Grove Apartments</u>	
Phone Number:	(231) 652-4410
Address:	620 West Brooks Street, Newaygo MI 49337
Contact Name:	
After Hours Number:	
Capacity:	24 Total Units
Unit Description:	8 one bedroom, 16 two bedroom
Notes:	Max: 80 People, Family population

Facility Name: <u>Edgeview Apartments</u>	
Phone Number:	(231) 652-7757
Address:	290 East 82 nd Street, Newaygo MI 49337
Contact Name:	
After Hours Number:	
Capacity:	36 Total Units
Unit Description:	16 one bedroom, 16 two bedroom, 4 three bedroom
Notes:	Max: 120 People, Family Population

Facility Name: <u>Woodview Apartments</u>	
Phone Number:	(231) 652-1671
Address:	782 W Brooks Street, Newaygo MI 49337
Contact Name:	Number below goes to live operator after hours
After Hours Number:	616-887-5032
Capacity:	66 Total Units
Unit Description:	61 one bedroom, 5 two bedroom
Notes:	Max: 142 People, 62 or older unless disabled

Facility Name:	<u>Wildwood North Apartments</u>
Phone Number:	(231) 652-1500
Address:	157 E Barton Street #9, Newaygo MI 49337
Contact Name:	Roger & Jan Cougar (Site Manager)
After Hours Number:	(231) 652-1500
Capacity:	18 Total Units
Unit Description:	18 one bedroom
Notes:	Max: 36 People, 62 or older unless disabled

Facility Name:	<u>Pine Lake Village Apartments</u>
Phone Number:	(231) 652-7900
Address:	137 W Pine Lake Dr, Newaygo MI 49337
Contact Name:	Leslie Siuda
After Hours Number:	(616) 309-3181 Bill Weirga
Capacity:	112 Total Units
Unit Description:	3 one bedroom, 85 two bedroom, 24 three bedroom
Notes:	Max: 490 People, Family Population

Facility Name:	<u>Grant Community Senior Center Housing</u>
Phone Number:	(231) 834-5352
Address:	10 N Lake Street, Grant MI 49327
Contact Name:	Number below goes to live operator after hours
After Hours Number:	616-887-5032
Capacity:	24 Total Units
Unit Description:	
Notes:	Manager: Nash & Company 616-887-5032

Facility Name:	<u>Dwelling Zone Apartments</u>
Phone Number:	(231) 834-0006
Address:	226 S. Endeavor Blvd, Grant MI 49327
Contact Name:	Kim
After Hours Number:	
Capacity:	46 Total Units
Unit Description:	one bedroom, two bedroom
Notes:	Family Population

Facility Name:	<u>Lakeview Apartments</u>
Phone Number:	(231) 652-1232
Address:	136 N Lake Street, Grant MI 49327
Contact Name:	Wyn & Pat Wyn
After Hours Number:	<u>(231) 652-4553</u>
Capacity:	9 Total Units
Unit Description:	8 two bedroom, 1 studio
Notes:	Max: 33 People, Family Population

Facility Name:	<u>Sand Hill Apartments</u>
Phone Number:	(231) 689-1710
Address:	92 N Lester Street, White Cloud MI 49349
Contact Name:	Mamie Adcock-Site Manager
After Hours Number:	<u>231-250-1430</u>
Capacity:	24
Unit Description:	
Notes:	Elderly and disabled

Facility Name:	<u>White Cloud Meadows</u>
Phone Number:	(231) 689-1710
Address:	102 N Lester Ave, White Cloud, MI 49349
Contact Name:	Mamie Adcock-Site Manager
After Hours Number:	<u>(231) 250-1430</u>
Capacity:	32
Unit Description:	
Notes:	Family Population

Facility Name:	<u>Fremont Townhouses</u>
Phone Number:	(231) 924-3729
Address:	1218 W. State St. Fremont, MI (Managed at Meadowhills North Apartments)
Contact Name:	
After Hours Number:	(231) 924-3729
Capacity:	12 Total Units
Unit Description:	4 two bedroom, 8 three bedroom
Notes:	Family Population

FLOODING

Flooding

To cover or submerge a place or area with water.

Hazard Description

Flood hazards in Michigan include dam failures, riverine flooding, urban flooding, and Great Lakes shoreline flooding, and erosion. Flooding in Michigan can cause extensive property damage, reduced quality of life, and even injuries and deaths. Flooding can be caused by weather hazards including thunderstorms, severe winter weather, and extreme temperatures, technological hazards including dam failures, sewer pumping, and lift station failures, and human related hazards such as terrorism, sabotage, or civil disturbances.

Every year, flooding causes more than \$2 billion of property damage in the U.S. 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. In a high risk area, a home has at least a 26% chance of being damaged by a flood during the course of a 30-year mortgage, compared to a 9% chance of being damaged by fire.

Dam Failures:

Dam failures are defined as the collapse or failure of an impoundment that results in downstream flooding. Dam failures can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Failure of a dam does not only occur during flood events, which may cause overtopping of a dam. Failure can also result from poor operation, lack of maintenance and repair, and vandalism. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation. The Michigan Department of Environmental Quality (MDEQ) has documented approximately 287 dam failures in Michigan since 1888.

The worst recorded dam failure in U.S. history occurred in Johnstown, Pennsylvania, in 1889. More than 2,200 people were killed when a dam upstream from Johnstown failed, sending a huge wall of water downstream which completely inundated the town.

Riverine Flooding

Riverine flooding is defined as 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 recorded history. 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. Some developments have also encroached into flood plain areas and thus impeded the carrying capacity of the drainage area.

Urban Flooding

Not all flooding occurs within recognized floodplain areas, or adjacent to rivers and lakes. In some cases, melting snow or other runoff waters pool in low-lying areas, damaging structures and inhibiting the function of roads and infrastructure. In other cases, some type of breakdown in an area's pumping or drainage infrastructure may result in a damaging flood. This type of flooding typically occurs in well-developed urban or suburban areas, and therefore is often called urban flooding. It tends to occur due to either (1) a breakdown in infrastructure or (2) inadequate planning and design standards on the part of builders, developers, engineers, architects, and planners.

Great Lakes Shoreline Flooding

Michigan has over 3,200 miles of coastline (the longest freshwater coastline in the world), and about 4.7 million persons live in the state's 41 shoreline counties. Wind, waves, water levels, and human activities constantly affect the communities along the shores of the Great Lakes. Shoreline flooding and erosion are natural processes, occurring at high, average, and even low Great Lakes water levels. However, during periods of high water, flooding and erosion are more obvious, causing serious damage to homes and businesses, roads, water and wastewater treatment facilities, and other structures in coastal communities. Low lake levels can also pose a hazard, as cargo ships are more prone to running aground and the shorelines may also become more polluted from lake bottom debris. Long-term and seasonal variations in precipitation and evaporation rates primarily control the Great Lakes water levels and their fluctuations.

Hazard Analysis

Floodprone areas are found throughout the state, as every lake, river, stream and open drain has a floodplain. The type of development that exists within the floodplain will determine whether or not flooding will cause damage. The Michigan Department of Environmental Quality (MDEQ) estimates that about 6% of Michigan's land – roughly the size of the southeast Michigan counties of Wayne, Oakland, Macomb, Washtenaw, and Monroe combined – is floodprone, including about 200,000 buildings. The southern half of the Lower Peninsula contains the areas with the most flood damage potential.

The primary flooding sources include the Great Lakes and connecting waters (Detroit River, St. Clair River, and St. Marys River), thousands of miles of rivers and streams, and hundreds of inland lakes. Michigan is divided into 63 major watersheds, as shown in the map at the end of this section. All of these watersheds experience flooding, although the following watersheds have experienced the most extensive flooding problems or have significant damage potential: 1) Clinton River; 2) Ecorse River;

3) Grand River; 4) Huron River; 5) Kalamazoo River; 6) Muskegon River; 7) Saginaw River; 8) Rifle River; 9) River Raisin; 10) Rouge River; 11) St. Joseph River; and 12) Whitefish River. The flooding is not restricted to the main branches of these rivers.

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams are also a cause of flooding in winter and early spring. Log jams can also cause streams and rivers to be clogged up, and the backed-up waters to overflow the stream's banks. Either ice jams or log jams can cause dangerous flash flooding to occur if the makeshift dam-effect caused by the ice or logs suddenly gives way. 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.

One of Michigan's most heavily damaging federally-declared disasters (#1346) was the result of urban flooding, in September of 2000. A tremendous amount of damage had been caused by the entrance of water into basements throughout the densely developed central areas of the Metropolitan Detroit area. A historical problem with the development of many urban areas has involved the use of infrastructure whose original design was appropriate for the expected functions of the central city, but that has become overburdened with the effects of considerable "suburban" developments upstream, which send extra runoff into the system. In other cases, inadequate or deteriorating components exist at the connections between the drainage/sewage system and the structures they serve. Leaks, inadequate backflow preventers, drain openings clogged with leaves or other debris, the inadequacies of combined storm/sanitary sewer systems, and other problems can all cause water and sewer systems to experience problems under certain circumstances.

Fortunately, many important flood mitigation activities have taken place in recent decades, including the separation of combined sewer systems, the installation of backflow preventers in houses, and the dredging, expansion, and re-design of drainage systems. Numerous activities have demonstrated that municipalities and their utility providers have been able to learn from the hard lessons of the past.

Dams are important components of the state's infrastructure and provide benefits to all citizens. However, as history has demonstrated, dams can fail with disastrous consequences, causing unfortunate loss of life and property and natural resources. As defined by Part 307 and Part 315 of The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, which regulates Dam safety in Michigan, a dam means an artificial barrier, including dikes, embankments, and appurtenant works, that impounds, diverts, or is designed to impound or divert water, or water and any other liquid or material in the water, and that is or will, when complete, be 6 feet or more in height, and has or will have an impounding capacity at design flood elevation of 5 surface acres or more. The DEQ also classifies dams into three different categories:

1. High Hazard Potential: 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. (Sec.31503 [11])
2. Significant Hazard: 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. (Sec. 31505 [5])
 3. Low Hazard: failure may cause damage limited to agriculture, uninhabited buildings, township or county roads, where environmental degradation would be minimal, and danger to individuals is slight or nonexistent. (Sec. 31504 [2])

Many existing dams are getting older, and new dams are sometimes built in developed areas. At the same time, development continues in potential inundation zones downstream from dams. More people are at risk from dam failure than ever before, despite better engineering and construction methods. As a result, continued loss of property can be expected to occur. The challenges facing local emergency management officials are: 1) minimize loss of life and property by working closely with dam owners in the development of the EAPs to ensure consistency with the Emergency Operations Plan (EOP) for the jurisdiction; 2) developing procedures in the EOP for responding to a dam failure (including a site-specific standard operating procedure for each dam site); 3) participating in dam site exercises; and 4) increasing public awareness of dam safety procedures.

The risk of dam failures should be calculated, where possible, from past occurrences. If a community has had no history of dam failures, the community may wish to examine the histories of similar types of dams (based on size, construction, ownership, maintenance schedules) and use that information to estimate the annual chance of a failure. Remember that not all failures result in damaging floods—many failures are caught in time to prevent flood damages, but still have costs associated with emergency response and repairs. It makes sense to calculate costs from different types of events. In most years, there will be no incident. If there is an incident, it may be relatively minor in its impact. The worst case scenario would involve catastrophic dam failure.

Although none of the 287 recorded dam failures in Michigan were truly catastrophic in terms of massive loss of life, property damage from major events has sometimes been very significant, particularly in terms of the related flooding that tends to follow a dam failure. Millions of dollars of damage resulted from the 2002 to 2004 events in the Upper Peninsula, which were the largest recent events of this type. Although dams vary widely in their significance and environmental context throughout Michigan, the historical record shows a frequency of about 2.3 failures per year, on average. Not all of these failures were damaging events, since most of Michigan's dams are small and located in rural areas.

The National Flood Insurance Program (NFIP) was instituted in 1968 to make flood insurance available in communities that have agreed 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) require non-residential structures to be elevated or dry floodproofed (the

floodproofing must be certified by a registered professional engineer or architect); and 3) require anchoring of manufactured homes in floodprone 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 floodproofed. 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 loan that is federally regulated, supervised or insured, for construction activities within the 100-year floodplain.

As of December 2010, there were 25,555 active flood insurance policies in Michigan. Officials from FEMA and the MDEQ estimate that only 15% of all flood-prone structures in Michigan eligible to purchase flood insurance actually have flood insurance. Furthermore, since only about 49% of the communities in Michigan participate in the NFIP, there are thousands of structures that are floodprone, but are not eligible to purchase flood insurance. (There were 867 participating communities as of December 22, 2010, and another 108 communities that were mapped but not participating—probably since the mapping was recently completed under FEMA's Map Modernization program.)

Since 1978, about \$45.1 million in claims have been paid due to flooding in Michigan. It should be remembered that officially claimed flood losses are only a small percentage of the total losses that are occurring from flood events. The flood insurance losses provide a good indication of where flooding problems currently exist, but they do not provide a good estimate of the total losses that are actually occurring.

The "Community Rating System" allows participating communities to earn discounts for their residents' flood insurance premiums. The following communities (as of October, 2010) are all CRS participants that have earned discounts of between 5% and 25% on the policy premiums for their NFIP-insured properties:

- ◆ CRS Class 9 (5% discounts earned on NFIP policy premiums): Fraser Township, Park Township, Plainfield Township
- ◆ CRS Class 8 (10% discounts earned): Bedford Township, **Brooks Township**, Commerce Township, Gibraltar City, Hamburg Township, Luna Pier City, Portage City, Richfield Township, Saginaw Township, Saugatuck City, Shelby Township, Taylor City, Taymouth Township, Zilwaukee City
- ◆ CRS Class 7 (15% discounts earned): Dearborn Heights City, Novi City, Sterling Heights City
- ◆ CRS Class 6 (20% discounts earned): Vassar City
- ◆ CRS Class 5 (25% discounts earned): Midland City

Flooding in Michigan

From 1975 to 2014, Michigan experienced 12 flood disasters that resulted in both a Presidential Major Disaster Declaration and a Governor's Disaster Declaration, and 11 that resulted only in a Governor's Disaster Declaration. Combined, these flood disasters have caused hundreds of millions of dollars in damage to homes, businesses, personal property, and agriculture. Following are brief synopses of these flood events from the 2012 Michigan Hazard Analysis;

Case: April 1975 – Southern Lower Michigan

A series of intense thunderstorms struck southern Lower Michigan in the last two weeks of April 1975, spawning several tornadoes and causing widespread flooding over a 21 county area. Total public and private damage was nearly \$58 million. A Presidential Major Disaster Declaration was granted for the 21 affected counties.

Case: September 1975 – West Central / Central Lower Michigan

During the last week of August and first week of September 1975, intense thunderstorms and severe winds pounded a 16 county area in west-central and central Lower Michigan. Intense rainfall accompanying these storms caused widespread flooding, resulting in nearly \$3 million in public and private damage. A Presidential Major Disaster Declaration was granted for the 16 affected counties.

Case: September 1986 – Central Lower Michigan

Beginning on September 10, 1986 a slow moving low-pressure system moved across the middle of the Lower Peninsula. In a 24-hour period, the intense rainstorm produced rainfall ranging from 8 to 17 inches over an area 60 miles wide and 180 miles long. In Big Rapids, 19" of rain fell from September 9 to 12. The storm resulted in thousands of people being evacuated due to flooding. Five people were killed and 89 injured. (Up to ten were killed, if indirect effects are included.) About 30,000 homes suffered basement and structural damage and 3,600 miles of roadways were impassable as a result of the failure of four primary bridges and hundreds of secondary road bridges and culverts. The heavy rainfall resulted in 11 dam failures and 19 others that threatened with failure, resulting in about 1,500 people being evacuated downstream of the dams. The failure and threatened failure of these dams was primarily the result of inadequate spillway capacity. Most of the dams were constructed without an emergency spillway, and didn't have an adequate inspection and maintenance program. The excessive rainfall resulted in the design capacity of the dam being exceeded, causing failure of the dam or intentional breaching of the embankment to save certain portions of the structure. Fortunately, no deaths or injuries were attributable to this series of dam failures. Over \$300 million in damage resulted from the flood. This was the worst flood in Michigan in 50 years. Thirty (30) counties were included in the Presidential Major Disaster Declaration granted for this flood.

Case: June 1997 – West Michigan

On June 20-21, 1997 a series of intense thunderstorms passed through West Michigan, spawning heavy rainfall that flooded many areas in Allegan, Ottawa, Barry, and Van Buren counties. Flood and wind damage was particularly severe in Allegan County, which reported four injuries, five homes destroyed and 234 damaged, and 37 businesses damaged. Damage to public facilities, roads and bridges, and culverts and drainage channels totaled nearly \$1.5 million. Ottawa County officials

reported damage to 111 homes and five businesses, in addition to nearly \$700,000 in public damages. On June 27, 1997, a Governor's Disaster Declaration was granted to Allegan and Ottawa counties to provide supplemental state assistance for the public damage. The SBA provided low-interest disaster loans to those home and business owners that suffered uninsured damage from the flooding or wind.

Case: May-June 2004 – Southern Lower Michigan

In May 2004, a stationary front over Iowa, Wisconsin, and Michigan brought severe thunderstorms and heavy rains, which caused widespread flooding over Southern Lower Michigan. Much of the rainfall occurred in saturated areas that had experienced well-above average precipitation for the month of May. Over a 36 hour period (12 am May 22nd to 8 am May 23rd), 2 to 6 inches of rain fell across Southeast Michigan. Backyards were submerged under several feet of water. About 100 homes in Macomb County had damage of about \$100,000 each. Road and bridge damage was expected to cost \$10 million to repair. Total rainfall over the Grand River basin from May 20th through June 3rd varied from four to as much as seven inches. It was the biggest and longest duration flooding event in the past ten to twenty years across southwestern and south central Lower Michigan. It was the wettest May on record in Lansing and Muskegon and the third wettest May on record in Grand Rapids. A Presidential Major Disaster Declaration was granted to 23 counties in Southern Lower Michigan.

Case: June 2008 – Lower Peninsula

Beginning on June 6, severe weather impacted twelve counties and two major population centers in the southwest and central Lower Peninsula. The National Weather Service reported two flash floods that exceeded the "100-year" threshold, confirmed three EF1 tornadoes, and also noted severe thunderstorms with winds exceeding 100 mph. Rainfall totals were estimated between 7 and 12 inches, exceeding the "100-year" rainfall values of 3.5 inches in less than 6 hours. Flash flooding washed out roads, flooded crops, and caused moderate flooding of rivers and streams. A large severe thunderstorm squall line affected Southwest Michigan on June 8, with four counties experiencing winds of 75 to 100 mph. Disaster declarations were requested and received in July, for 11 full counties.

Case: 2002-2004: Upper Peninsula Flooding and Dam Failures

A pattern of flooding and dam failures occurred in the Western and Central Upper Peninsula for several years in a row. In April of 2002, several dams in Gogebic County were breached by floodwaters, with the City of Wakefield being especially affected. The city's water treatment, wastewater treatment, and electric plant were all in danger of inundation and shutdown, and the State Police Post there was evacuated due to flooding. The Wood Dam (Presque Isle Wildlife Dam) was breached and an embankment to its north partially eroded, allowing waters to flow through. In Gogebic County, 48 homes were destroyed, 91 suffered major damage, and 27 endured minor damage; 7 businesses were destroyed, and 11 were damaged. A federal Disaster Declaration was issued by the president. In Marquette County, two dams were at maximum levels, but held during that 2002 event. In May of the next year, however, Marquette County was the one to suffer from flooding, as a series of dikes and dams failed, starting with the Silver Lake dike, and caused excessive water

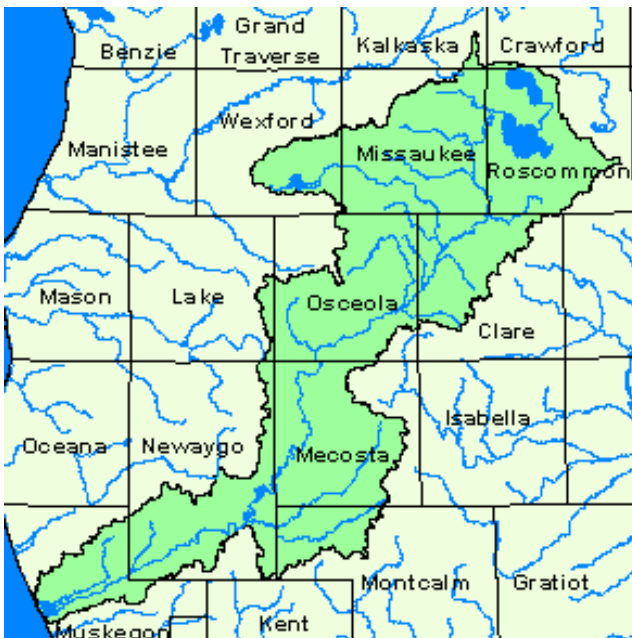
to flood low-lying areas in the City of Marquette. Marquette County declared a local state of emergency, and damages were estimated at about \$3.2 million, of which \$1,000,000 was caused by the failed dike and downstream dams themselves. The Governor ordered the evacuation of persons living along waterways in the Dead River Basin area and its tributaries downstream of Silver Lake. Although the U.S. Small Business Administration issued a “Declaration of Economic Injury,” no federal Disaster Declaration was approved for this event. In 2004, similar flooding threatened to occur, but did not have quite the same level of impact as had happened in the previous two years.

Flooding in Newaygo County

Like many Michigan communities, Newaygo County is permeated with numerous lakes, rivers, and streams of varying sizes, including 234 natural lakes and ponds, 356 miles of rivers and streams covering 12,543 acres. Naturally, these have resulted in a significant amount of seasonal and permanent housing development along the scenic waterways and have added to the area’s popularity in recreational activities.

Along with the role that the water base has played in the jurisdiction’s development, it has also resulted in a significant flooding risk to those same areas of the population. Minor flooding occurs annually along the low lying areas of the Muskegon River and White River, which regularly affect the permanent and seasonal residences in the associated sub-divisions.

The Muskegon River



The Muskegon River Watershed begins in north-central lower Michigan, flowing from Higgins and Houghton Lakes, southwesterly to the City of Muskegon and discharging into central Lake Michigan. The watershed incorporates over 2,350 square miles of land with approximately 94 tributaries flowing directly into the Muskegon River. Most of the watershed is contained within eight counties: Roscommon, Missaukee, Clare, Osceola, Mecosta, Montcalm, Newaygo, and Muskegon. The Muskegon River is the main stem river within the Muskegon River Watershed. The river is 212 miles long and drops 575 feet in elevation between its sources and the river mouth.

There are numerous dams and impoundments in the Muskegon River watershed. Many dams are not registered with the State of Michigan and are established on tributary streams. Four dams are currently located on the Muskegon River and include Reedsburg Dam (constructed in 1940), Rogers Dam (constructed in 1906), Hardy Dam (constructed in 1931), and Croton Dam (constructed in 1907). The Hardy Dam and Croton Dams are both located within Newaygo County.



Hardy Dam

Located in Big Prairie Township, the Hardy Hydroelectric Dam is the third largest earthen-filled dam in the world, and the largest east of the Mississippi River. Its impoundment forms Michigan's largest inland lake with over 50 miles of shoreline and a reservoir of 3,902 acres. The average annual cubic feet per second of flow through the dam is 1,460. The Hardy Dam is capable of generating 30,000 kilowatts of electricity which is enough power to serve a community of 16,600 people.



The Hardy Dam is owned and operated by Consumers Energy. Because of its size and operation, the dam is licensed by the Federal Energy Regulatory Commission (FERC). This license governs plant operation, dam safety, and

land management and recreation. The Hardy Dam is not designed and cannot operate as a flood control structure under the FERC License. The dam operates in a peaking mode, with pond levels maintained within +/- 0.5 feet of the 822.0 feet surface water level on a daily basis (except during drawdown and refill). Annually, from January until the end of April, the Hardy Dam may be drawn down up to -12 feet below 822.0 feet +/- 0.5 feet. The maximum depth of the drawdown is based on a winter snow survey conducted with the National Weather Service. The pond must be refilled back to full levels by May 1st. Rates of drawdown and refill must not exceed 1 foot in a 24 hour period.

The Hardy Dam is listed as a High Hazard Dam by the Michigan DEQ. This dam is noteworthy not only because of the large amounts of water impounded behind it, but also because of its location upstream from the populated and agriculture areas along the Muskegon River near the City of Newaygo and in Muskegon County. A failure on this dam would likely result in loss of life and/or damage to structures, roads, utilities, crops and the environment. In addition, a failure of the Hardy Dam would cause a failure of the Croton Dam.

Croton Dam

The Croton Hydroelectric Generating Dam has been in continuous operation since 1907. Its impoundment, the Croton Pond, is 1,290 acres with a mean depth of 18 feet. The average annual cubic feet per second of flow through the dam is 1,871. The dam is capable of generating 8,800 kilowatts of electricity, enough to serve a community of about 4,900 people. The plant is located in Newaygo County's Croton Township and is the site of the great salmon migration.

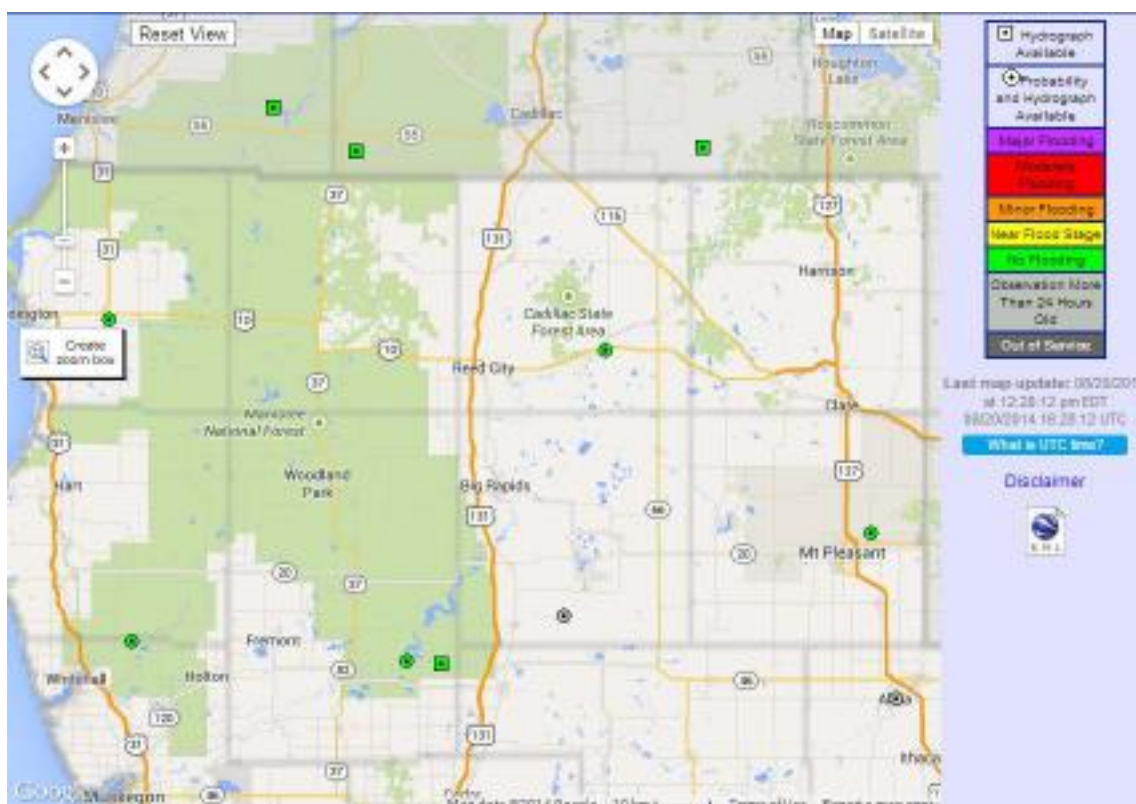


The Croton Dam is owned and operated by Consumers Energy. Because of its size and operation, the dam is licensed by the Federal Energy Regulatory Commission (FERC). This license governs plant operation, dam safety, and land management and recreation. The Croton Dam is not designed and cannot operate as a flood control structure under the FERC License. The dam operates in a re-regulation mode, with pond levels maintained at 722.0 feet surface water level on a daily basis. With Hardy at full or minimum pond level, flows from Croton are to approximate the inflows from Rodgers Dam plus the Little Muskegon River. During the Hardy drawdown or refill periods, Croton is to release the projected daily average flow from Hardy plus the Little Muskegon River. Rates of drawdown and refill must not exceed 1 foot in a 24 hour period.

The Croton Dam is also listed as a High Hazard Dam by the Michigan DEQ. This dam is noteworthy not only because of the large amounts of water impounded behind it, but also because of its location upstream from the populated and agriculture areas along the Muskegon River near the City of Newaygo and in Muskegon County. A failure on this dam would likely result in loss of life and/or damage to structures, roads, utilities, crops and the environment.

USGS River Gauges on the Muskegon River

A system of United States Geological Survey (USGS) stream gauges exists across Michigan and is linked with a real-time remote monitoring system through the internet (www.waterwatch.usgs.gov). Most gauges commonly measure the height and volume of water flowing through rivers. Live updates and old records from the gauges are available online. Local, State, and Federal agencies rely on the data for flood forecasting and issuing permits. Along the Muskegon River there are two USGS stream gauges, one in the City of Evart and one below the Croton Dam in Newaygo.



The USGS from 1964 through 1993, the Muskegon River gauge below the Croton Dam was located within the City of Newaygo. While the gauge was at this location, the flood stage was 11.0 feet. During this 29 year period there were 12 flooding events. The following graph shows the Peak Streamflow on the Muskegon River at Newaygo, MI from the USGS:

Water Year	Date	Gage Height (Feet)	Flood Height above FS	Stream Flow (CFS)
1964	May 01, 1964	9.42		4,580
1965	April 12, 1965	11.05	0.05	7,190
1966	December 15, 1965	10.34		6,050
1967	December 10, 1966	10.97		7,060
1968	June 28, 1968	9.72		5,130
1969	July 1, 1969	13.98	2.98	9,550
1970	June 3, 1970	12.08	1.08	5,900
1971	April 17, 1971	12.31	1.31	7,220
1972	April 20, 1972	10.59		5,190
1973	March 9, 1973	10.67		6,390
1974	May 18, 1974	11.01	0.01	7,020
1975	September 2, 1975	12.75	1.75	9,800

Water Year	Date	Gage Height (Feet)	Flood Height above FS	Stream Flow (CFS)
1976	March 30, 1976	13.37	2.37	10,800
1977	March 13, 1977	9.78		5,170
1978	April 11, 1978	10.20		5,800
1979	April 2, 1979	10.40		6,100
1980	March 21, 1980	9.94		5,410
1981	February 24, 1981	9.87		5,300
1982	April 3, 1982	10.06		5,590
1983	December 4, 1982	10.50		6,720
1984	June 17, 1984	10.54		6,300
1985	December 30, 1984	11.06	0.06	7,090
1986	September 12, 1986	19.54	8.54	23,200
1987	October 1, 1986	12.88	1.88	9,940
1988	April 4, 1988	10.57		6,280
1989	April 2, 1989	11.83	0.83	8,290
1990	March 14, 1990	10.50		6,170
1991	April 16, 1991	10.95		6,870
1992	November 1, 1991	11.28	0.28	7,400
1993	April 21, 1993	10.57		6,280



When the gauge was moved to Croton in 1995, the flood stage dropped to 9.0 feet. Trends have been regularly tracked by local and state officials through various methods including a local spotting system and an electronic river gauge installed on the Muskegon River. Utilizing this information, emergency officials have been able to anticipate routine flooding activity and severity with relatively high accuracy. From 1996-2014, a 19 year period, there were 8 flooding events. The following graph shows the Peak Streamflow on the Muskegon River at Croton, MI from the USGS:

Water Year	Date	Gage Height (Feet)	Flood Height above FS	Stream Flow (CFS)
1996	June 24, 1996	8.42		5,780
1997	Jan 5, 1997	8.23		5,410
1998	April 2, 1998	9.12	0.12	7,130
1999	June 15, 1999	7.56		4,150
2000	May 19, 2000	8.33		6,080
2001	May 18, 2001	8.49		6,390
2002	March 10, 2002	8.67		6,620
2003	May 12, 2003	6.84		3,420
2004	May 24, 2004	10.45	1.45	9,580
2005	April 4, 2005	9.10	0.10	7,080
2006	March 14, 2006	9.42	0.42	7,630
2007	March 24, 2007	8.45		6,020
2008	June 9, 2008	8.78		6,550
2009	December 29, 2008	8.89		6,730
2010	October 31, 2009	8.63		6,300
2011	April 29, 2001	10.64	1.64	9,970
2012	May 5, 2012	8.49		6,150
2013	April 19, 2013	11.11	2.11	11,000
2014	April 15, 2014	12.89	3.89	15,600



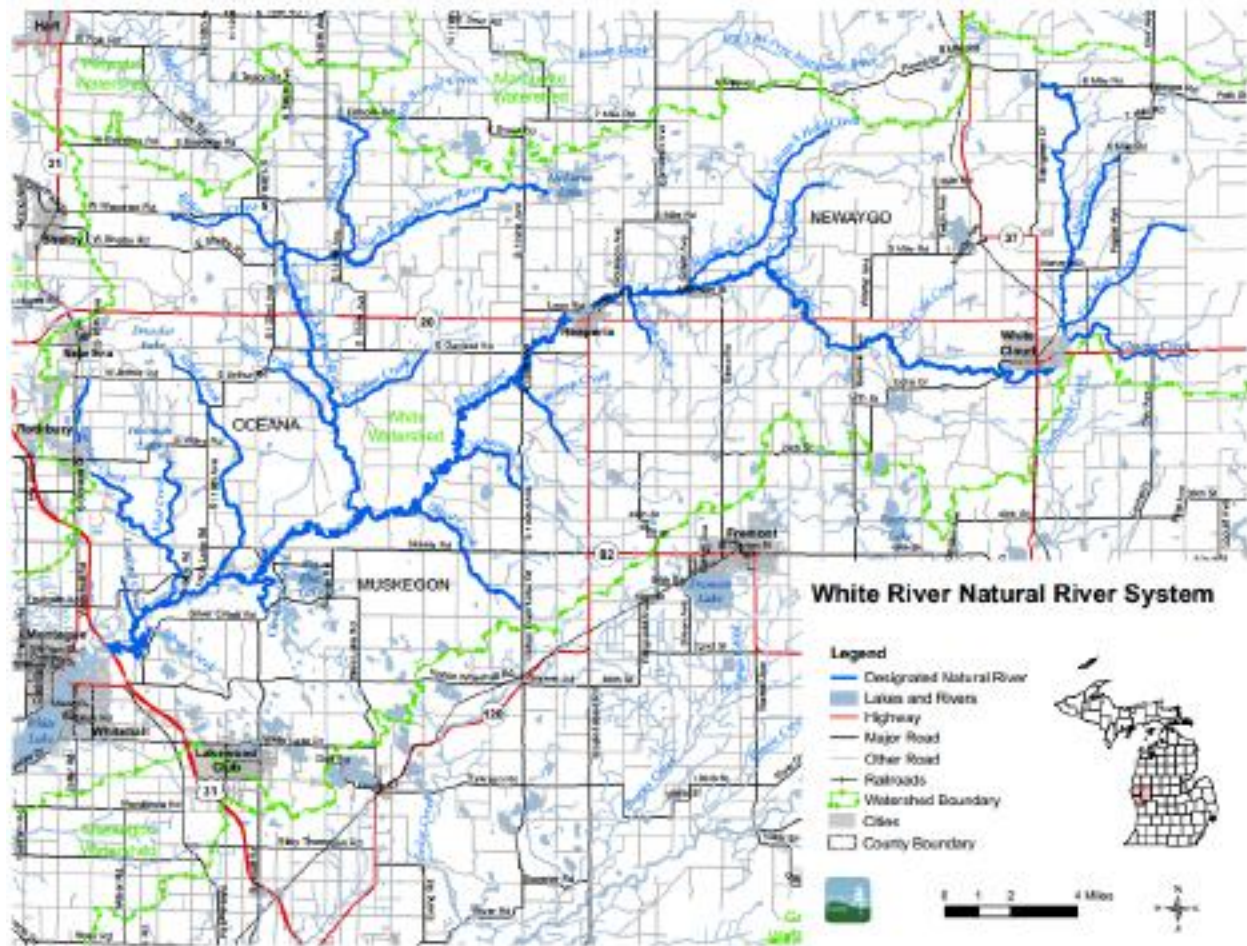
Action Stage	8 Feet
Flood Stage	9 Feet
Moderate Flooding	11 Feet
Major Flood Stage	12 Feet

Flood Impacts on the Muskegon River

13.0	Flood water begins surrounding properties on Russel Road and Salmon Run in Croton Township... Cottonwood Flats and Gould Subdivision in Brooks Township... and 128th Street in Bridgeton Township impacting 77 properties. Expect Major flooding of 132 properties in Old Womans Bend... Anderson Flats... 100th Avenue... Sycamore Flats... SugarBush Lane... Bell Meadow... Leisure Land... Freight Hill... Bridgeton Flats... and Devils Hole. Expect Moderate flooding of an additional 55 properties in these areas.
12.0	Expect the Bridge Street Bridge in the City of Newaygo and the Maple Island Bridge in Bridgeton Township to close. Expect water over Maple Island Road in Bridgeton Township and Main Street in Brooks Township. Expect Major flooding of 80 properties downstream from the City of Newaygo in Old Womans Bend... Anderson Flats... 100th Avenue... Sycamore Flats... SugarBush Lane... Bell Meadow... Leisure Land... Freight Hill... and Bridgeton Flats. Expect Major flooding of 16 properties in Devils Hole.
11	Flood water begins surrounding homes on Sarrell Street in the City of Newaygo. Expect water to be over South River Drive near Maple Island and Main Street in Bridgeton Township. Expect Moderate flooding of 76 properties downstream from the City of Newaygo in Old Womans Bend... Anderson Flats... 100th Avenue... Sycamore Flats... SugarBush Lane... Bell Meadow... Leisure Land... Freight Hill... and Bridgeton Flats. Expect Minor flooding in Devils Hole in Brooks Township.
10.5	Flood water begins surrounding cottages and homes downstream from the City of Newaygo in the areas of Sugarbush Lane and 100th Avenue in Ashland Township...and Bell Meadow Subdivision...Leisure Land Subdivision...Freight Hill Subdivision...and Main Street in Bridgeton Township...impacting 76 properties. Flood water begins surrounding cottages and homes upstream from the City of Newaygo in Devils Hole and Main Street in Brooks Township. Expect all public River Access Sites to be closed.
10	Flood water begins surrounding properties downstream from the City of Newaygo in the areas of Anderson Flats and Old Women's Bend in Garfield Township and Fright Hill Subdivision and 8753 S River Drive and 9230 Main Street in Bridgeton Township impacting 54 properties. Felch Ave near Salmon Run Campground and South River Lane become impassable in Garfield Township. Expect minor flooding in Leisure Land Subdivision and Sycamore Flats. Expect all public River Access Sites to be closed.
9.5	Flood water begins surrounding cottages and homes downstream from the City of Newaygo in the areas of Leisure Land Subdivision in Bridgeton Township and Sycamore Flats in Ashland Township impacting 17 properties.
8	River is at bankfull. River begins to exceed its banks and minor flooding begins in low lying areas along the river.

The White River

The White River Watershed is located in west central Michigan and is approximately 83 miles long from its start in northeastern Newaygo County to its mouth at White Lake and eventually, Lake Michigan. It covers 344,166 acres and spans three counties: Muskegon, Newaygo, and Oceana. The White River is divided into two branches, the North Branch and the South Branch. The North Branch has headwaters in central Oceana County while the South Branch originates in eastern Newaygo County.



The White River rises from the extensive Oxford Swamp in north central Newaygo County and flows in a southwesterly direction into White Lake then into Lake Michigan, near the towns of Whitehall and Montague. The White River system drains a surface area of approximately 300,000 acres and includes about 253 miles of streams.

White Cloud Dam

The White Cloud Dam is located on the White River in the City of White Cloud. The dam was built in 1872 and is 18.89 foot high, 950 foot long earthen embankment with three spillways. The dam's impoundment is 475 acres. The Principal Spillway and the Secondary Spillway control the impoundment elevation and flow during normal conditions. The Emergency Spillway is an overflow structure, designed to overtop when the other spillways cannot

adequately pass the flow through the dam. The dam structure supports State Street in the City of White Cloud. The dam is presently owned and operated by the City of White Cloud.

The White Cloud Dam is listed as a High Hazard Dam by the Michigan DEQ. This dam is noteworthy because of its location upstream from M-37 and the Marquette Railroad Bridge just south of the City of White Cloud. A failure on this dam would likely result in loss of life and/or damage to structures, roads, utilities, crops and the environment. It is unknown if a failure of the White Cloud Dam would cause a failure of the Hesperia Dam.



Secondary Dams in Newaygo County

Private dam owners are responsible for more than 65% of the nation's dams with the average age of dams more than 53 years old. As dams get older, deterioration increases and repair costs rise. Common problems include deteriorating metal pipes and structural components, sediment filled reservoirs, and increased volume of runoff into the reservoir upstream from a change in land use. Many private dam owners lack the financial resources necessary for adequate dam maintenance.



The following are a list of known private dams in Newaygo County from the National Inventory of Dams, US Army Corps of Engineers.

NAME	NIDID	OWNER NAME	ADDRESS	LOCATION	YEAR COMPLETE	Height (Ft)	MAX STORAGE (Acres)	MAX DISCHARGE (CFS)	HAZARD POTENTIAL
Minnie Lake Dam (Mena Creek)	MI82402	USDA FS	Alger Ave	Lincoln Township	1939	13	264	1,132	Low
Henkin Pond Dam	MI00526	Steve F Pagura	N. Dickinson Ave	Troy Township	1966	18	66	36	
Clayton Dam	MI00312	Leonard Kurello	West 9 Mile Road (Woodland Park)	Merrill Township	1955	10	200	N/A	
Peace Creek Dam	MI00406	Grass Lake Hunting Club	13453 Pine Street	Home Township	1965	16	179	620	
Rowe Dams No. 1 (Penoyer Creek)	MI00234	Mark Coe	171 Curve Street, Newaygo	City of Newaygo	1888	13	65	400	
Rowe Dams No. 2 (Penoyer Creek)	MI00235	Mark Coe	171 Curve Street, Newaygo	City of Newaygo	1915	14	65	250	
Peterson Dam	MI02119	Thomas Merritt	7124 Robinwood Lane, Fremont	Sheridan Township	N/A	9	108	300	Significant
Minnie Lake Dam (Mena Creek)	MI00185	Huron Manistee National Forest	W 2 Mile Road, Manistee National Forest	Lincoln Township	1939	17	290	1,000	

Raw Data shows the frequency of flooding events in Newaygo County are increasing. In a report developed by the Federal Emergency Management Agency, the 2008 ASFPM Working Group on Dams, and the 2012-13 Dam Risk Reduction Committee, "*A Strategy to Reduce the Risks and Impact of Dams on Floodplains*," identifies there are clear trends toward more heavy precipitation in a short amount of time, particularly in the Northeast and Midwest. The Muskegon River Watershed Research Partnership also released several bulletins in 2008 with projections suggesting a shifting future climate change to a warmer and wetter climate. Muskegon River models responded to the climate change with increased flows during spring flood period and also during much of the drier summer and late fall. Annual flood flows throughout the watershed show an increase in magnitude on average from 20-42% relative to 1998. In the main stem of the lower river (below Croton Dam) average increases ranged from 17-33%.

Based on historical occurrence, on average Newaygo County experiences and estimated 2 – 3 flooding events per year. While most of these events may be urban flooding or minor riverine flooding, the following are summaries of major flooding events in Newaygo County:

Case: September 1986 Flood

Beginning on September 10, 1986 a slow moving low-pressure system moved across the middle of the Lower Peninsula. In a 48 hour period, the intense rainstorm produced 14 inches of rainfall over a widespread area. The storm resulted in thousands of people being evacuated due to flooding. Many dams failed or threatened failure during this event including the White Cloud Dam, Croton Dam, and Hardy Dam in Newaygo County. Thousands of homes suffered basement and structural damage and hundreds of roadways were impassable as a result of the failure of bridges and culverts. Across the State, over \$300 million in damage resulted from the flood. This was the worst flood in Michigan in 50 years and is still the worst flood in Newaygo County. Thirty (30) counties were included in the Presidential Major Disaster Declaration granted for this flood.

Case: February and May 2001 Flash Flooding

Extensive flooding began on the 9th of February as a result of the combination of heavy rain and melting snow. Numerous roads were closed across all of southwestern and south central lower Michigan, including portions of M-37 in Lake county. A dozen roads were washed out or closed across Newaygo County. There were also many reports of standing water in low lying areas and poor drainage areas. The event transitioned into a river flood event across the area. Ten forecast points on 8 different rivers went above flood stage. However, no lives were lost, and only minor property damage occurred. The event caused \$100k in property damage.

In May, thunderstorms developed during the morning hours of the 15th, producing several reports of large hail and high winds. It was also a record rainfall event for the Grand Rapids area, and 4 to 5 inches of rain fell in less than 6 hours across much of southwestern and south central lower Michigan. Again, flash flooding became the primary problem. There were numerous reports received of flooded roads, basements, and flooding of small creeks and streams. Fortunately, however, the flash flooding

and flooding did not cause any fatalities. Newaygo County was included in a Governor's Disaster Declaration for this event.

Case: April 2013 Flooding on the Muskegon River

The Muskegon River Basin received two heavy rainfall events close together in April of 2013, causing moderate to major flooding. The first rainfall event occurred on April 8 – 12, dumping 3.8 inches of rain across the state. The second event occurred on April 17-19, dumping an additional 4.45 inches of rain over an already saturated ground and swollen rivers. The Muskegon River below the Croton Dam peaked on April 19, 2013 at 11.11 feet. Hundreds of homeowners were evacuated for several days to a week. River access sites were closed for a week due to unsafe river conditions and the high flows over an extended period of time caused massive erosion and sedimentation issues, destroyed spawning beds, and caused other environmental issues. The flood caused approximately \$1.5 Million in damages to 109 homes and \$175,000 in damages to roads and bridges. Newaygo County was included in a Presidential Disaster Declaration along with 19 other counties for this event.

Case: April 2014 Flooding on the Muskegon River and White River

The combination of a very significant snowpack that gradually melted and multiple rounds of severe thunderstorms with heavy rainfall resulted in significant flooding in eight counties. Generally 5 to 8 inches of rainfall occurred over the Muskegon River Basin from April 12 – 14th. Hundreds of homeowners were evacuated for close to one week. Some homes had over 6 feet of water on the first floor living space. River access sites were closed and several parks sustained extensive damage. The flood caused over \$4 million in private damages and \$587,000 in public damages. Newaygo County was included in a Governor's Disaster Declaration along with 7 other counties for this event. In addition, due to the extensive home damage, Newaygo County received a disaster declaration under the Small Business Administration which opened up low interest loans to assist homeowners with recovery.

Urban Flooding in Newaygo County

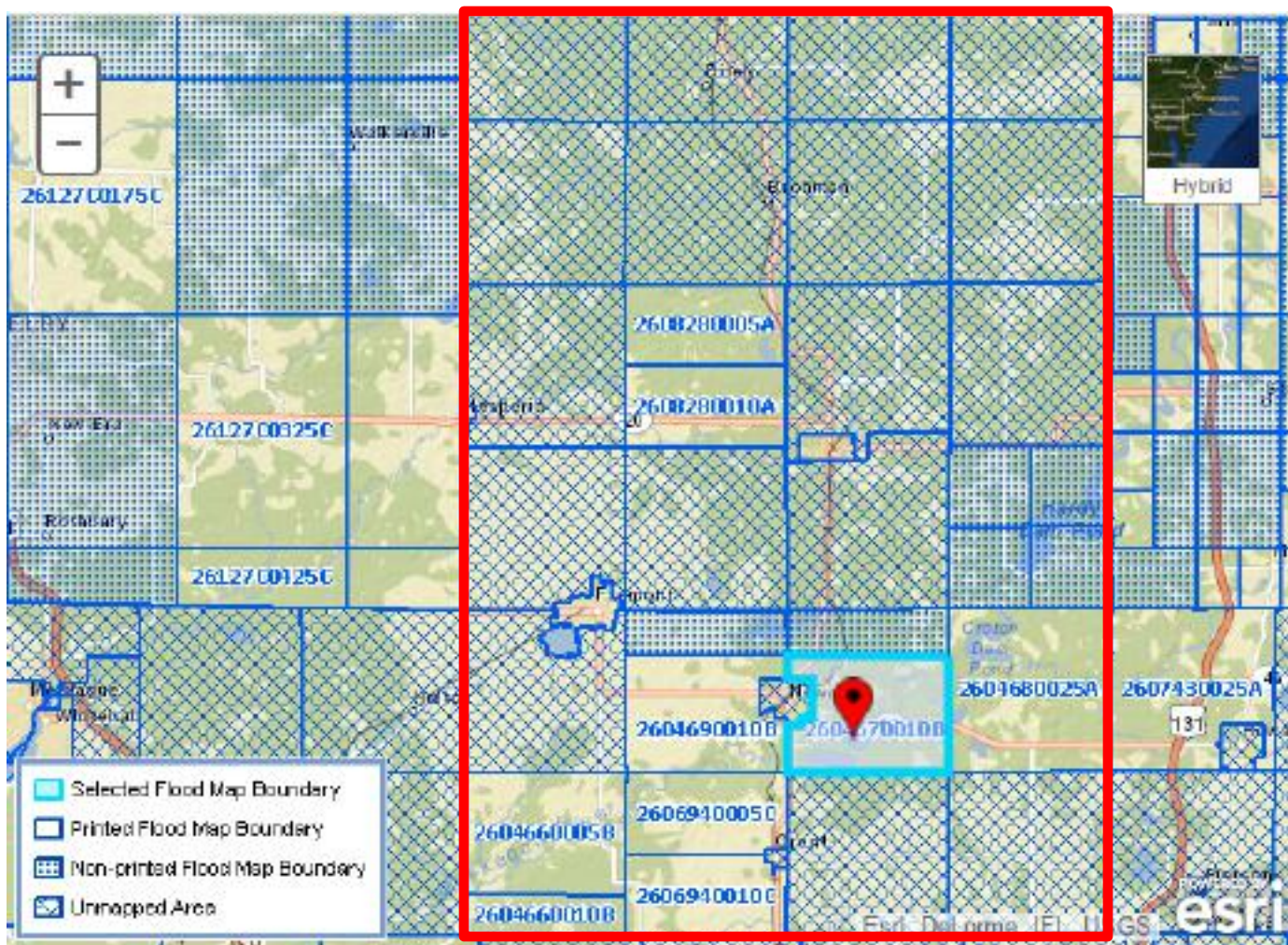
With the increase in heavy rainfall events, areas not within recognized floodplain areas, or adjacent to rivers and lakes are also experiencing an increase in flooding. In some cases, melting snow or other runoff waters pool in low-lying areas, damaging structures and inhibiting the function of roads and infrastructure. In other cases, some type of breakdown in an area's pumping or drainage infrastructure may result in a damaging flood.

Within Newaygo County, several areas experiencing urban flooding issues include the City of Fremont, the City of Newaygo, the City of Grant, the City of White Cloud, and the Village of Hesperia. In these areas, there is a risk for vehicle accidents from hydroplaning, storm water damaging businesses, and storm water seeping into basements causing damage to contents and structures. As most of these areas are not within an identified floodplain, most jurisdictions do not participate in the National Flood Insurance Program. Therefore homeowners and businesses in these areas cannot get flood insurance to cover any losses from urban flooding.

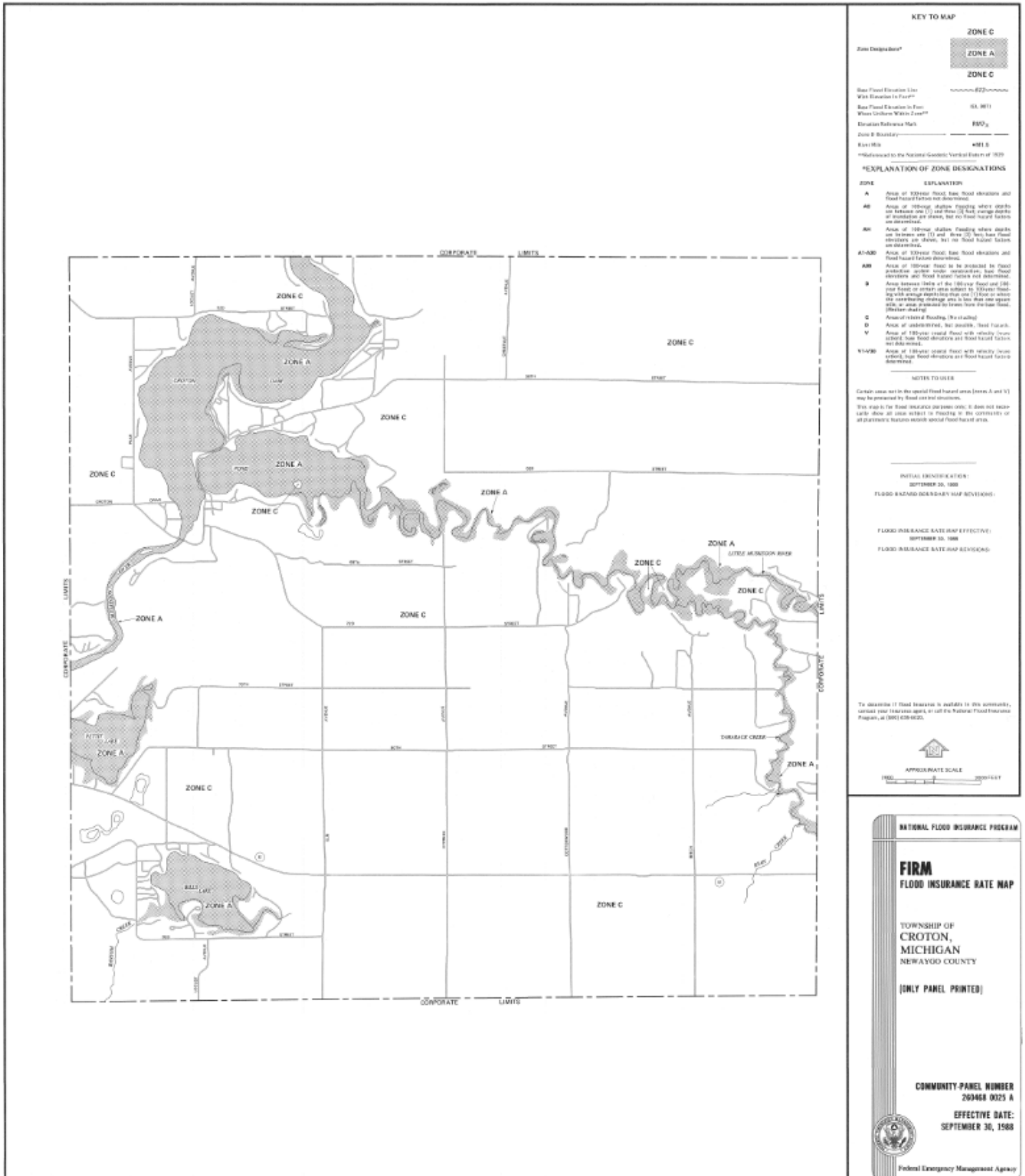
Floodplain Mapping and the National Flood Insurance Program

The primary source of floodplain mapping information in Michigan is the Flood Insurance Rate Maps (FIRMs), which are developed by the Federal Emergency Management Agency ([FEMA](#)). According to the DEQ Floodplain Mapping website, of the 1776 communities (cities, villages, and townships) in Michigan, currently about 750 communities have floodplain maps that have been developed by FEMA. A [community status book](#) may be obtained from FEMA identifying the communities which have a floodplain map developed under the [National Flood Insurance Program](#).

The flowing Newaygo County map displays the NFIP mapped and unmapped areas within the County.



Specific NFIP floodplain Maps are contained within this document on the next several pages for the following jurisdictions: Croton Township, Brooks Township, Garfield Township, Ashland Township, Bridgeton Township, Lincoln Township, the City of White Cloud and the City of Fremont. These maps are currently under revision by the NFIP and are expected to be re-adopted in 2015.





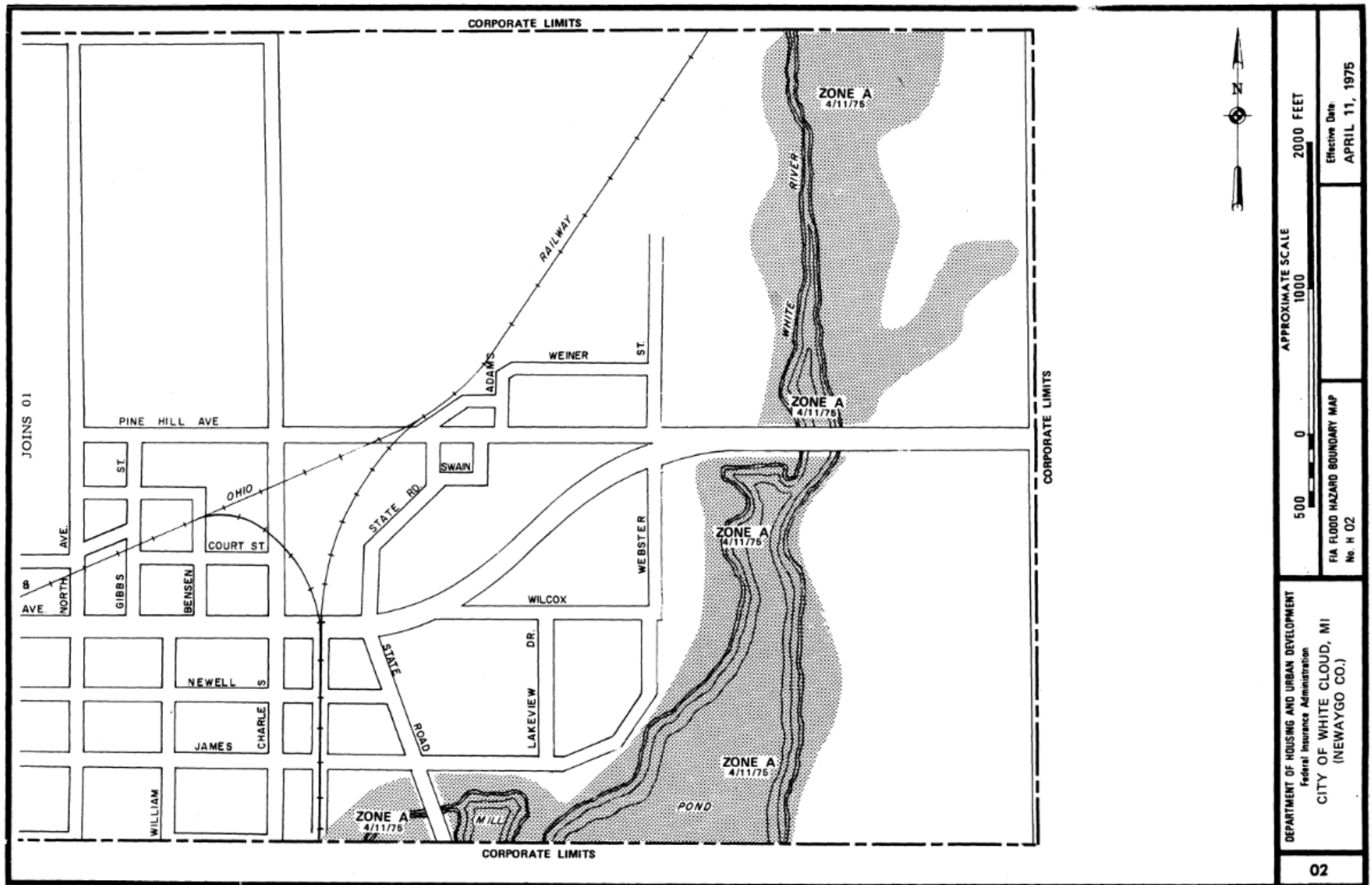


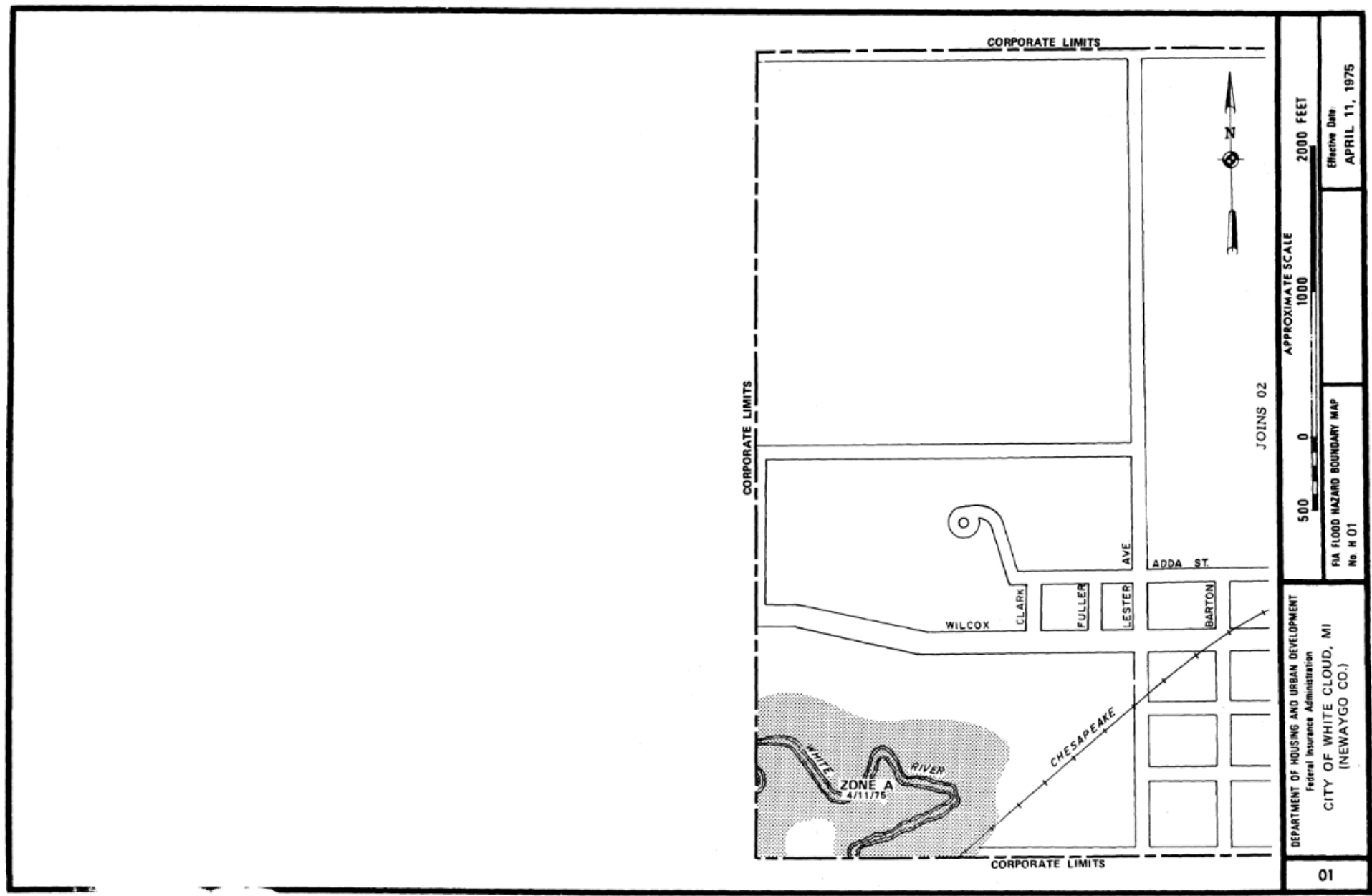




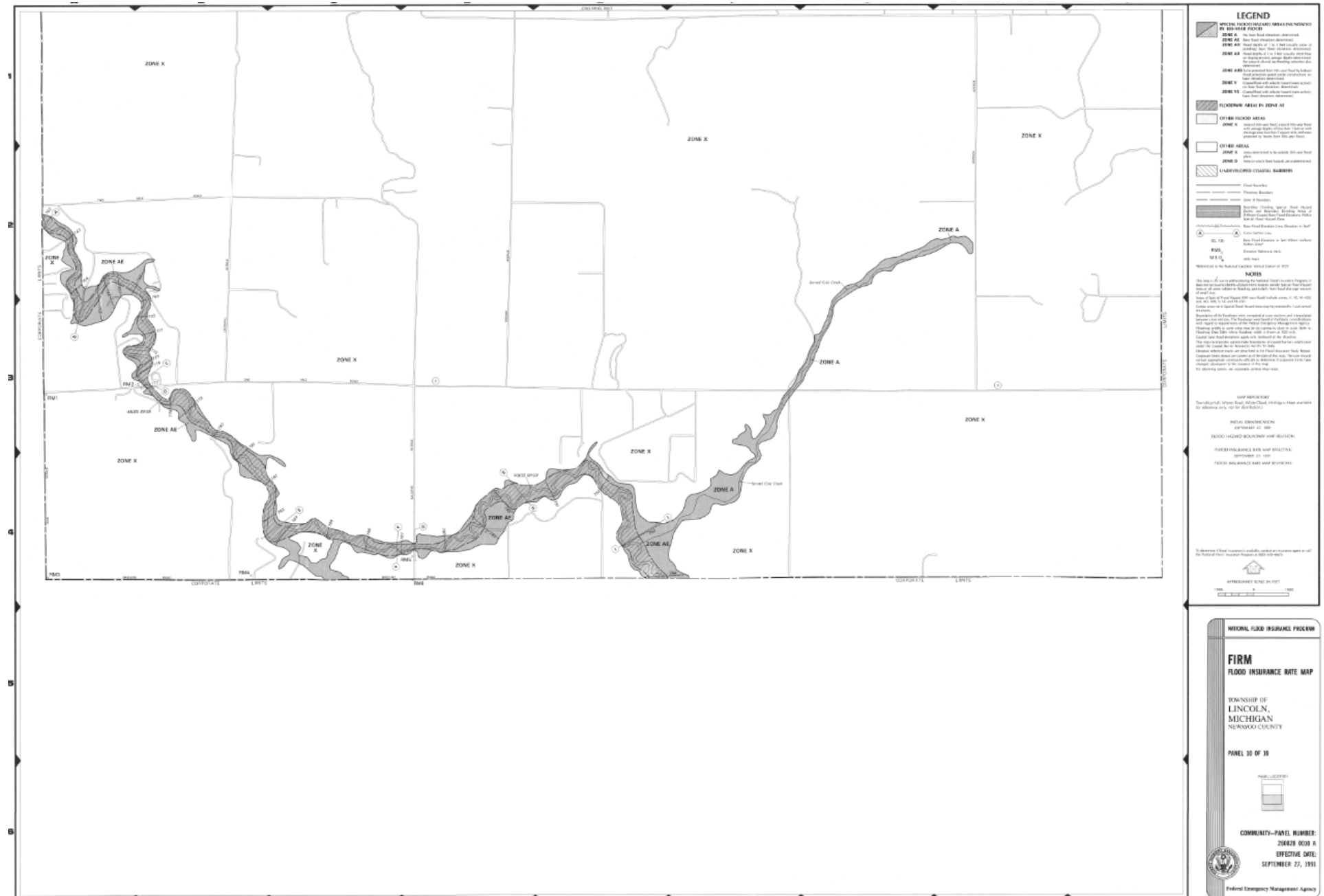


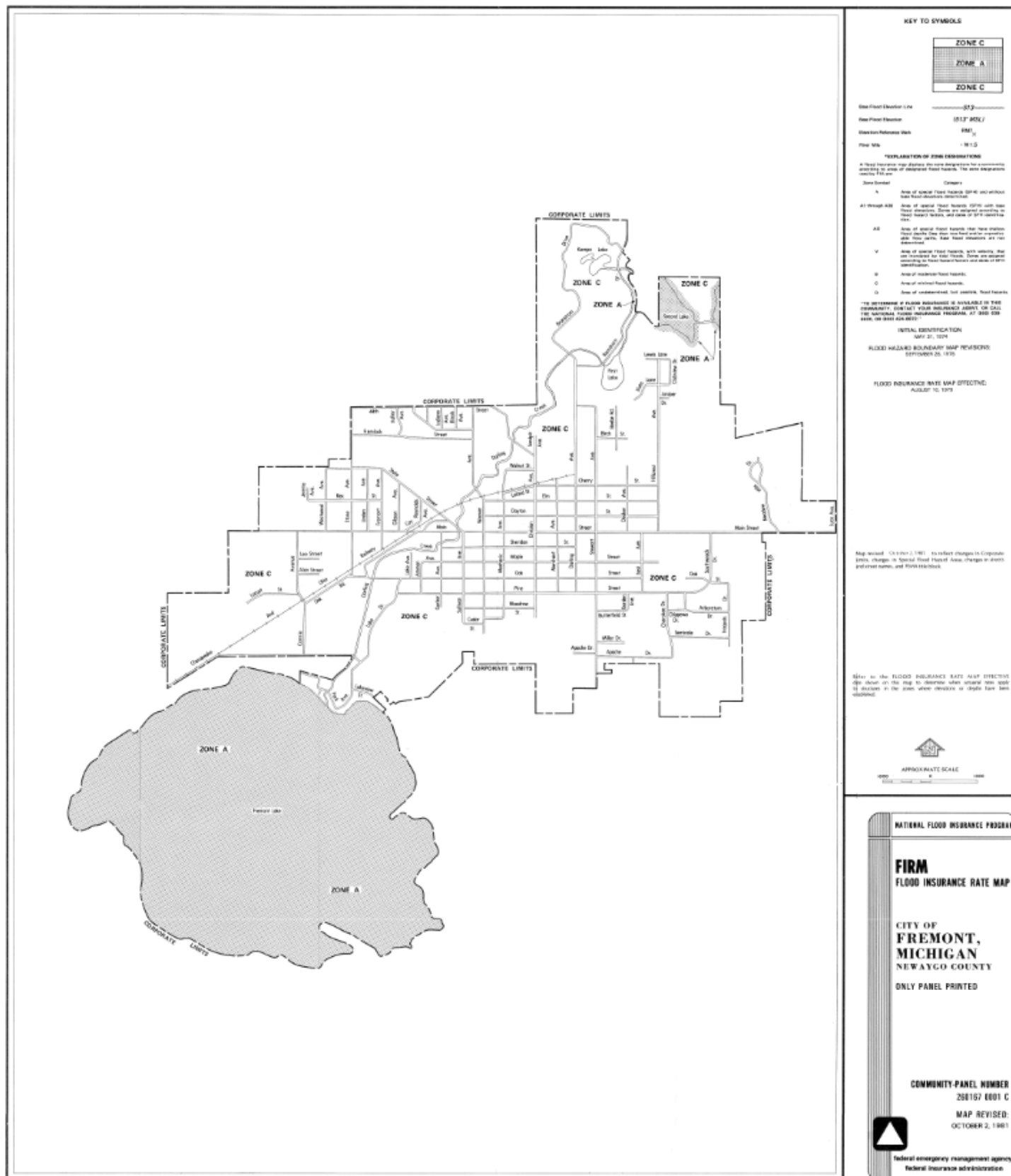












As of March 2014 there are 112 active flood insurance policies in Newaygo County. Officials from FEMA and the MDEQ estimate that only 15% of all flood-prone structures in Michigan eligible to purchase flood insurance actually have flood insurance. Furthermore, since only about 49% of the communities in Michigan participate in the NFIP, there are thousands of structures that are floodprone, but are not eligible to purchase flood insurance.

NFIP in Newaygo County

Participating Communities (as of 12-07-14)	Number of Insurance Policies (as of 10-30-14)	\$ Amount of Insurance Coverage (as of 10-30-14)	Number of Repetitive Losses (as of 10-31-13)
Ashland Township	13	1,675,000	3
Bridgeton Township	25	3,544,300	8
Brooks Township	33	5,660,300	
Croton Township	21	4,337,200	
Ensley Township			
City of Fremont	1	350,000	
Garfield Township	7	823,100	3
Village of Hesperia	3	327,700	
Lincoln Township	15	1,584,000	
City of Newaygo	5	935,100	
Sherman Township			
City of White Cloud	2	387,000	
Wilcox Township			

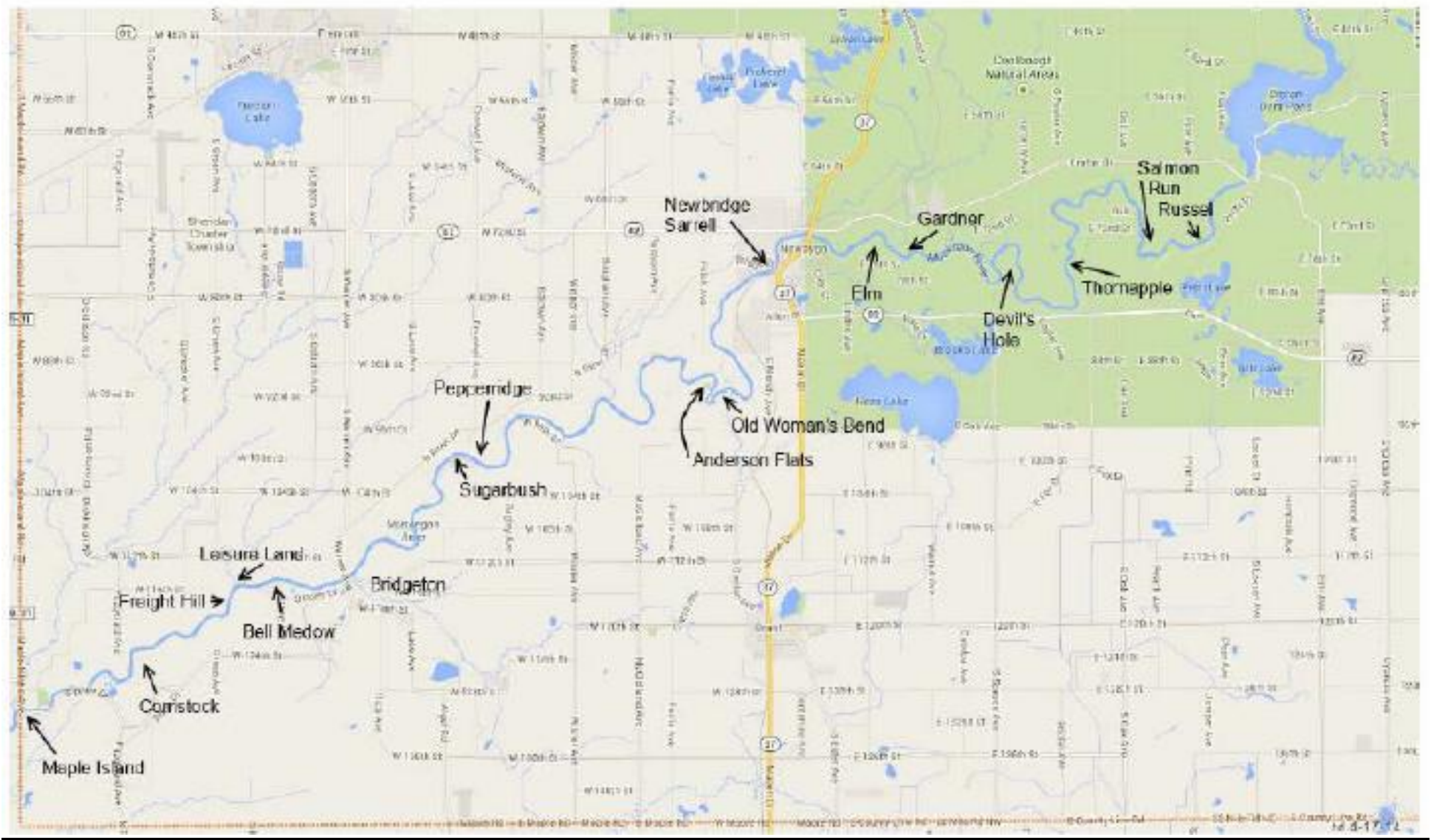
*NOTE: The statistics for the repetitive flood loss properties do not account for the April 2014 flood, as many claims were in the process of being submitted.

Sources:

- Participating Communities: <http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-status-book>
- Policies and Coverage: <http://www.fema.gov/policy-claim-statistics-flood-insurance/policy-claim-statistics-flood-insurance/policy-claim-13>
- Repetitive Losses: Les Thomas, NFIP Coordinator, Michigan DEQ - Water Resources Division

The following information is from the 2011, 2013, and 2014 flooding events along the Muskegon River. These properties have flooded repetitively since 1986. For detailed information on each area, please refer to the Muskegon River Dam Failure and Flooding Evacuation Plan. All information was gathered by the Newaygo County Field Damage Assessment Teams.

Muskegon River Subdivisions



**Leisure Land Subdivision (Riverview Drive), Bridgeton Township
Impacted at 9.5 Feet – Consumers Energy**

North of the River



**Picture taken on April 15, 2014
Croton Gauge at 12.89 feet**

**Picture taken on April 19, 2013
Croton Gauge at 11.11 feet**



**Picture taken on April 15, 2014
Croton Gauge at 13.01 feet**



**Leisure Land Subdivision (Riverview Drive), Bridgeton Township
Impacted at 9.5 Feet – Consumers Energy**

North of the River

**6932 W Riverview Dr on April 15, 2014
Croton Gauge at 12.89 feet**



**6920 W Riverview Dr on April 19, 2014
Croton Gauge at 10.81 Feet**



6868 W Riverview Dr



6848 W Riverview Dr

6836 W Riverview Dr



**Sycamore Flats (Sycamore Street), Ashland Township
Impacted at 9.5 Feet – Great Lakes Energy**

North of the River



**Picture taken on April 15, 2014
Croton Gauge at 12.89 feet**

9624 S Pepperidge April 19, 2013 at 11.11 feet



4062 W Sycamore April 19, 2013 at 11.11 feet



100th Ave, Ashland Township North of the River
Impacted at 10.0 Feet – Great Lakes Energy



Picture taken on April 15, 2014
Croton Gauge at 13.01 feet

3932 W 100th Ave



3908 W 100th Ave



Old Women's Bend (River Lane), Garfield Township

North of the River

Impacted at 10.0 Feet – Great Lakes Energy



**Picture taken on April 15, 2014
Croton Gauge at 12.89 feet**

**Old Women's Bend (River Lane), Garfield Township
Impacted at 10.0 Feet – Great Lakes Energy**

North of the River

9231 S River Lane



9242 S River Lane



Anderson Flats (Felch Ave), Garfield Township

South of the River

Impacted at 10.0 Feet – Great Lakes Energy



**(Top and Left) April 15, 2014
Croton gauge at 12.89 Feet**

**(Right) April 19, 2013
Croton Gauge at 11.11 Feet**



Freight Hill (Riverman Street), Bridgeton Township North of the River
Impacted at 10.0 Feet – Consumers Energy



Homesite Park (Main Street), Bridgeton Township North of the River
Impacted at 10.5 Feet – Consumers Energy



Sugarbush Lane, Ashland Township South of the River
Impacted at 10.5 Feet – Great Lakes Energy



Bell Meadow Subdivision, Bridgeton Township **South of the River**
Impacted at 10.5 Feet – Consumers Energy



Devil's Hole Subdivision, Brooks Township South of the River
Impacted at 10.5 Feet – Consumers Energy



Sarrell, City of Newaygo North of the River
Impacted at 11.0 Feet – Consumers Energy



DROUGHT AND EXTREME TEMPREATURES

Drought

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

Hazard Description

Drought is the consequence of a natural reduction in the amount of precipitation received over an extended period of time, usually a season or more in length. Drought is a normal part of the climate of Michigan and of virtually all other climates around the world – including areas with high and low average rainfall. In low rainfall areas, drought differs from normal arid conditions in that the extent of aridity exceeds even that which is usual for the climate. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the area's water supply needs for human activities and vegetation. This local variation of drought standards makes the hazard difficult to refer to and makes it difficult to assess when and where one is likely to occur.

Drought differs from other natural hazards in several ways. First, in the lack of an exact beginning and endpoint for a drought, whose effects may accumulate slowly and linger even after the event is generally thought of as being over. Second, the lack of a clear-cut definition of drought can make it difficult to confirm whether one actually exists, and if it does, its degree of severity. Third, drought impacts are often less obvious than other natural hazards, and they are typically spread over a much larger geographic area. Fourth, due primarily to the aforementioned reasons, most communities do not have in place any contingency plans for addressing drought. This lack of pre-planning can hinder support for drought mitigation capabilities that would otherwise effectively increase awareness and reduce drought impacts.

Hazard Analysis

Droughts can cause many severe impacts on communities and regions, including: 1) water shortages for human consumption, industrial, business and agricultural uses, power generation, recreation and navigation; 2) a drop in the quantity and quality of agricultural crops; 3) decline of water quality in lakes, streams and other natural bodies of water; 4) malnourishment of wildlife and livestock; 5) increase in wildfires and wildfire-related losses to timber, homes and other property; 6) declines in tourism in areas with water-related attractions and amenities; 7) declines in land values due to physical damage from the drought conditions and/or decreased economic or functional use of the property; 8) reduced tax revenue due to income losses in agriculture, retail, tourism and other economic sectors; 9) increases in insect infestations, plant disease, and wind erosion; and 10) possible loss of human life due to food shortages, extreme heat, fire, and other health-related problems such as diminished sewage flows and increased pollutant concentrations in surface water.

Although it is difficult to determine when a drought is actually occurring, once a drought is recognized it can be classified within four different categories - meteorological, hydrologic, agricultural, and socioeconomic. A **meteorological** drought is based on the degree of dryness, or the departure of

actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales. A **hydrologic** drought involves the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels. An **agricultural** drought concerns soil moisture deficiencies relative to the water demands of plant life, usually crops. A **socioeconomic** drought is when the effective demand for water exceeds the supply, as a result of weather-related shortfalls.

The U.S. Drought Monitor (<http://www.drought.unl.edu/dm/monitor.html>) uses four classifications of severity, from the least intense category (D1) to the most intense (D4), with an additional (D0) category used to designate a “drought watch” area in which long-term impacts such as low reservoir levels are probably present. The Drought Monitor summary map is available online, identifying general drought areas and labeling their intensity. While not the only way to characterize droughts, the U.S. Drought Monitor is convenient and their classification levels have recently been used in various reports and assessments of drought conditions. Short-term indicators are on the level of 1-3 months, while long-term indicators focus on a duration of 6 to 60 months.

Palmer Drought Classification Categories

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

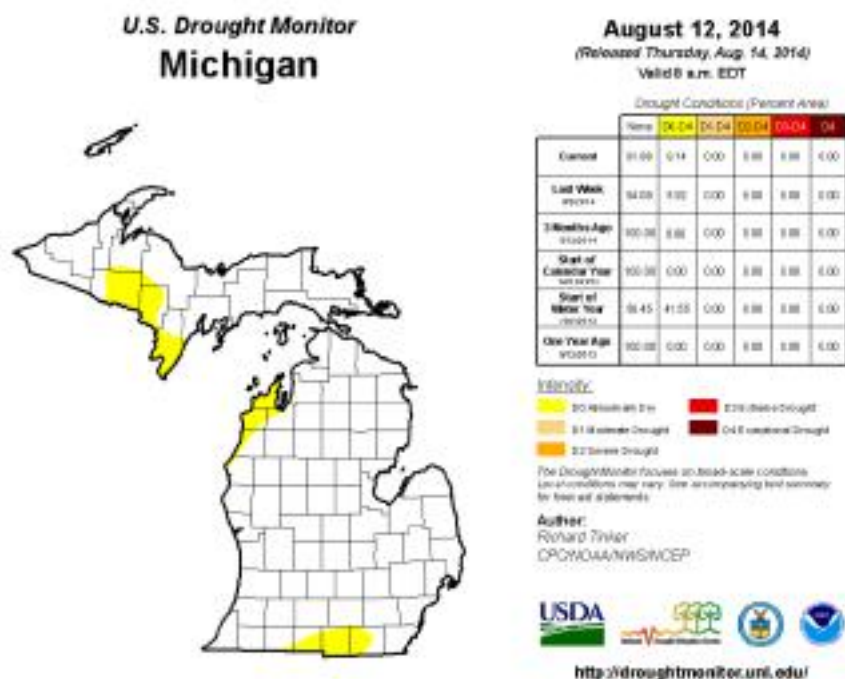
Source: U.S. Drought Monitor web site <http://drought.unl.edu/dm/classify.htm>

In addition, the U.S. Drought Monitor uses two general drought categories in assessing an event—an A to denote agricultural effects on crops, pastures, and grasslands, and an H to denote hydrologic effects on water supplies such as rivers, groundwater, and reservoirs.

Drought in Michigan

Despite the thousands of miles of rivers and streams in the state, Michigan has experienced occasional drought conditions. Most common are agricultural droughts, with severe soil-moisture deficits, which have had serious consequences for crop production, particularly when coupled with extreme summer temperatures. Also, various water bodies, both inland lakes and the Great Lakes themselves, cyclically go through periods of low-water levels. Michigan has been in such a period for a number of years now. (See the section on Flooding Hazards: Great Lakes Shoreline Flooding and Erosion for more information about these trends in water levels.)

Recent trends suggest that the pattern in Michigan will continue to be one of low water and lake levels, and even declared declarations of drought. The only exception appears to be the water levels in Lake Erie and Lake St. Clair, which are currently at or above their historically normal levels. (Updated graphs of Great Lakes water levels can be found in the Great Lakes Shoreline Hazards section.) In 2007, all 83 counties received drought disaster declarations from the U.S. Department of Agriculture due to crop losses from drought. In the Muskegon harbor, two freighters became stuck, with low water levels increasing the need for dredging activities and causing ships to unintentionally run aground on the sandy harbor bottom. These events occurred in August and September of 2007, at the same time that drought conditions were present in Michigan. At the beginning of August, three counties (Allegan, Kalamazoo, and Van Buren) were judged to be at D2 (severe drought) status. Twelve other counties in Southwest Michigan were evaluated as having D1 (moderate drought) conditions. Several others were considered to have abnormally dry (D0) status. Wildfire dangers were similarly escalated, due to these dry conditions, with fire danger levels in Southern Michigan ranging from “high” to “extreme.” (Usually fire dangers become less significant after a spring “green up,” but this year was an exception due to the drought effects.) Water flows in various rivers and creeks were far below normal—in many cases only about 60% of their usual rates. In addition to various Red Flag Warnings, by mid-August the Michigan Department of Natural Resources released a proclamation prohibiting the use of fire on or adjacent to forest lands for 75 counties in Michigan. In late August, drought conditions worsened, with 23 Northern Michigan counties at moderate (D1) drought status and two (Chippewa and Mackinac) at severe (D2) drought status. Although some rainfall in early September allowed the fire restriction proclamation to be rescinded in 23 southern Michigan counties, it remained in effect for 52 of the more northern counties. By late September, drought conditions had been alleviated somewhat by additional rainfall, except for the Upper Peninsula, which still had severe drought (D2) status in seven of its western counties, and moderate (D1) drought status for 5 of its eastern counties. (Source: Law Enforcement Information Network messages)



Drought in Newaygo County

According to the US Geological Survey mild droughts are common in Michigan, but severe droughts are infrequent and generally of short duration. The even distribution of precipitation and moderate humidity are helpful in meeting the large demand for moisture by crops. Although rainfall is abundant during the summer, runoff is decreased because of increased evapotranspiration and absorptive capacity of soils. A majority of the severe droughts occurred in the late 1800s and early 1900s. These droughts were prolonged and statewide. In the summer of 1871, there was a prolonged drought over much of the Great Lakes Regions, and again in May through September of 1891 which devastated Michigan's Lumber industry. The most severe drought on record was during the 1930's. The recurrence interval of the 1930-37 drought was 50-70 years, depending upon locality.

More recent droughts and heat waves have caused considerable damage to agriculture and related industries in several areas of the United States. In rural agricultural areas and the heavily forested areas similar to Newaygo County, drought brings on a host of other problems to address. The agricultural areas of Newaygo County are highly vulnerable to drought conditions that impact the quantity or quality of crops, livestock, and other agricultural activities. These areas often depend heavily on agricultural production for their economic needs. A prolonged drought can seriously impact local and regional income, which in turn has a rippling effect on the other components of the economy. Drought can also cause long-term problems that can negatively affect the very viability of some agricultural operations. In Newaygo County's forested regions, drought can adversely impact timber production and some tourism and recreational enterprises. This can also cause a drop in income, which impacts other economic sectors. The biggest problem drought presents, however, is the increased threat of wildfire. As Newaygo County is heavily forested, we are highly vulnerable to drought-related wildfire threats. As the 1976 Seney fire proved, a drought-impacted landscape could quickly turn a small fire into a raging, out of control conflagration.

Extreme Temperatures, Heat

Prolonged periods of very high or very low temperatures, often accompanied by other extreme meteorological conditions.

Hazard Description

Prolonged periods of extreme temperatures, whether extreme summer heat or extreme winter cold, can pose severe and life-threatening problems for Michigan's citizens. Although they differ in their initiating conditions, the two hazards share a commonality in that they both tend to have a special impact on the most vulnerable segments of the population—the elderly, young children and infants, impoverished individuals, and persons who are in poor health. Due to their different characteristics, extreme summer heat and extreme winter cold hazards will mostly be discussed separately in this section. For both types of temperature extremes, however, a longer hot or cold spell makes the temperature effects much more severe on vulnerable populations—a longer duration tends to produce more severe effects.

Hazard Analysis

Extreme Summer Heat 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 heat exhaustion and heatstroke (a major medical emergency). Heat exhaustion is a less severe condition than heatstroke, but it causes 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. If heat exhaustion is not addressed and treated, it can advance to heatstroke, so medical attention should be sought immediately. Heatstroke symptoms include a high body temperature (it can be 106 degrees or higher), dry skin, inadequate perspiration, paleness or reddening, confusion or irritability, and seizures. The victim may become delirious, stuporous, unconscious, or even comatose. Cooling is essential to preventing permanent neurological damage or death.

Other, less serious risks associated with extreme summer heat are often exercise-related and include heat cramps (an imbalance of fluids that occurs when people unaccustomed to heat exercise outdoors) and heat syncope (a loss of consciousness by persons not acclimated to hot weather). Periods of hot weather also entail risks of dehydration, even for those who are not engaged in demanding physical activities. Non-caffeinated fluids should be consumed to maintain adequate hydration.

A useful set of general principles to recognize is that evaporation is a cooling mechanism for our bodies. Evaporation of moisture (i.e. perspiration) doesn't occur as rapidly when the surrounding air already has a relatively high moisture content (humidity). Thus, humidity inhibits evaporation and produces a feeling of greater heat, while winds assist the evaporation of perspiration from skin and thus tend to produce a feeling of greater coolness. It can therefore be difficult for the body to precisely gauge actual outdoor temperatures—it rather senses the potential for heat gain or loss. A period of extreme heat is more debilitating when the air humidity is high, and a period of extreme cold is similarly more dangerous when coupled with strong winds. For these reasons, temperature alone is usually only a limited indicator of the weather's likely threat to human health, and additional factors should also be considered. The additional factors of humidity and wind speed have provided the basis for two additional means of describing the extent of extreme temperatures' impact—the Heat Index (HI) and the Wind Chill Temperature Index (WCT).

The following tables indicate the way that temperature, humidity, and wind speed probably feels to the human body, and suggests the types of temperature effects relevant to Michigan's climate. Although some of the resulting heat numbers may at first seem outrageous to describe Michigan temperatures, some of the extremes are actually comparable to what is felt in a sauna, which is often set at more than 140 degrees. Like saunas, such heat should not be felt by the body for more than brief periods of time, and since one of the body's cooling reactions is to increase the rate of blood circulation, this also adds to the burden placed on the heart muscle, and can be too much strain for some persons to bear.

NOAA's National Weather Service

Heat Index

Temperature (°F)

	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
 Extreme Caution
 Danger
 Extreme Danger

Extreme Temperatures, Heat in Michigan

In Michigan, heat advisories will tend to be announced when the heat index is calculated to exceed 105 degrees in an area for a period of at least 3 hours in duration. It should be noted, however, that the temperature inside of vehicles without air conditioning can be dozens of degrees hotter than the outdoor temperature—an outdoor temperature might be “only” 100 degrees Fahrenheit, but people may then get into a car that exceeds 130 degrees. People vary in the conditions in which they operate (and in their capacity to tolerate extreme temperatures), and can find themselves in circumstances that threaten their health even if no official temperature advisory has been issued.

Heat waves tend to have stagnant atmospheric conditions that trap pollutants in urban areas and thus compound the health effects faced by urban residents. Because the combined effects of high temperatures, high humidity, and trapped pollution are focused more intensely in urban centers, heatstroke and heat exhaustion are a greater problem in sizeable cities than in suburban or rural areas. Nationwide, approximately 135 deaths per year are attributable to extreme heat (a total of 3,311 over the 24 year period from 1986 to 2009, according to (<http://www.nws.noaa.gov/om/hazstats/images/70-years.pdf>)).

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 materials). Scorching weather also puts a strain on the energy demands for an area, as the use of air conditioning increases greatly. Possible shutdowns of schools, colleges, and industries can occur during these times.

Case: July 1936

During the second week of July 1936, a terrible heat wave struck Michigan, and particularly Detroit, with temperatures exceeding 100 degrees for up to seven days in a row (this varied by location—for example, Detroit had 7, West Branch and Alpena had 6, and Traverse City had 5). The temperature peaked at 112 degrees in Mio, setting a state record that still stands today. The extreme heat was an “equal opportunity” killer, causing many healthy adults to succumb to the heat at work or in the streets. Also, because most people relied on iceboxes to keep their food fresh, many heat-related deaths and illnesses occurred when the ice melted, causing the food to spoil. Statewide, 570 people died from heat-related causes, including 364 in Detroit. Nationally, the heat wave caused 5,000 deaths. Notice that these casualties disproportionately affected the large city of Detroit, and that Michigan was over-represented in terms of its population (11.4% of the national deaths were in Michigan).

Case: Summer 1988

The 1988 drought/heat wave in the Central and Eastern U.S. also greatly impacted Michigan. Nationwide, the drought caused an estimated \$40 billion in damages from agricultural losses, disruption of river transportation, water supply shortages, wildfires, and related economic impacts. The heat wave that accompanied the drought conditions was particularly long in Michigan – 39 days with 90 degree or better heat – eclipsing the previous record of 36 days recorded in the “dust bowl” days of 1934. During that 39-day stretch, the temperature in Southeast Michigan topped the 100 degree mark on 5 occasions, including a peak of 104 degrees on June 25. Nationwide, the 1988 drought/heat wave caused an estimated 5,000 to 10,000 deaths. (Again, the range of estimates is due largely to varying interpretations of “heat-related” death.)

Case: June – August 2001

Extreme heat and humidity in the Midwest and Central Plains during parts of June, July and August sent heat stress index readings soaring well above 100 degrees Fahrenheit on many days. Communities across the region were forced to open “cooling centers” and take other steps in an attempt to avoid heat related deaths among vulnerable segments of the population. Despite those efforts, heat-related deaths occurred in many areas – and unfortunately Michigan was no exception. In mid-June, three elderly residents of a Detroit-area nursing home died and five more were hospitalized due to heat-related stress. (Note: the deaths prompted a bill within the Michigan Legislature to require all nursing homes in Michigan to have air conditioning in resident rooms and common areas.) On August 1 and August 8, heat advisories were issued for many counties in the

southern Lower Peninsula, with heat indices at 105 degrees for some jurisdictions on the former date, and 110 degrees for some jurisdictions on the latter date. The National Climatic Data Center reports one death and 200 “injured” during early August, from excessive heat.

Case: Summer 2006

The National Climatic Data Center reports that 315 “injuries” occurred as a result of heat in Michigan—75 occurring on May 29, and 240 in late July and early August, although most of the latter were mild cases involving dehydration, some heat exhaustion, and only 6 known cases of heat stroke. A 5 day period of temperatures at or above 90 degrees started on July 29 for Southeastern Michigan. The heat index averaged between 105 and 110 degrees, and various temperature records were tied. A large number of cooling centers were provided for residents in need, and preparedness was very good, perhaps because the earlier May 29 event had provided a milder warning event that alerted communities to the potential for heat problems. In that earlier case, on Memorial Day, temperatures went as high as the mid-90s (with a temperature of 98 reported at Midland), and outdoor parade events caused many to swoon and be treated for dehydration and heat exhaustion.

Extreme Temperatures, Heat in Newaygo County

Table 1: Record Monthly Temperatures in Degrees Fahrenheit
Source: Weather Underground Weather Station in Fremont, Michigan

Month	Record High	Date	Previous Record
January	63°F	01-25-1950	59°F (1-24-1950)
February	67°F	02-11-1999	58°F (02-21-1930)
March	82°F	03-20-2012 03-21-2012	77°F (03-27-1967) (03-30-1967)
April	86°F	04-29-1970	85°F (04-27-1899)
May	93°F	05-29-1962	90°F (05-10-1930)
June	98°F	06-20-1995	94°F (06-11-1956) (06-24-1901)
July	99°F	07-07-2012 07-30-1913	
August	99°F	08-03-1964	96°F (08-24-1947)
September	95°F	09-1-1953 09-06-1957	94°F (09-02-1913) (09-03-1953)
October	89°F	10-18-1910	
November	76°F	11-2-1961 11-20-1930	74°F (11-19-1930) (11-01-1935)
December	64°F	12-02-1982	63°F (12-06-1951) (12-05-2001)

WILDFIRES

Wildfires

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

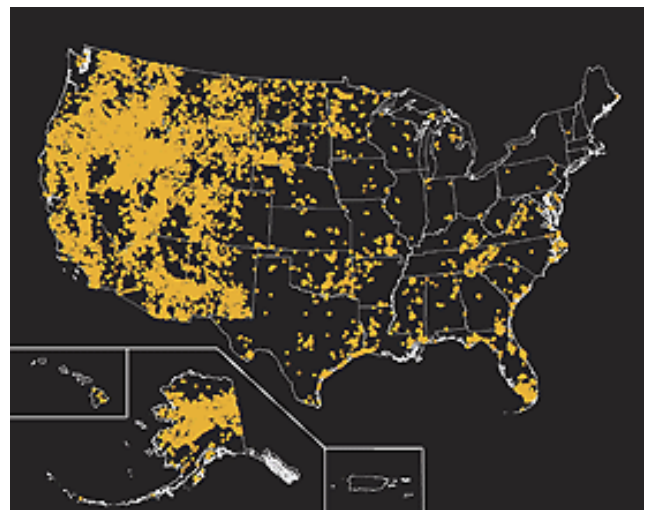
Hazard Description

Annually the Federal Government spends billions of dollars to suppress wildfires. The most immediate dangers from wildfires are the destruction of homes and timber, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area. Impacts from wildfires include the increased potential for flooding, debris flows, and landslides and smoke and other emissions containing pollutants that can cause significant health problems. Short term effects include destruction of timber, forage, wildlife habitats, scenic vistas, and watersheds. Long term effects include reduced access to recreational areas, destruction of community infrastructure and cultural and economic resources. Forests cover approximately one-half of Michigan's total land bases. As a result, much of the state is vulnerable to wildfire. In addition, development in and around forests and grasslands is increasing rapidly, making public safety a primary consideration in wildfire mitigation and suppression efforts.

According to the National Interagency Fire Center:

- ◆ More land has been affected by wildfires in recent years than at any time since the 1960's.
- ◆ In 2012, the United States had 692,000 outside fires. 67,774 of these were wildland fires that burned 9,326,238 acres of land. The U.S. Federal Government spent \$1,902,446,000 to suppress these fires.
- ◆ Only two fires have burned over a million acres. The Taylor Complex Fire of 2004 burned over 1.3 million acres. The greater Yellowstone National Park fire of 1988 burned more than 1.2 million acres.
- ◆ Wildfire severity has increased and the fire frequency has decreased during the past 200 years
- ◆ Many species depend on wildfires to improve habitat, recycle nutrients, and maintain diverse communities
- ◆ Land management agencies light "prescribed fires" under controlled conditions for specific management objectives

This map shows locations that experienced wildfires greater than 250 acres, from 1980 to 2003. Map not to scale. Sources: Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, National Park Service, and the USGS National Atlas



Hazard Analysis

Forests cover approximately 49% (18.2 million acres) of Michigan's total land area. These vast forests provide Michigan with the largest state-owned forest system in the United States. In addition, Michigan has the fifth largest quantity of timberland acreage, with 4.2 million acres of softwoods and 13.1 million acres of hardwoods. That vast forest cover is a boon for both industry and recreation. However, it also makes many areas of Michigan highly vulnerable to wildfires.

Although Michigan's landscape has been shaped by wildfire, the nature and scope of the wildfire threat has changed. Michigan's landscape has changed substantially over the last several decades due to wildland development, and so the potential danger from wildfires has become more severe. Increased development in and around rural areas (more than a 60% increase in the number of rural homes since the 1980s) has increased the potential for loss of life and property from wildfires. (The map at the end of this section shows the wildland / urban interface areas of highest concern in Michigan.) There are simply not enough fire suppression forces available in rural areas to protect every structure from a disastrous wildfire.

Contrary to popular belief, lightning strikes are **not** the primary cause of wildfires in Michigan. Recently, only about 7% of all wildfires in Michigan were caused by lightning strikes, and most other causes have been attributed to human activity. Outdoor debris burning is the leading cause of wildfires in Michigan. Most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from wildfires is the destruction of property, timber, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area.

According to 2011 MDNR information, the leading causes of wildfires from 2001 to 2010 were:

1. Debris burning (32%)
2. Equipment (17%)
3. Miscellaneous (11%)
4. Unknown (10%)
5. Campfires (9%)
6. Lightning (7%)
7. Incendiary activity (5%)
8. Children (5%)
9. Railroads (3%)
10. Smoking (3%)

Wildfires in Michigan

Michigan has experienced many destructive wildfires. Thousands of homes (during Michigan's first century) and millions of acres of forest have been destroyed by wildfires. According to Michigan Department of Natural Resources (MDNR) and U.S. Forest Service records, over 5.8 million acres of forest in Michigan were burned between 1910 and 1949, an average of 145,000 acres per year. By comparison, it was reported that between 1950 and 1996, the MDNR and U.S. Forest Service were

involved in suppressing over 46,100 wildfires that burned 390,000 acres of forest, which averages only 8,300 acres burned per year. In 2012, there were 777 wildland fires, burning 28,377 acres. This drastic reduction in the acres of timber burned was largely the result of (1) increased use of specialized equipment to suppress the fires, and (2) intensified efforts toward fire prevention.

The following list summarizes some of the largest and most severe wildfires that have occurred in Michigan to date.

Case: October 1871 - Lower Peninsula

The State's first recorded catastrophic fire occurred in the fall of 1871, after a prolonged drought over much of the Great Lakes region in the summer of 1871. The drought had left debris from logging and land clearing tinder dry, and as a result numerous fires burned throughout the state. These fires continued to smolder until, on October 8th of that year, gale and hurricane force winds fanned a series of fires across much of the northern Lower Peninsula. Because this tremendously destructive wildfire occurred at the same time as the great wildfires that struck Peshtigo, Wisconsin (which killed 1,300 people in a single night, and also affected Menominee County in the Upper Peninsula) and the Great Chicago Fire (which destroyed much of central Chicago), the Michigan wildfire received little publicity. However, the 1871 Michigan wildfire killed 200 people and burned 1.2 million acres. When the winds finally subsided, the fire's swath stretched from Lake Michigan across to Lake Huron. The most heavily affected area, north of Saginaw Bay, had an area 40 miles square that was completely destroyed, with over 50 people killed. The worst of the fire was over by October 19, although the fire wasn't completely extinguished for over a month.

Case: May 1990 - Grayling (Crawford County)

In May 1990, a wildfire near Grayling in Crawford County (known as the Stephan Bridge Road fire) burned 76 homes and 125 other structures, 37 vehicles and boats, and over 5,900 acres of forestland, resulting in property losses of \$5.5 million. The timber losses totaled another \$700,000. The fire originated from a controlled burning of a pile of brush and timber accumulated from recently cleared land. The burning was initiated while snow covered the ground, and it had been presumed that the fire was completely extinguished. However, the pile rekindled approximately seven weeks later, and on May 8, ignited the Stephan Bridge Road fire. Strong winds and dry conditions helped spread the fire at a rate beyond that which could be controlled by human intervention. At one point in the fire, the rate of spread was an astonishing 277 feet per minute. Fortunately, the combination of human fire suppression and a passing weather front that produced rainfall finally contained the fire before it could do any additional damage. There were no fatalities as a result of this fire, and only one firefighter was injured from smoke inhalation. However, the property losses were significant.

Case: 2000 - Mio (Oscoda County), Torch Lake Township / Lake Linden (Houghton County)

A wildfire that began on April 30 near Mio and was fed by extremely dry conditions consumed nearly 5,200 acres in the Huron-Manistee National Forest before being contained a week later. Nearly 300 firefighters and two aerial water tankers were deployed to suppress the fire. The fire prompted the evacuation of approximately 30 persons for a short time. Fortunately, the fire did not cause any

injuries or structural damage. About a month later, on June 6, a brush fire set on a blueberry farm near Rice Lake in Torch Lake Township, Houghton County, got out of control and eventually burned over 350 acres before being contained the next day. Firefighters from the MDNR and 15 local fire departments, plus two aerial water tankers, were called to fight the blaze. The fire forced the evacuation of over 20 homes and cottages, and at one point was one-half mile wide and almost one mile long. Brisk winds pushed the fire to within one-quarter mile of homes along the shoreline of Lake Superior. However, no structures were lost and no injuries were reported.

Case: May 18 to 26, 2010 – Crawford and Kalkaska Counties

A debris fire expanded out of control and resulted in the “Meridian Boundary Fire” by about 1:30pm on May 18. A total of 8,800 acres were eventually burned by this fire, which took until May 26 to reach 95% containment. Twelve residences were destroyed, six were damaged, and 36 outbuildings were either destroyed or damaged, resulting in total property damages of about \$825,000. Also on May 18, in adjacent Kalkaska County, the “Range 9 Fire” started when a controlled burn on an artillery range became uncontrolled as winds increased through the area. The Range 9 Fire burned 1,100 acres of mostly grassy areas on the Camp Grayling grounds, but also crossed over the boundary line at one point and destroyed 4 seasonal homes in Blue Lake Township, resulting in an estimated \$125,000 in property damage. By late evening on the same date, that smaller fire was under control.

Wildfires in Newaygo County

Sixty-one percent of Newaygo County’s 537 thousand acres of land is forested (MSU Extension 2006). Of this, 62% is in private ownership, almost all owned by small, non-industrial owners. Of the 38% in public ownership, the vast majority is part of the Manistee National Forest managed by the US Forest Service. Oak-hickory, beech-maple and lowland hardwoods make up 79% of the forestland in the county. Pine types (white, red and jack) are predominant on 15% of the forested acreage.

The forests of northern Michigan are rich in history. In the late 1800s logging was at its peak and these forests were quickly cut and cleared. In 1909, the Huron National Forest was established and the Manistee National Forest was formed in 1938. In 1945, these two National Forests were administratively combined. Working hand in hand with the Michigan Department of Natural Resources and other partners, the Forest Service has changed the “lands that nobody wanted” to healthy forests again.

The threat of wildfire is a key challenge of spring, especially in the northern part of the county where the vegetation (red, white and jack pine and oak) is on dry, sandy sites. There is danger prior to and at the beginning of spring green up. Recreation areas are in direct contact with vegetation and need to be especially careful with sources of ignition such as cigarettes, motorized recreational equipment and campfires. In the spring of 1994 A Type I Incident Management Team was mobilized from the United States Forest Services for the County Line Fire on the Huron-Manistee National Forest on April 24. This fire started on the border of Lake and Newaygo Counties and threatened the community of Baldwin, Michigan. The fire burned eight mobile homes before being controlled at 330 ha (820 acres).

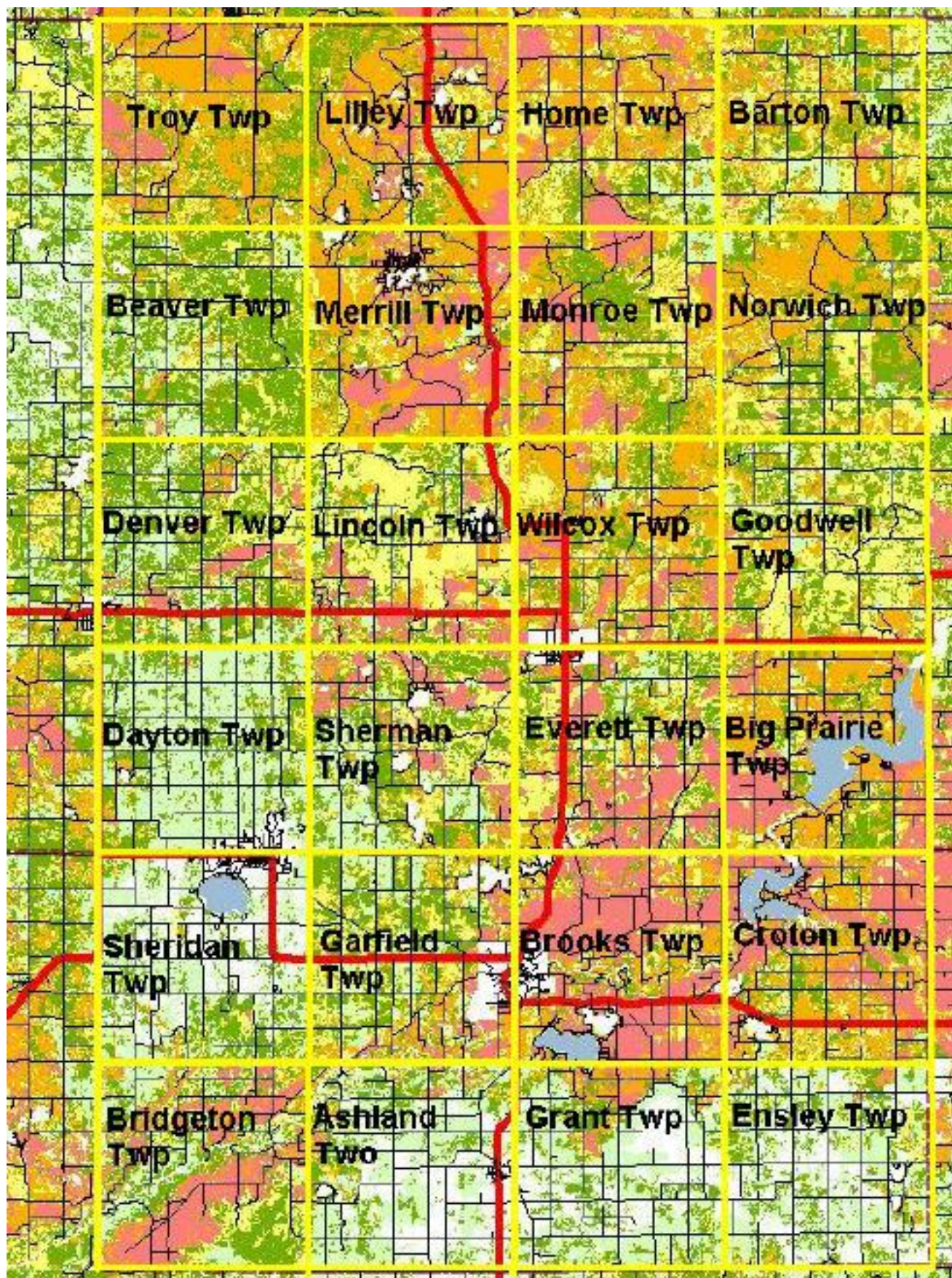
Based on historical occurrence, on average an estimated 2 – 3 smaller wildfire events occur annually. The following data came from the Fuels Management Specialist with the Huron Manistee National Forest.

The types of wildfire behavior of greatest concern in Newaygo County are crown fires and high-intensity surface fires. Crown fires are characterized by sustained burning through the forest canopy, often independent of a surface fire. Crown fires burn primarily the needles and small branches of trees. Crown fires are able to move very swiftly, spot long distances, and release large amounts of heat energy, and therefore are very difficult to control.

High-intensity surface fires are different from a crown fire in that the greatest amount of burning is taking place on the forest floor and lower shrub layers, with occasional torching of individual or small clumps of trees. Like crown fires, high-intensity surface fires have the potential to move swiftly, spot long distances, and release large amounts of heat energy. However, since the heat energy comes primarily from larger surface fuels spread across the forest floor, this energy is spread over a wider area and is sustained for a longer period of time. This type of surface fire is also very difficult to control.

The forest types of greatest concern in Newaygo County are: jack pine, Scotch pine, jack pine-oak, red pine, and oak. The forest types are listed with the most hazardous type first and so on to the least hazardous of the species of concern. The jack pine-dominated stands have the greatest potential for high-intensity wildfire, and are considered one of the most volatile fuel types occurring in the United States or Canada. Contained on the following is a fuels map from the National Forest Service:

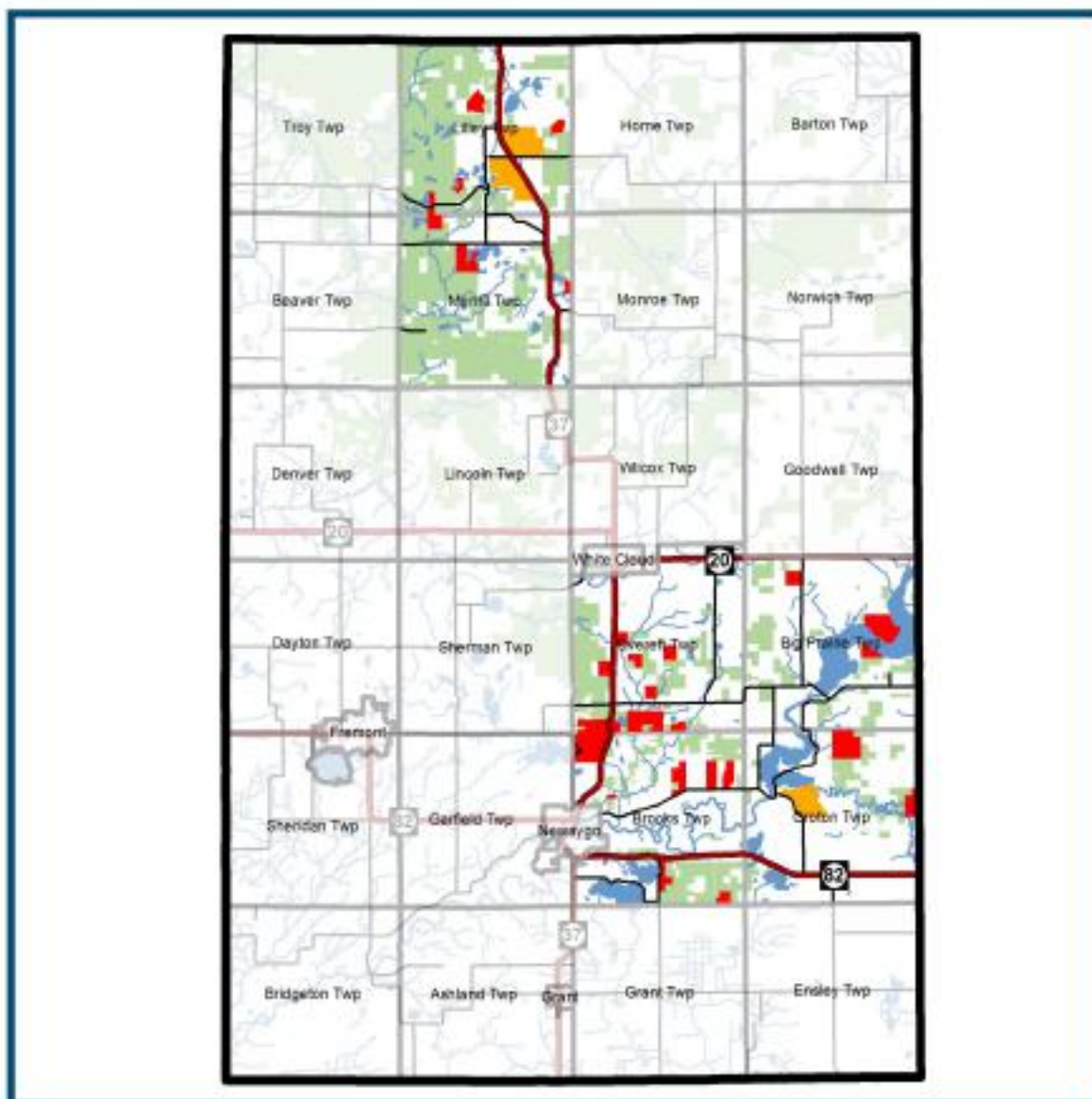
Newaygo County Fuels Map



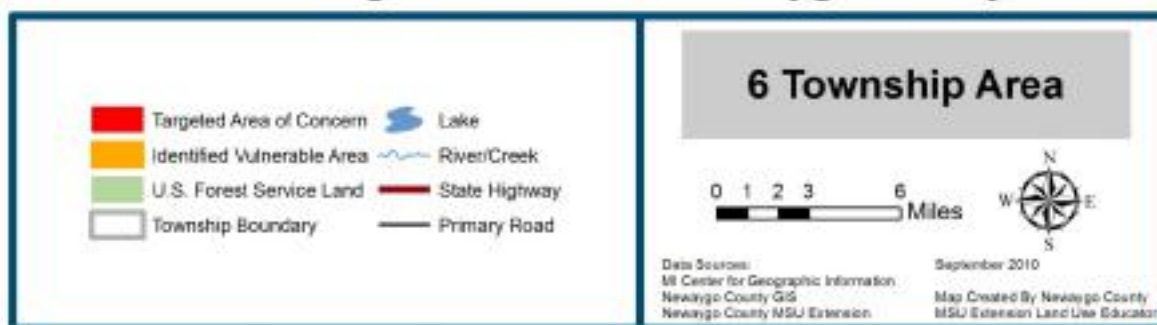
History of Wildland Fire Occurrence for Newaygo County
(Grass, Woods, and Illegal Burn Fire Starts)

Township	Fire Dept	2005	2006	2007	2008	2009	NFS	Total
<i>Ashland</i>	Station 13 – Grant Fire	10	4	5	11	5	0	35
<i>Barton</i>	Big Rapids City Fire	3	2	1	1	3	5	15
<i>Beaver</i>	Station 19 – Hesperia Fire	1	0	0	0	0	12	14
	Walkerville Fire	0	0	1	0	0		
<i>Big Prairie</i>	Station 15 – Big Prairie Fire	5	9	0	7	10	14	45
<i>Bridgeton</i>	Station 11 – Fremont Fire	4	3	2	5	5	0	22
	Station 13 - Grant Fire	1	1	1	0	1		
<i>Brooks</i>	Station 12 – Newaygo Fire	11	9	7	7	9	21	64
<i>Croton</i>	Station 14 – Croton Fire	5	9	6	9	12	22	63
<i>Dayton</i>	Station 11 – Fremont Fire	6	3	3	4	6	1	26
	Station 19 – Hesperia Fire	1	0	0	2	0		
<i>Denver</i>	Station 19 – Hesperia Fire	5	4	0	4	3	8	24
<i>Ensley</i>	Sand Lake Fire	6	9	4	2	5	1	27
<i>Everett</i>	Station 18 – White Cloud Fire	5	10	3	7	8	23	56
<i>Garfield</i>	Station 11 –Fremont Fire	3	2	3	2	1	6	34
	Station 12 – Newaygo Fire	8	2	4	1	2		
<i>Goodwell</i>	Station 15 – Big Prairie Fire	1	0	0	0	0	9	10
<i>Grant</i>	Station 13 – Grant Fire	12	7	7	6	10	3	45
<i>Home</i>	Station 17 – Lilley Fire	1	0	3	1	1	17	23
<i>Lilley</i>	Station 17 – Lilley Fire	1	5	1	4	3	32	46
<i>Lincoln</i>	Station 18 – White Cloud Fire	6	1	4	2	1	25	39
<i>Merrill</i>	Station 17 – Lilley Fire	5	3	0	4	6	33	51
<i>Monroe</i>	Station 17 – Lilley Fire	1	0	0	0	1	16	18
<i>Norwich</i>	Big Rapids City Fire	0	3	1	1	2	20	27
<i>Sheridan</i>	Station 11 – Fremont Fire	3	3	3	2	6	0	17
<i>Sherman</i>	Station 11 – Fremont Fire	4	1	3	5	5	24	45
	Station 18 – White Cloud Fire	0	1	0	1	1		
<i>Troy</i>	Walkerville Fire	3	4	0	0	0	19	28
	Station 17 – Lilley Fire	0	0	0	0	2		
<i>Wilcox</i>	Station 18 – White Cloud Fire	16	10	2	3	5	29	65

Within Newaygo County, six Wildland Urban Interface (WUI) areas have been identified. Each area has its own set of unique circumstances and need for mitigating measures. Each of Wildland Urban Interface areas (WUI) were assessed and documentation for each of the Wildland Urban Interface areas (WUI) can be found starting within the Newaygo County Community Wildfire Protection Plan starting on page 93.



Wildfire Management Plan - Newaygo County, MI



FIRES

Structural Fires

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

Hazard Description

Structure fires are any instance of an uncontrolled burning which results in structural damage to residential, commercial, industrial, or other properties in developed areas. Structural fires can be started by cooking accidents, electrical faults, fuel leaks, children playing with lighters or matches, and accidents involved an open flame from candles, cigarettes, etc. The leading cause of home fires and home injuries is unattended cooking. The leading cause of fire deaths is structural fires originating from smoking material starting upholstered furniture or mattress/bedding on fire.

Hazard Analysis

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 most common 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 property damage and loss of life 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 fires.

According to the National Fire Protection Association Fire Analysis and Research Division, the following are fire loss statistics in the United States during 2012:

- 1,375,000 fires were responded to by public fire departments
- 480,500 fires occurred in structures with 76% occurring in homes
- 2,855 civilian fire deaths occurred in 2012
- 83 percent of all civilian fire deaths occurred in residences.
- 16,500 civilian injuries occurred as the result of fire
- An estimated \$12.4 billion in property damage occurred as a result of fire.
- \$9.8 billion of property damage occurred in structure fires
- An estimated 26,000 fires were intentionally set resulting in 180 civilian deaths
- Intentionally set structure fires resulted in an estimated \$480 million in property damage.

During 2012, a fire department responded to a fire every 23 seconds. One structure fire was reported every 66 seconds. Nationwide, there is a civilian fire injury every 32 minutes. In 2012, structure fires represented 35% of the total fires across the United States.

Unfortunately, although the United States has made great strides in lessening deaths and injuries caused by other types of disasters, structural fires are worse problems in this country than in many other industrialized countries (even those with a more densely-developed population pattern). The United States Centers for Disease Control (CDC) figures indicate that fire-associated mortality rates in the United States are approximately 2-3 times greater than those in many other developed countries. According to the Federal Emergency Management Agency's National Fire Data Center, residential fires represent 78% of all structural fires and cause 80% of all fire fatalities. Approximately 83% 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. (Studies have repeatedly shown that a working smoke alarm dramatically increases a person's chance of surviving a fire.)

Structure Fires in Michigan

Michigan's fire experience generally mirrors the national fire situation. According to statistics compiled by the Fire Marshal Division of the Michigan Department of Licensing and Regulatory Affairs for 2003, nearly 19,000 structural fires occurred in Michigan, resulting in 161 deaths and 624 injuries. The dollar loss for all fires was estimated at over \$230 million. The Fire Marshal Division estimated that a structural fire occurred in Michigan about every 28 minutes in 2003. Michigan's fire death rate of 15.4 persons per million puts it toward the middle of all states in the nation in 2006. As the following table indicates, Michigan is ranked 19th in terms of fire deaths per million population. Michigan's fire death rate is ranked third in the Midwest, behind Missouri and Indiana as of 2007.

During the period from 1975-2009, the number of reported fires in Michigan (both structural and nonstructural) has trended downwards from a high of just over 80,000 to the current low of around 40,000, with yearly numbers fluctuating within this range. The number of structural fires represents approximately 35-40% of those yearly totals. Although fire risks are clearly a major concern, most of the incidents are of a limited scale and do not threaten or harm an entire community. This analysis will focus on major fires that do cause a severe impact to local communities—as disaster events.

Unfortunately, Michigan has not been immune to large structural fires that resulted in a significant loss of life. Michigan has not had a catastrophic structural fire disaster in recent years that resulted in a significant loss of human life or significant injury. However, in any given year it is not uncommon for several multiple-casualty residential structural fires to occur throughout the state. Despite the best efforts of fire officials in fire safety education and prevention, deadly residential fires continue to occur year after year.

Case: Calumet Italian Hall 1913

December 24, 1913: Not an actual fire, but the threat of a fire caused the suffocation deaths of 73 persons (mostly children) in Calumet's Italian Hall when someone attending a party there yelled "Fire!", sending masses of party goers in a mad rush for the exit. Although there was no fire, 73 persons died while attempting to escape down a stairwell that had doors that opened inward. The perpetrator of the tragic false fire alarm was never identified.

Case: State Office Building Fire 1951

February 8, 1951: Although it did not result in any loss of life, the arson fire at the State Office Building in Lansing was another significant structural fire that had a profound impact on Michigan. That fire, which caused close to \$7 million in damage and burned for a week—destroyed thousands of irreplaceable state records and archives, including the Michigan Library. The fire was started by a young employee who thought having a criminal record would prevent him from being drafted into the Korean War.

Case: Herbruck's Poultry Ranch Fire 2005

August 2005: Another example of a catastrophic fire that did not result in any loss of human life is the blaze at a poultry farm in Berlin Township, Ionia County. The fire destroyed an egg-production building at one of the state's largest poultry farms, causing the death of over 250,000 chickens and \$5 million in damage. Sixteen fire departments from four counties responded to the fire that destroyed the 150-by 600-foot building, which housed egg-laying hens.

Case: Grand Rapids Condominium Fire 2008

On January 20, 2008 a massive structural fire in Grand Rapids resulted in the destruction of over 100 condominium units in two adjacent buildings. Around 200 individuals escaped the building, and although nobody was injured, four persons had to be rescued.

Case: Marquette County Wildfire 2009

In May 2009 about 777 acres and 33 structures, including houses and outbuildings, burned in Marquette County, southwest of Ishpeming, and caused about 500 persons to be evacuated.

Although structural fires occur every day in both large cities and small towns in Michigan, what was significant about these particular fires was the level of impact they had on the communities. In some cases, the very lifeblood of the community's business and retail districts was destroyed or severely damaged, affecting not only the structures themselves, but also the community's economy as well. Some of the affected businesses never reopened. (Note: please refer also to the section on Wildfires, for more information about some of these events.)

Structure Fires in Newaygo County

Newaygo County is served with fire suppression services from 11 local fire departments funded by townships and cities. Each is staffed by paid on-call personnel who are activated on a per call basis to respond to emergencies as required. Fire chiefs' association meetings have contributed to fostering inter-department coordination, mutual aid, and cooperative efforts. Although the volunteer nature of the system has posed a continual challenge in several aspects of fire suppression capabilities in key areas of administration, personnel, training, and pre-planning, the system has served the jurisdiction with a high level of pride and professionalism since its establishment.

Despite the independent multi-department system, Newaygo County's fire hazards remain a primary countywide concern. As a small community, Newaygo County's major fire hazard concerns lies in critical economic, societal, and/or historic sites such as large businesses, downtown areas, and service facilities (i.e. schools, hospital, etc.)

Historically, when Newaygo County was first established, large fires plagued it. In 1867, the first serious fire in the history of the county occurred and the Newaygo Company's Mill burned; this was called The Big Red Mill. It was rebuilt in 1869 at a cost of \$40,000. In 1883 a massive fire destroyed the City Newaygo, leaving only two buildings standing and completely relocating the County Seat from Newaygo to White Cloud. More recently, most structural fires are residences and can be handled by one to three departments and do not require a lot of outside mutual aid support.

Case: Northern Trails Bar and Grill Fire 2007



On, Monday July 16, 2007 Northern Trails Bar and Grill was destroyed by fire. The fire was spotted around 6:15 am by a Newaygo County Sheriff's Deputy patrolling the area. Fire departments from Kent County, Mecosta County, Montcalm County, and Newaygo County responded to the fire. The fire was ruled as arson. This fire was connected to a second restaurant fire in Croton (Mr. Pibs) the following week.

Case: Pine Lake Village Apartment Complex Fire 2010

On Sunday, August 15, 2010, a medical oxygen tank exploded around 8pm in a unit of Pine Lake Village Apartments in the 100 block of West Pine Lake in Newaygo. The explosion ignited a fire which heavily damaged 4 units within the apartment complex. Through response efforts from the local fire department, the building was saved along with the exposure buildings. Newaygo Fire Department, Fremont Fire Department, White Cloud Fire Department, and Grant Fire Department responded to the fire.

Scrap Tire Fires

A large fire that burns scrap tires being stored for recycling or reuse.

Hazard Description

Tire fires are described as any instance of uncontrolled burning at scrap tire storage or recycling site. Each year in the U.S., an estimated 290 million vehicle tires have to be disposed of. Michigan alone generates 10 million scrap tires annually. Many of these scrap tires end up in disposal sites (legal or illegal), some of which may have several hundred thousand tires. Although responsible means of storage and disposal have become more common, tire dumps of the last forty years still present environmental and safety hazards.

Tire disposal sites can be fire hazards due to the large quantity of “fuel” onsite, coupled with the fact that the shape of a tire allows air to flow into the interior of a tire pile, rendering standard firefighting practices nearly useless. Flowing burning oil released by the burning tires spreads the fire to adjacent areas. Some scrap tire fires have burned for months, creating acrid smoke and an oily residue, which can leach into the soil, creating long-term environmental problems.

Scrap tire fires differ from conventional fires in several respects: 1) even relatively small scrap tire fires can require significant resources to control and extinguish; 2) the costs of fire management are often far beyond that which local government can absorb; 3) the environmental consequences of a major tire fire can be significant; and 4) the extreme heat from the fire converts a standard passenger vehicle tire into about two gallons of oily residue, which can then leach into the soil or migrate to streams.

Hazard Analysis

In November 2009, the State of Michigan has identified a total of more than 990,400 tires (those that pose the greatest fire danger) in outdoor stockpiles scattered around the state. Since the MDEQ Michigan Scrap Tire Program began in 1991, the total amount of Michigan’s scrap tire stockpile has gone from 31 million to about 3,400,000. The department estimates that most of the remaining tires were disposed of before the program’s ending date in December 2012.

Scrap Tire Fires in Michigan

Scrap tire fires have occurred in Michigan in the past. Over the past several years, there has been a decrease in both the frequency and severity of fires at scrap tire disposal sites due to the cleanup of existing stockpiles and an increase in compliance at collection sites. Unfortunately, fire departments are generally ill-equipped and untrained to handle these incidents when they do occur. This is especially true in rural areas where many scrap tire disposal sites are located. Scrap tire fires occur often enough to present a major concern to those communities that have quantities of tires stored at disposal sites within or adjacent to their borders. Given the right set of circumstances, the potential is always there for a major fire that may require evacuation, sheltering, large amounts of fire suppression assistance, and both short and long-term environmental monitoring. Large scrap tire fires

can also be very costly for the owner/operator and the affected local jurisdiction(s), as the fires are difficult to extinguish and typically require a large emergency response personnel presence at the fire scene (often for an extended period of time).

Scrap Tire Disposal Sites in Michigan: November 2009

County	Sites	Tires	County	Sites	Tires
Alpena	2	100,250	Livingston	1	1,000
Arenac	1	37,341	Marquette	1	3,000
Bay	1	700	Mecosta	1	8,000
Benzie	1	10,000	Menominee	1	2,000
Calhoun	2	5,700	Midland	2	121,100
Cass	1	37,000	Monroe	2	7,500
Chippewa	1	500	Montcalm	1	2,000
Clare	1	700	Newaygo	2	27,000
Crawford	1	10,000	Oakland	2	20,633
Dickinson	1	499	Oceana	1	11,000
Eaton	1	300	Osceola	2	2,385,000
Genesee	2	152,000	Ottawa	1	100,000
Grand Traverse	1	1,499	St. Clair	3	9,400
Gratiot	1	2,500	St. Joseph	2	48,000
Hillsdale	1	1,300	Sanilac	2	11,000
Houghton	2	117,500	Shiawassee	1	1,000
Ingham	1	500	Tuscola	2	12,700
Iosco	1	4,800	Wayne	22	168,977
Ionia	1	3,000	Van Buren	2	3,000
Jackson	2	6,600	Total	76	3,435,499

Source: Department of Environmental Quality, Waste and Hazardous Materials Division.

NOTE: Inventory totals compiled for tire quantities are approximated and will vary from year to year, as new tires are brought in and others are recycled or otherwise disposed of.

In recent history, the following incidents stand out as examples of the adverse impacts that can occur when fire breaks out at a scrap tire disposal site.

Case: October 30, 1987 – Kent County

A large fire broke out at a scrap tire disposal site in Kent County containing over one million tires. It was estimated that the blaze was contained to about a fifth of the ten-acre site and a fire break was established with bulldozers. Firefighters ultimately concluded that the best course of action was to allow the contained portion of the fire to burn, and that applying water would add no benefit. Nearby residents were evacuated during the early stages of the fire.

Case: December 29, 1995 to January 20, 1996 – Grand Traverse County

A tire fire burned at a re-treading facility in Grawn near Traverse City. Initial fire response was delayed due to attempts by employees at the recycling center to extinguish the blaze without outside assistance. Over the course of the event, surrounding subdivisions were evacuated. The fire engulfed 100,000 tires spread over a three-acre site. Personnel from numerous area fire departments, as well as the U. S. Environmental Protection Agency (EPA) and U. S. Coast Guard, were involved in the containment and suppression effort. In all, 451 responders from 30 separate agencies assisted with

the fire over its 22-day duration. The long duration of this fire was testimony to the difficulty of extinguishing fires of this nature.

Case: July 30, 1996 – Clare County

A fire broke out at a scrap tire storage facility located in Redding Township in Clare County. Over the course of the fire, 14 fire departments responded, along with representatives from the EPA and Michigan Department of Environmental Quality (MDEQ). Fortunately, the fire was contained to 250,000 of the 4.2 million tires on the ten-acre site, and was extinguished the following day, some 32 hours after it began.

Case: April 16, 1997 – Osceola County

The worst tire fire ever in Michigan occurred in Osceola County. The salvage yard where the blaze started contained over 6 million tires. All of the fire departments in a five county area were contacted. Residents within a three-mile radius were evacuated. The fire was extinguished in about two and one-half days by digging a trench around the perimeter of the fire to prevent its spread, and capping the fire with sand. In all, 478 firefighters from 34 different departments fought the blaze. The final cost of putting the fire out came to approximately \$300,000. Over 1.5 million tires, two buildings and some trailers were lost in the fire.

Case: February 24, 2000 – Mecosta County

A fire broke out at a tire recycling plant located in Hinton Township in Mecosta County. The fire had started in a pole barn that contained approximately 50,000 shredded tires. Nearby structures that also contained scrap tires were in danger of catching fire as well. Approximately 150 fire personnel from 13 local fire departments fought the blaze. Eventually, sand was brought in by a local contracting firm to smother the flames. Investigators determined that the apparent cause of the fire was a machine that had caught fire earlier and had not been adequately extinguished. The fire had then spread from the machine to the tires.

Case: June 13, 2003 – Clare County

A large fire broke out at a scrap tire disposal site in Clare County. It was estimated that 135,000 of the 850,000 tires at the site had caught on fire. The fire response and pollution control efforts would have been much more difficult without the \$250,000 in funds awarded to Clare County through the DEQ Scrap Tire Grant Program in 2002. The lanes constructed between the tire piles had bought firefighters enough time to prevent the fire from spreading into the remaining piles. Otherwise, they would have been dealing with a much larger fire. This fire occurred at the same location as the scrap tire fire of 1996, when 250,000 tires were involved.

Case: July 23, 2008 – Ottawa County

A scrap yard fire, fueled by 1,000 tires, kept fire departments from Spring Lake Township, Coopersville, Fruitport, Ferrysburg, Ottawa County, Marne and Grand Haven Township busy for several hours and sent thick plumes of black smoke over the area. This fire in Nunica was first reported at around 3:45 pm and was caused by sparks from workers who were cutting off an

automobile's catalytic converter. The blaze was confined to roughly a 50-by-50-foot area. Because the nearest hydrant was about 2,000 feet away, water had to be trucked in. In all, 70,000 gallons of water were poured onto the fire before it was brought under control after 90 minutes. No structures were damaged by the fire and no injuries occurred. Because of possible oil contamination from melting tires, the Department of Environmental Quality was notified.

Case: December 31, 2010 – Muskegon County

An early morning fire destroyed a Twin Lake tire business on December 31, 2010 with damage estimates over \$325,000. The fire started on the west end of a 100-by-60 foot pole barn construction building. The building had several tires inside it which provided extra fuel for the fire after it started. City water was not available on the scene so responding fire crews set up water reservoirs at three sites and used tanker trucks to shuttle water in from other areas. A tanker task force involving 10 area fire departments was used to battle the blaze. Assisting Dalton Township were fire departments from the townships of Muskegon, Blue Lake, Holton, Fruitport, and Egelston, along with the North Muskegon and Fremont city departments, the White Lake Fire Authority and Montague Fire District.

Local Structural Scrap Fire Analysis:

With strong zoning and ordinances in all townships, scrap tire piles and junkyards have not been a significant fire and blight concerns. The State Department of Environmental Quality Waste Division has addressed many problems associated with these hazards by providing for grants to clean up Scrap Tire Sites. To date, Newaygo County has received several grants totaling over \$85,000 to clean up two sites. There are, however, three known sites within the County which have around a combined total of 37,000 tires.

HAZARDOUS MATERIALS

Hazardous Material Incidents

Any solid, liquid, or gas that can cause harm to humans and other living organisms due to its being radioactive, flammable, explosive, toxic, corrosive, a biohazard, an oxidizer, an asphyxiant, or capable of causing severe allergic reactions.

Hazard Description

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. A reportable hazardous material incident is one in which all three of the following conditions apply: 1) a material is present that is suspected to be something other than ordinary combustible by-product material; 2) the material is in such a state, quantity or circumstance that, if left unattended, it is presumed to pose a threat to life, health, property or the environment; and 3) special hazardous material resources were dispatched or used, or should have been dispatched or used, for assessing, mitigating or managing the situation.

The following are specific types of hazardous materials incidents:

Fixed Site:

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

Industrial Accidents

Industrial accidents differ from hazardous material incidents in the scope and magnitude of offsite impacts. An industrial accident is a fire, explosion, or other severe accident (especially if it involves hazardous materials) at an industrial facility that results in serious damage, injury, or loss of life. 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.

Transportation Incidents:

An uncontrolled release of hazardous materials that during transport is capable of posing a risk to health, safety, property or the environment. All modes of transportation - highway, railroad, seaway, airway, and pipeline - are carrying thousands of hazardous material 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. The U.S. Department of Transportation regulates the transportation and shipping of over 18,000 different materials. Areas most at risk are within a 1-5 mile radius of a major transportation route along which hazardous material shipments move. All areas in Michigan are potentially vulnerable to a hazardous material transportation incident, although the heavily urbanized and industrialized areas in southern Michigan are particularly vulnerable due to the highly concentrated population, the large number of transportation routes that criss-cross the area, and the large number of hazardous material shipments that occur on a daily basis.

Petroleum and Natural Gas Pipeline Accidents:

Petroleum and Natural Gas Pipeline Accidents are an uncontrolled release of petroleum or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline. As a major petroleum and natural gas consumer in the United States, vast quantities of petroleum and natural gas are transported through and stored in Michigan. Though often overlooked as a threat because much of the petroleum and gas infrastructure in the state is located underground, petroleum and gas pipelines can leak, erupt or explode, causing property damage, environmental contamination, injuries and loss of life. In addition to these hazards, there is also a danger of hydrogen sulfide release. Hydrogen sulfide is an extremely poisonous gas that is also explosive when mixed with air temperatures of 500 degrees or above. In addition to pipelines, these dangers can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has high sulfur content.

Oil and Natural Gas Well Accidents:

Oil and Gas Well Accidents are defined as an uncontrolled release of oil or natural gas, or the poisonous by-product hydrogen sulfide, from production wells. Oil and natural gas are produced from fields across 63 counties in the Lower Peninsula. From 1927 to January 2009, there have been 56,525 oil and natural gas wells drilled in Michigan, of which roughly half have produced oil and gas. To date, Michigan wells have produced over 1.4 billion barrels of crude oil and 6 trillion cubic feet of gas.

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 150 ppm, 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

10 ppm	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	Immediate unconsciousness, with early cessation of respiration and death following within a few minutes. Death may occur even if the individual is removed to fresh air at once.

Source: American National Standards Institute, Standard: Z37.2-1972

An unplugged abandoned well, also known as an orphan well, can be a hazard to the health and safety of the surrounding people and environment. There are many situations where an unplugged well can become dangerous. For example, a rusted-out casing in a gas well can let natural gas flow underground and accumulate in the basement of a nearby building, possibly causing an explosion. Occasionally, gas leaking from an old well can contaminate a nearby water well. An old well might also be a conduit for salt brine from deeper formations to pollute fresh groundwater, or to discharge at the surface. In some cases, oil leaks from abandoned wells, polluting soil and water. In the vicinity of a coal mine, an old well can be a conduit for explosive gas

to enter the mine, a serious mine safety problem. Also, where coal mining has occurred, an old well can allow acidic mine water to discharge at the surface.

Hazard Analysis

Both fixed site and transport-related hazardous material incidents involve the potential for evacuation (or sheltering in place), with significant problems possible for special populations in hospitals, schools, nursing homes, and other critical facilities. Areas at most risks 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 fixed sites, but releases can still cause severe harm to people, property and the environment if proper mitigation actions are not taken in a timely manner.

Certain types of extremely hazardous substances may result in a public health emergency, and a resulting need for triage, mass treatment, and congregate care. In addition to the direct impacts of the hazardous material event itself, transportation incidents may directly affect the transportation infrastructure in the area and cause extensive delays in travel and the conduct of business.

The world's deadliest hazardous material incident occurred on December 4, 1984 in Bhopal, India. A cloud of methyl isocyanate gas, an extremely toxic chemical, escaped from a Union Carbide chemical plant, killing 2,500 people and injuring tens of thousands more. This incident triggered historical Federal legislation intended to minimize such disasters from occurring in the United States.

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. Many structures are located right next to pipelines and thus may be at risk. Pipelines can also cross through rivers, streams, and wetlands, thus posing the possibility of extensive environmental damage in the event of a major failure.

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.

Hazardous Materials Incidents in Michigan

Michigan has not experienced such a large-scale hazardous material release involving mass casualties as that which occurred in Bhopal, India. This can be attributed, in large part, to the steps taken by government and private industry to carefully regulate those processes and practices that could cause an accidental hazardous material release. Michigan's population density is also lower, and its zoning and planning personnel tend to separate conflicting land uses from each other. Bhopal's 2001 population density was 12,655 persons per square mile, whereas Michigan's highest population density (according to the 2010 census) is the city of Hamtramck, at 10,751 persons per square mile. Bhopal's population was reported as totaling 1.5 million in 2001—Michigan's smaller and more widely spaced urban developments tend to make it less vulnerable to the most severe types of impacts, as do the regulations it currently has in place to oversee the handling of extremely hazardous substances.

Michigan has also been fortunate not to have a large-scale, serious hazardous material transportation incident. However, Michigan has had numerous smaller-scale hazardous material transportation incidents that required a response by local fire departments and hazardous material teams, and many events also required evacuations and other protective actions. 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 area surrounding 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 that 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. As a major manufacturer, user, and transporter of hazardous materials, Michigan will always be vulnerable to the threat of a serious hazardous material transportation incident.

However, Michigan has had numerous petroleum or natural gas pipeline accidents in recent years that resulted in injury, loss of life, or significant property damage. Since 1996, the MPSC has investigated over 100 incidents involving pipelines, and at least half of those incidents involved injury, loss of life, or significant property damage. A majority of the state's major natural gas storage facilities are located in the central part of the Lower Peninsula. Natural gas is piped into those storage facilities from Michigan wells, and from large transmission pipelines that originate in Canada, the southwestern United States, and the Gulf of Mexico area.

Michigan is both a major consumer and producer of natural gas and petroleum products. According to the federal Energy Information Administration, Michigan's consumption of petroleum products, particularly liquefied petroleum gases (LPG) is high; Michigan is the largest residential LPG market in the nation, due mostly to high residential and commercial propane consumption. The state has a single petroleum refinery but a large network of product pipelines. More than 78% of the overall home heating market uses natural gas as its primary fuel. With over one-tenth of U.S. capacity, Michigan has the greatest underground natural gas storage capacity in the nation and supplies natural gas to neighboring states during high-demand winter months. Driven largely by the residential sector, Michigan's natural gas consumption is high. Nearly four-fifths of Michigan households use natural gas as their primary energy source for home heating.

Following are brief synopses of the more significant accidents and their impacts as highlighted in the 2012 Michigan Hazard Analysis:

Case: September 7, 1950 Big Rapids (Mecosta County)

A newly installed natural gas pipeline exploded near Big Rapids because of a flaw in the line. Two barns were destroyed and many windows were shaken. The ensuing fire was seen from 50 miles away.

Case: February 22, 1986 Muskegon (Muskegon County)

A Muskegon County pipeline break occurred when an 8-inch high-pressure Marathon Oil pipeline ruptured, spilling thousands of gallons of gas into streams feeding Ruddiman Creek. Gas vapors also caused some minor house explosions that forced dozens of Lakeside-Glenside residents to flee. No one was injured in the incident, although the environment suffered damage.

Case: April 22, 1990 – Egelston Twp. (Muskegon County)

A release of phosphorus oxychloride from a plant created a toxic plume that covered a two-mile area, forcing the evacuation of 1,000 people from two mobile home parks.

Case: May 13, 1994, and August 1996 Manistee and Mason Counties

An accident occurred when a blown gasket released hydrogen sulfide emissions after a seal in a compressing station in Mason County's Victory Township failed. The incident resulted in 11 people requiring emergency hospital treatment (four of them children) and the death of 10 cattle. Another similar incident occurred two years later when a release of 5,500 cubic feet of natural gas containing 900 ppm of poisonous H₂S occurred in Manistee Township. The release, which occurred while workers were attempting to plug a well, caused several citizens in the neighborhood to lose consciousness and collapse. Eleven victims were treated at the hospital; at least one of them sustained serious lung damage. Others were being treated for symptoms of asthma, skin irritations and neuropsychological problems. From 1980 to 1998, other injuries and evacuations have occurred in Manistee and Mason Counties as a result of

H₂S releases. At least 10 separate accidental releases of H₂S from pipelines and processing plants caused at least 262 people in Manistee and Mason Counties to evacuate their homes (five since 1995), caused at least 22 people to have been injured and seek medical treatment since 1994, and caused 35 cattle to be killed in Mason County since 1994. Many more have suffered respiratory and skin complications, and all are bearing the psychological burden of repeated evacuations.

Case: December 11, 1998 – Osseo (Hillsdale County) – Fireworks Plant Explosion

On December 11, 1998 an explosion at the Independence Professional Fireworks Company manufacturing plant near Osseo, in Hillsdale County, killed seven employees and leveled one building at the site. The blast, which occurred in a fireworks shell assembly room, sent debris flying in all directions for about 300 yards and could be heard for at least 20 miles. Fifteen other workers escaped serious injury in the explosion. Subsequent investigations by the Federal Bureau of Alcohol, Tobacco and Firearms, the Michigan State Police Fire Marshal Division, and the Michigan Occupational Safety and Health Administration (MIOSHA) were unable to determine a definitive cause of the explosion. This explosion was the worst industrial accident in Michigan in 20 years.

Case: February 1, 1999 – Dearborn (Wayne County) – Automobile Plant Boiler Explosion

On February 1, 1999 an explosion in one of several large boilers at the Ford Motor Company Rouge Power Plant killed six workers, critically injured another 14, and caused extensive structural damage. State officials who investigated the accident concluded that human error played a major part in the explosion, when a work crew failed to shut off one of two gas mains leading to the boiler's furnace. That error caused a buildup of natural gas in the boiler that was somehow ignited and caused the explosion. The force of the explosion split open the 60-foot high furnace, blew off the roof of the power plant, ignited fires on five floors, and sprayed surrounding workers with super-heated water that caused severe burns. The blast, which forced the shutdown of the Rouge Complex and other Ford plants for several days, was the second worst industrial accident in Michigan in 20 years and the deadliest at an automobile plant in over 50 years. It also turned out to be the most expensive workplace disaster in U.S. history, with final costs of at least \$1 billion. The seven-month probe by state officials was the largest and most complex in the history of state workplace safety investigations.

Case: June 4, 1999 Whitehall (Muskegon County)

At a tannery, a tanker truck driver unloaded (unknowingly) a shipment of sodium hydrosulfide solution into a storage tank normally used exclusively for ferrous sulfate solution, creating a chemical reaction that produced hydrogen sulfide – a poisonous gas. The truck driver was pronounced dead at the scene after having been overcome by the hydrogen sulfide gas. An employee of the tannery was rendered unconscious by the gas, but regained consciousness in time to avoid lasting, serious injury. Eleven employees at the tannery were evacuated. Total property damage was in excess of \$411,000.

Case: June 23, 1999 Lake County

A broken gas main near the intersection of US-10 and M-37 in Pleasant Plains Township, Lake County, forced the evacuation of nearby residences (including senior and low-income housing complexes) until the main could be repaired.

Case: April 12, 2000 – Egelston Twp. (Muskegon County)

On April 12, 2000, two explosions occurred in rapid succession at a chemical plant in Muskegon, resulting in 10 workers sustaining injuries and flattening part of the plant's production area. The explosion is believed to have been caused by the chemical tetranitromethane, once used to make rocket fuel. Although the plant never produced the chemical, it may have been an unintended by-product of the company's herbicide production. The first, smaller blast occurred in a two-inch stainless steel pipe leading from a building to the wet well. The second, larger blast occurred below grade in the southwest quadrant of the wet well. The explosions shook buildings more than a mile from the plant and hurled sections of steel I-beams onto the roof of a nearby factory more than 200 yards away. The cleanup operation forced the evacuation of businesses within a one-half mile safety zone around the plant.

Case: May 27, 2002 Potterville

A horizontal break in a railroad track running through Potterville caused the derailment of 35 cars from a 58-car Canadian National Railroad freight train. Nine cars contained liquid propane, two of which leaked the gas. About 2,200 citizens were evacuated for up to four days. Canadian National Railroad reimbursed residents who could document losses such as missed work, spoiled food, and hotel stays.

Case: July 7, 2006 Tustin (Osceola County)

A semi truck overturned on US-131 in an accident involving ethanol fuel near Tustin in Osceola County. Both lanes of the highway were shut down. Over 2,000 gallons of fuel contaminated the soil, resulting in about 10,000 gallons of sludge being removed by the hazardous materials teams.

Case: December 2006 Mecosta County

In December, 2006 a gas well burst into an explosion in Mecosta County, resulting in the evacuation of several nearby residents. The issue was later resolved, with no additional threat to public safety.

Case: August 28, 2007 Muskegon (Muskegon County)

A house exploded after a contractor accidentally struck a natural gas line. Fortunately, no one was inside the home when the incident occurred. The explosion also caused damage to a neighbor's house.

Case: September 15, 2007 – Lowell (Kent County)

A fire and an explosion destroyed several connected buildings at a Lowell factory. The fire affected a quantity of 10% solution of sulfuric acid that was between 5 and 10 thousand gallons. There was a concern over the effect on groundwater, and on the Lowell municipal water supply. The blaze sent black and gray smoke billowing high into the evening sky, visible at least 10 miles away, and attracted hundreds of onlookers. A half-dozen area fire departments, from as far as East Grand Rapids and Belding, helped Lowell firefighters battle the blaze. There was at least one reported injury.

Case: February 26, 2008 Grand Rapids (Kent County)

A natural gas explosion occurring at 3:30pm on February 26, 2008 resulted in the collapse of a two story building. Seven persons were injured, and five neighboring businesses suffered damage. A fire burned well into the night, due to an inability to shut off the natural gas until 9:30pm because the fire wouldn't allow access. Three quarters of the city's firefighters were involved in the effort, with neighboring departments covering calls in the city. A gas leak was also detected under the road.

Case: May 16, 2010 Kentwood (Kent County)

A natural gas leak caused a four-unit apartment to explode on May 16, 2010, resulting in 4 injuries. The gas leak occurred in a vacant apartment in the complex. The scene resembled that of a tornado, with debris scattered nearby, shards of broken window glass littered on the ground, lumber lodged into a neighbor's garage, and siding propelled through a neighbor's window.

Case: July 21, 2010 Ravenna (Muskegon County)

A man was killed in a propane leak explosion that destroyed his mobile home. The man had attempted to convert a kitchen stove from natural gas to propane, but a leak later occurred, resulting in the explosion while he was sleeping.

Case: July 26, 2010 Calhoun & Kalamazoo Counties Enbridge Pipeline Disaster

On July 26, 2010, an oil spill was discovered by the owners of an oil pipeline, Enbridge Energy Partners L.P., during a maintenance activity at a pumping station located on the south edge of the City of Marshall. The 30-inch pipeline normally transported 190,000 barrels per day from Griffith, Indiana, to Sarnia, Ontario, and passes through Calhoun County and several other Michigan counties. Oil from the pipeline leaked into the Talmadge Creek and then into the Kalamazoo River and began to flow downstream toward Lake Michigan. Enbridge Energy officials shut down the pipeline pumps and closed valves located upstream and downstream from the leak site to stem the flow of additional oil and try to contain the spill. Based on company estimates, up to 19,500 barrels of crude oil had leaked from the pipeline (approximately 800,000 gallons).

Calhoun County declared a local state of emergency and several downstream communities, including Kalamazoo County, took emergency response actions in coordination with Calhoun County. The State Emergency Operations Center in Lansing was activated and a number of state departments and support organizations convened there to monitor the incident and coordinate state response activities with involved governmental agencies and company officials. Representatives of the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Transportation Safety Board, U.S. Department of Transportation and other federal agencies quickly convened at the incident site and began working with company, local and state officials (under a Unified Command structure) to develop and implement a spill containment, recovery, and clean-up plan and protection strategy for the environment and affected local residents.

A coordination facility was established in the City of Marshall and contractors were brought in for environmental restoration and product recovery. Aggressive product recovery efforts were instituted to expedite oil containment and environmental clean-up. Wildlife rescue and rehabilitation operations were also implemented to aid in protecting animals and aquatic life from harm, and saving wildlife that had been adversely impacted by the spill. Health advisories were issued to protect the public from harm, and some of the nearby residents were evacuated for a time until the air quality improved within the area. A number of contracted cleanup crews were brought in to perform clean-up and product recovery work.

On September 27, the repaired oil pipeline was restarted by company officials, with the approval of the U.S. Department of Transportation. New oil again flowed through the pipeline, initially at a reduced pressure level but then at full capacity again. Clean-up and product recovery efforts are still ongoing. The unified command center remained operational for an extended period of time, due to the long-term nature of product recovery and environmental clean-up operations.

Hazardous Materials Incidents in Newaygo County

Regardless of their type or classification, it is a fact that every Newaygo County citizen could potentially be affected by a hazardous materials incident, whether they live or work in a rural or urban community. This obviously results in a high level of risk.

Newaygo County's primary vulnerability concern for hazardous materials incidents directly results from the lack of local hazardous materials response capability. Although local emergency services expend great efforts to plan and train in such emergencies to the best of their abilities, the fact remains that there is no quantifiable level of hazardous materials response team within the jurisdiction. Lack of this essential equipment in detection, personal protection, containment, and decontamination, etc. has resulted in the need to call contracted hazmat teams from nearby Counties for response and cleanup, requiring 1 ½ to 2 ½ hour response time.

Although virtually every business, industry, and household contains some levels of hazardous materials, of primary concern in Newaygo County are identified sites that are required to meet regulatory requirements of the Superfund Amendment and Reauthorization Act (SARA) due to their quantity and type of extremely hazardous substances (EHS). Facilities identified by the Michigan Department of Environmental Quality (MDEQ) as containing Extremely Hazardous Substances (EHS) above identified Threshold Planning Quantities (TPQ) are classified as SARAIII 302 sites. Facilities identified by the Michigan Department of Environmental Quality (MDEQ) as containing Extremely Hazardous Substances (EHS) at established reporting quantities are classified as SARAIII 312 sites. Although less than identified SARAIII 302 sites, these facilities still pose a significant level of risk to their communities.

The following facilities have been identified as containing Extremely Hazardous Substances (EHS) at or above established reporting quantities as identified by the Environmental Protection Association (EPA). As such, off-site response plans have been developed and are annually revised by the Emergency Management Department, Emergency Planning Committee, Site Coordinator, and local fire department. These plans are additionally designed to meet Firefighter Right to Know and MIOSHA HAZWOPER requirements.

- ◆ CARAJON CHEMICAL (FREMONT)
- ◆ NORTH CENTRAL CO-OP (FREMONT)
- ◆ GERBER PRODUCTS (FREMONT)
- ◆ KARNEMAAT FARMS (FREMONT)
- ◆ MAGNA DONNELLY (NEWAYGO)
- ◆ AT&T (GRANT)
- ◆ AT&T (NEWAYGO)
- ◆ AT&T (FREMONT)
- ◆ AT&T (WHITE CLOUD)
- ◆ FRONTIER COMMUNICATIONS (HESPERIA)
- ◆ CHARTER COMMUNICATIONS (GRANT)
- ◆ NORTH AMERICAN REFACTORIES (WHITE CLOUD)
- ◆ WILBUR-ELLIS (GRANT)

It is unknown how many more businesses and farms throughout the county utilize, store, or transport reportable quantities of Extremely Hazardous Substances (EHS) and who are not reporting under the Community Right-to-Know law, therefore, the above list is not all inclusive.

Naturally, hazardous materials utilized at local fixed sites don't just magically appear and disappear. They simply must arrive and leave the community through some method. As

such, regular shipments of hazardous materials travel through Newaygo County on primary and secondary local transportation routes on a regular, daily basis. Primary highways such as M-37, M-20, and M-82 are not only utilized for transportation of shipments to and from local business/industry, but are also heavily utilized for transportation of shipments to statewide and neighboring jurisdiction facilities. Secondary routes, such as local county roads, provide concern, as they are necessary to transport shipments either to or from local businesses to the main highways. Although these routes are secondary roads, many of these are located in populated or vulnerable areas.

In addition, several hazardous materials are shipped through the southwestern portion of the County by Marquette Railway on a daily basis. This includes Calcium Carbonate, Hot Asphalt, and other petroleum products. The line is one of the busiest in the state of Michigan traveling through the Cities of Grant, Newaygo, and White Cloud. The other line is a C&O Railway ending at the City of Fremont at Gerber Products.

Newaygo County also has natural gas and petroleum pipeline infrastructure running through the County. Large compressor stations, pipelines, and other resources make the jurisdiction's pipeline emergencies a concern on a statewide basis. The 200,000 miles of oil pipelines traversing this country represents an estimated \$200 to \$400 billion investment in an infrastructure that is vital to our economy, safety, and standard of living. The nation's pipelines are a transportation system that enables the safe movement of extraordinary quantities of energy products to industry and consumers, literally fueling our economy and way of life. The arteries of the Nation's energy infrastructure, as well as the safest and least costly ways to transport energy products, our oil and gas pipelines provide the resources needed for national defense, heat and cool our homes, generate power for business and fuel an unparalleled transportation system. The United States has the largest network of energy pipelines – both oil and natural gas -- of any nation in the world. The oil pipeline network alone in the U.S. is more than 10 times larger than that in Europe.

Based on historical occurrences, Newaygo County experiences a hazardous materials incident on average, approximately once every two to three years. The following are hazardous materials incidents which have occurred in Newaygo County:

Case: February 4, 1978 Woodland Park (Newaygo County)

A Dow Chemical train derailed caused a chemical spill of approximately 30,000 gallons of ethylene oxide, carbolic acid, methylene chloride, and phropheline oxide. A total of 50 persons were evacuated from the vicinity of the accident scene. According to the Merrill Township Master Plan, recent tests conducted by 24 Hour News 8 in the area show chemical levels of the potential carcinogen 1,1-DCE (used to make plastics and flame-retardant coatings) to be more than twice the level for safe drinking water and that the chemical has spread to the southwest, toward East Lake. Additional tests conducted by a consultant hired by CSX have found traces of vinyl chloride in East Lake. Vinyl chloride is a known carcinogen

and is created when 1,1-DCE breaks down in the environment. The Environmental Protection Agency (EPA) says 1,1-DCE might cause cancer in humans. This chemical can damage the nervous system, liver, and lungs. Unconfirmed anecdotal evidence shows that many people who lived around the train derailment site died of cancer within a few years of the derailment.

The biggest concern for Merrill Township is human exposure through drinking the groundwater. Clean-up efforts on the groundwater were stopped in 1998 after it became apparent that they were not working. Since this time, monitoring wells are showing chemical levels up to 137 times higher than the safe level for drinking. Another investigation several years ago indicated that the contamination had spread uphill and upstream to the north, crossing 11 Mile Road.

Case: June 22, 1979 Newaygo (Newaygo County)

A freight train derailment caused a chlorine leak that eventually sealed itself. A total of 300 persons were evacuated as a precautionary measure.

Case: October 21, 2000 Woodland Park (Newaygo County)

A propane explosion on October 21, 2000, demolished a summer home in Woodland Park and killed 4 members of a family, just minutes after they had arrived at the home for a weekend visit. Two other family members survived the blast, which may have originated in the basement of the home.

Case: May 24, 2007 (Wesco Tanker Truck)

A tanker truck carrying 13,000 gallons of gasoline and ethanol turned onto its side while swerving to miss a deer on 80th Street west of Warner Ave. The tanker truck rolled into a ditch spilling gasoline and ethanol contaminating soil and a nearby stream. No one was hurt during the accident or response.



Case: June 5, 2008 (Dart Oil Fire)

Lightning from a Severe Thunderstorm hit a pole nearby the Dart Oil natural gas well located at South Cypress Ave and 96th Street in Ensley Township igniting the tank on fire. Flames leaped 60 feet into the air after the strike, but the oil eventually burned itself out. The tank is used to capture sludge that drips off from a natural gas well.

Case: May 2012 Oil Well Head Leak (Beaver Township)

An oil well head located at approximately 9552 E Filmore Rd, Hesperia MI was found to be leaking crude oil. There was a 12 foot by 15 foot pool of oil around the well head, approximately 80 yards from a creek. The owner and installer of the well is Well Masters out of Rothbury, Michigan. DEQ worked with the EPA and Newaygo County Emergency Services to clean up the spill.

*Case: 2000 and 2014 Campbell, Wyatt, and Cannon Pipeline Leak (Bridgeton Township)*

In 2000, the DEQ and Grant Fire Department responded to a crude petroleum leak in the Muskegon River near Bell Meadow Subdivision. The leak was coming from a decommissioned 6-8 inch pipe that was once a transmission line owned by Campbell, Wyatt, and Cannon running from near Big Rapids to the Muskegon Refinery. The line crosses the Muskegon River in Section 14 of Bridgeton Township, and is exposed on the bottom of the river. As the pipe is no longer in service, it only contained residual crude oil. In

an attempt to stop the leak, the DEQ contracted with Northern A-1 to cap the line and suction off any remaining crude oil.

On Sunday, June 29th a property owner on Bell Meadow Subdivision contacted Newaygo County Emergency Services reporting an oil leak going into the river. After further investigation, the DEQ believes the leak is residual oil from contaminated ground and is being seeped into the river because of high ground water and deteriorating condition of the transmission line. With the assistance of Grant Fire Department and DNR Officer Ginn, absorbent booms and pads were placed to keep the sheen from spreading. The DEQ is currently working to resolve the leak permanently by removing any contaminated soil in addition to the section of the pipe running along the bottom of the Muskegon River.

INFRASTRUCTURE FAILURE

Infrastructure Failure

The failure of critical public or private utility infrastructure that results in a temporary loss of essential functions and/or services.

Hazard Description

Public and private utility infrastructure provides 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 inter-related systems fails 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. When the water or wastewater 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.

All of these situations can lead to disastrous public health and safety consequences if immediate actions are not taken. Typically, it is the most vulnerable segments of society - the elderly, children, ill or frail individuals, etc., that are 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 even regions can be negatively impacted.

Hazard Analysis

Infrastructure failures can occur at any time and in any place in the state of Michigan and have the potential to affect hundreds of thousands of people. The risk of failure grows each year, as physical and technological infrastructure gets steadily more complex, and the interdependency between various facets of infrastructure (like pipelines, telecommunications lines, and roads) becomes more intertwined. Additionally, more vulnerable and aging infrastructure (rail lines, electrical components, bridges, roads, sewers, etc.) is in need of repair. Because of these reasons, large-scale disruptions in various components of infrastructure are likely. Major disruptions could lead to widespread economic losses, limit security, and altered ways of life.

As the Nation's public and private utility infrastructure systems continue to age, infrastructure disasters will undoubtedly become more common. Because many of these systems were developed decades ago, the costs of repairing and replacing aging sections and/or components have greatly increased. As a result, many communities cannot afford to do the maintenance work necessary to keep the system in ideal operational mode. Increasing demands on the systems also lead to increased deterioration, and many components have far exceeded their useful service life. This creates a situation of increasing risk from infrastructure-related disasters, either as a primary event, or as a secondary event from

floods, windstorms, snow and ice storms, or other natural or technological hazards. When those disasters do occur, they cause great inconvenience to the affected population and they can also create severe public health and safety concerns.

Infrastructure Failure in Michigan

According to the Michigan Asset Management Council, the condition of 10,000 miles of Michigan's federal aid eligible roads went from either "good" or "fair" to "poor" between 2004 and 2007. According to the US Census Bureau, Michigan has been ranked in the bottom ten of all states for over 40 years in its level of funding. After a decade of stagnant revenues in road funding, the Michigan Department of Transportation (MDOT) showed an additional 15 percent decline in funding between 2008 and 2011. Another challenge for Michigan's roads and bridges is the annual winter freeze and thaw cycle that causes a continual breakdown of road and bridge surfaces. According to the July 2008 report by the Citizens Advisory Committee on Transportation Funding, Michigan's roads and bridges will require an estimated annual investment of \$6.1 billion, which is nearly two times the current funding level, for basic improvements to its road and bridge system.

Two recent major engineering studies provide a glimpse of the extent of the infrastructure repair and rebuilding effort required just for Michigan to keep up with current and anticipated demand. The first study, completed by the American Society of Civil Engineers (ASCE) in 2009, found the results listed below.

Key Infrastructure Facts

- ◆ 38% of Michigan's roads are in poor or mediocre condition, rated the 3rd worst state in the United States.
- ◆ In 2005, 39% of Michigan's urban highways were congested, compared to 23% in 2000.
- ◆ Michigan Department of Transportation had a 15% decline in funding between 2008 and 2011.
- ◆ Michigan has the 8th worst road system in the nation, based on overall performance.
- ◆ Michigan is 6th in the nation in the total cost of road miles needed.
- ◆ A total of 23,000 road lane miles will need to be repaired or replaced by 2015, while expected funding will pay for only 876 lane miles, just 4% of what is needed.
- ◆ 25% of Michigan's bridges are structurally deficient or functionally obsolete.
- ◆ By 2030, unless additional roadway capacity is added, rush hour travel in major urban areas will take up to 50% longer to complete in Michigan.
- ◆ Driving on crumbling roads costs Michigan motorists a total of \$2.6 billion per year.
- ◆ An additional 30% of Michigan roads will decline to fair or poor condition over the next decade.
- ◆ Under current funding mechanisms, Michigan stands to lose nearly \$1 billion in federal funds each year, because its transportation agencies will not have enough revenue to provide the required matching funds.

- ◆ Michigan's drinking water infrastructure needs \$11.3 billion over the next 20 years.
- ◆ Michigan's wastewater infrastructure needs \$6 billion over the next 20 years.
- ◆ Michigan Department of Environmental Quality estimates that less than 40% of the State's stormwater infrastructure has even been reviewed for its impact on water quality.
- ◆ 52% of Michigan's schools have at least one inadequate building feature.
- ◆ There are 84 high hazard dams in Michigan. A high hazard dam is defined as a dam whose failure would cause a loss of life or significant property damage.
- ◆ A significant portion of the state's primary water distribution system is nearly 100 years old, with 80% of the city of Detroit's piping system having been installed before 1940.
- ◆ In 2007 alone, 26 billion gallons of raw or partially treated sewage spilled into surface waters in the state of Michigan, and 23 billion gallons, or 88% of the state total of sewage spilled into surface waters, were located in Detroit.

The ASCE study found a common thread nationwide of an increase in demands on public infrastructure without a corresponding increase in funding to perform the necessary maintenance and repairs on facilities, and to rebuild aging or dilapidated facilities.

Unfortunately, Michigan has had its share of infrastructure failures, mostly due to the effects of natural disasters such as snow and ice storms, severe cold, windstorms, tornadoes, and floods. Michigan has had numerous widespread and severe electrical power outages, caused mostly by severe weather such as windstorms or ice and sleet storms. In addition, Michigan has had several power outages in recent years that left upwards of 500,000 people (roughly 5% of the State's population) without power for periods lasting from several hours to several days at a time. Fortunately, most of those occurred during months when severe cold temperatures were not a problem. If they had occurred during the cold winter months, there certainly would have been a potential for loss of life – especially among the elderly and other more vulnerable members of society. The following are incidents highlighted in the 2012 Michigan Hazard Analysis.

Case: December 1989 Monroe County Water Supply Infrastructure Failure

The December 15, 1989 water emergency in Monroe was the result of a water intake in Lake Erie being blocked by ice build-up and Zebra Mussel crustaceans. Officials issued water conservation and boil-water advisories, and schools and most large businesses were closed. Local hospitals limited their activity to emergencies only and referred new patients to out-county hospitals. The hospitals operated on bottled water for the duration of the incident. The fire service was also adversely impacted, invoking mutual aid and stationing tankers throughout the city in case a fire occurred. The city eventually completed an emergency hookup with the Toledo, Ohio water system, which helped alleviate most of the water supply problems. The city also had three pumps drawing water from the River Raisin and pumping it to the water treatment facility. Emergency measures continued for three days. By December 18, the flow of water was back to normal. This incident showed how a vast public infrastructure system can be made inoperable – and thousands of people inconvenienced or even imperiled – by something as small as an aquatic mollusk.

Case: July 7, 1991 Electric Power Infrastructure Failure

One of the major electrical blackout events due to storms was on July 7, 1991 when a powerful wind storm affected a large portion of central North America and knocked out power to over 1 million customers from Iowa to Ontario. Almost the entire lower half of the lower peninsula of Michigan was affected by the derecho, with wind gusts of 65 to 85 mph. Electrical power was cut off to around 850,000 customers in Michigan alone, which was the largest number of customers to lose power from a single storm up to that time.

Case: Winter of 1993/94 Northern Michigan Water Supply and Sewer Infrastructure Failures

The underground freeze disaster in northern Michigan in 1994 provided an indication of how vulnerable our public water and sewer infrastructure can be to the adverse effects of natural phenomena. Due to a prolonged period of severe cold weather that caused ground frost to greatly increase beyond normal depths, municipal water and sewer systems in ten counties partially failed, disrupting service to over 18,000 homes and businesses and causing over \$7 million in infrastructure damage. Some of the homes and businesses were without normal water and sewer service for several weeks. At final count, over 3,200 water and sewer lines had been frozen and/or broken, making this infrastructure failure not only unusual but also unprecedented in U.S. history in terms of scope and magnitude. This disaster showed how vulnerable our underground infrastructure can be when the “right” set of natural conditions occurs. Furthermore, these types of disasters may occur with greater frequency in the future, as our public infrastructure ages and thus becomes more fragile (and since most systems are not built to be “disaster resistant/disaster proof” in the first place).

January 1, 2000 Statewide Y2K – Electric Power Infrastructure Failure

The most anticipated electric power failure in the history of humankind never actually occurred. The much-celebrated year 2000 (commonly known as Y2K) computer conversion crisis was considered by many to be the biggest “non-event” ever. Actually, several years of mitigation and preparedness efforts had paid off on the morning of January 1, 2000, when the electric power grid and other critical public utility systems remained operational – stemming fears that there would be widespread power outages, resource shortages, and economic and social chaos. The electrical grid in Michigan and across the country continued to operate on January 1 and beyond, without so much as a hiccup – a testament to the proactive efforts of the electric power industry.

Case: August 2003 Northeastern United States Electrical Blackout

On Aug. 14, 2003, most residents of the northeast United States and Ontario were hit by the largest blackout in North America's history. Electricity was cut to 50 million people, bringing darkness to customers from New York to Michigan. Some essential services remained in operation in most of these areas, although backup generation in some cities was not up to the task. The phone systems remained operational in most areas; however, the increased demand by people phoning home left many circuits overloaded. Water systems in several cities lost pressure, forcing boil-water advisories. Cellular telephones experienced significant service disruptions as their transmission towers were overloaded with a sudden increase in

the volume of calls. Television and radio stations mostly remained on the air, with the help of backup generators, or by relaying their broadcasts through the Grimsby transmission towers, which were online throughout the blackout. Most interstate rail transportation in the United States was shut down, and the power outage's impact on international air transportation and financial markets was widespread. Meanwhile, the reliability and vulnerability of all electrical power grids were called into question. Total costs of the blackout have been estimated at between 4 and 10 billion dollars.

Case: January 2005 Muskegon County Water Main Failure

In January of 2005, most of the residents of the city of Muskegon Heights lost water service for a brief time. The cause of the failure was determined to be a broken water main.

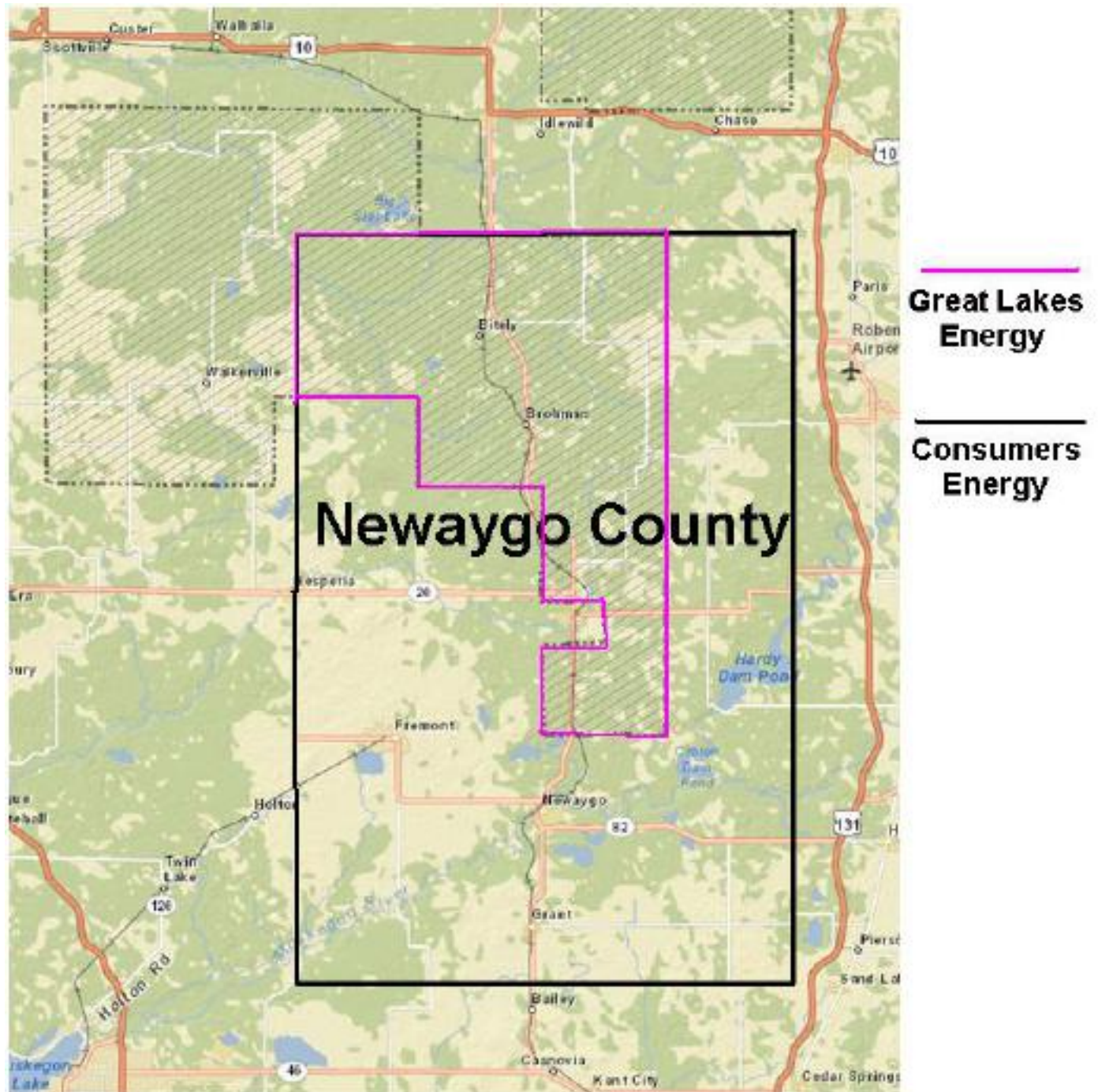
Case: March 2007 Muskegon County Sewer Main Break

On Friday March 2, 2007 a break occurred in a 66 inch underground sewer main in Muskegon Township, resulting in flood damage to several homes and sending 25 million gallons of raw sewage into Muskegon Lake. The county hired crews to repair the ruptured pipe as soon as possible. Around 30 homes had to be evacuated. The county spent \$38 million to replace eight and a half miles of underground sewer main.

Infrastructure Failure in Newaygo County

Due to older utility systems, Newaygo County has historically been affected by localized infrastructure failures of critical electrical, telephone, and public safety communications services. Based on historical occurrence, Newaygo County on average, experiences hundreds of infrastructure failures annually. Despite the majority of these occurrences being brief in nature and of limited effects, they have clearly demonstrated the potential of significant public safety and economic concerns posed by larger magnitude incidents. Primary concern for this hazard focuses on the lack of critical back-up systems to facilitate an effective response to such incidents.

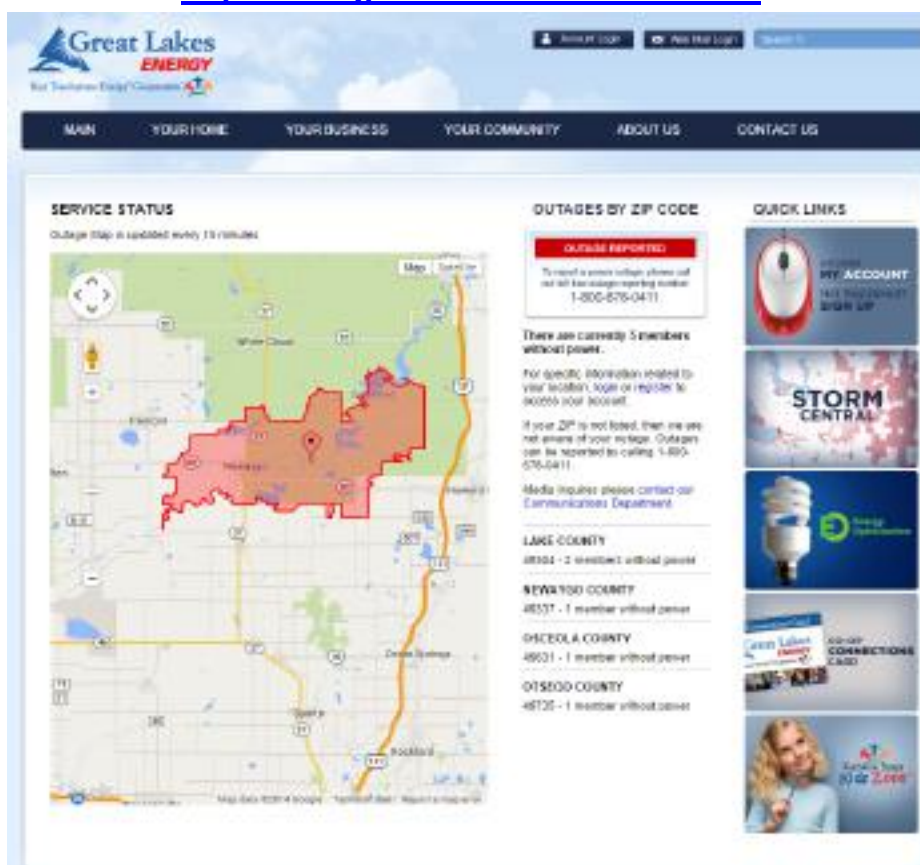
Electrical infrastructure failure is not only a common occurrence in Newaygo County but is also an identified consequence of many other local hazards. This has resulted in intense concerns by emergency management and response officials focused on the lack of generator capability at critical facilities identified as shelters (primarily schools). Newaygo County is serviced by two private electric companies, Great Lakes Energy and Consumers Energy. These companies own the distribution lines and infrastructure to provide electricity to the public. ITC Transmission is also a private company that owns a majority of the transmission lines and electrical substations within Newaygo County. Great Lakes Energy and Consumers Energy utilize ITC Transmissions' infrastructure to distribute power to end users.



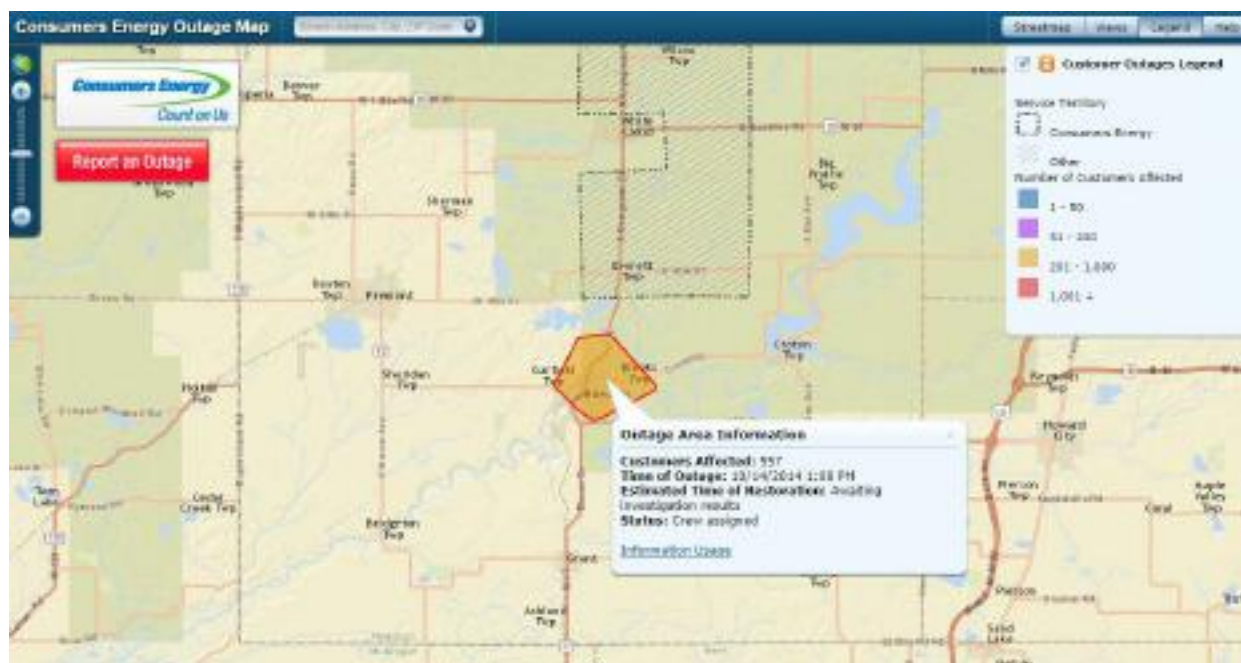
Electric Company Service Area for Newaygo County

Both Great Lakes Energy and Consumers Energy maintain online outage maps where the public can access information on current outages. Information is listed via county and zip code. Consumers Energy's website also contains status information on the outage and estimated restoration times.

<http://www.gtlakes.com/storm-central/>



<http://www.consumersenergy.com/outagemap>

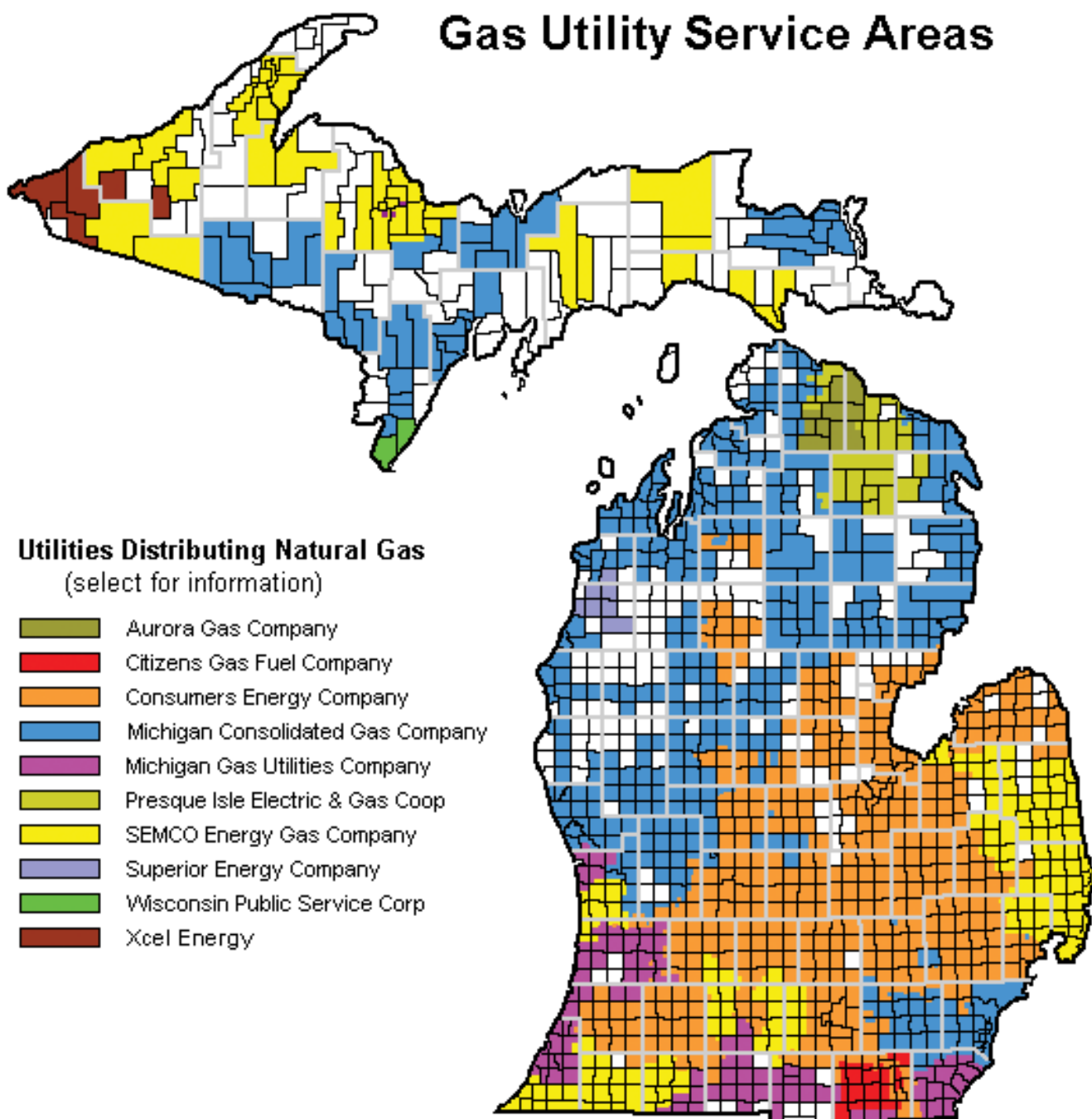


Newaygo County Outages and Customer Count by Month (Consumers Energy)

Year	Month	# Incidents	# Customers	County Name
2009	January	26	325	NEWAYGO
2009	February	15	344	NEWAYGO
2009	March	43	1,039	NEWAYGO
2009	April	37	545	NEWAYGO
2009	May	35	564	NEWAYGO
2009	June	48	936	NEWAYGO
2009	July	46	304	NEWAYGO
2009	August	107	6,473	NEWAYGO
2009	September	49	1,987	NEWAYGO
2009	October	134	3,851	NEWAYGO
2009	November	27	263	NEWAYGO
2009	December	42	1,889	NEWAYGO
2009 Totals		609	18,520	
Year	Month	# Incidents	# Customers	County Name
2010	January	18	203	NEWAYGO
2010	February	15	4,580	NEWAYGO
2010	March	33	2,028	NEWAYGO
2010	April	42	1,647	NEWAYGO
2010	May	62	2,573	NEWAYGO
2010	June	55	1,930	NEWAYGO
2010	July	81	2,302	NEWAYGO
2010	August	66	1,606	NEWAYGO
2010	September	243	10,344	NEWAYGO
2010	October	185	6,630	NEWAYGO
2010	November	47	5,197	NEWAYGO
2010	December	49	1,174	NEWAYGO
2010 Totals		896	40,214	
Year	Month	# Incidents	# Customers	County Name
2011	January	16	146	NEWAYGO
2011	February	54	5,569	NEWAYGO
2011	March	149	8,522	NEWAYGO
2011	April	64	1,315	NEWAYGO
2011	May	39	1,882	NEWAYGO
2011	June	131	5,670	NEWAYGO
2011	July	261	13,535	NEWAYGO
2011	August	136	6,674	NEWAYGO
2011	September	276	18,904	NEWAYGO
2011	October	49	6,847	NEWAYGO
2011	November	49	2,053	NEWAYGO
2011	December	27	474	NEWAYGO
2011 Totals		1251	71,591	

Year	Month	# Incidents	# Customers	County Name
2012	January	43	741	NEWAYGO
2012	February	15	384	NEWAYGO
2012	March	135	7,015	NEWAYGO
2012	April	63	3,907	NEWAYGO
2012	May	118	3,125	NEWAYGO
2012	June	62	1,831	NEWAYGO
2012	July	293	13,521	NEWAYGO
2012	August	50	4,010	NEWAYGO
2012	September	63	304	NEWAYGO
2012	October	55	1,311	NEWAYGO
2012	November	20	1,217	NEWAYGO
2012	December	39	2,752	NEWAYGO
2012 Totals		956	40,118	
Year	Month	# Incidents	# Customers	County Name
2013	January	73	5,950	NEWAYGO
2013	February	17	175	NEWAYGO
2013	March	14	91	NEWAYGO
2013	April	77	4,488	NEWAYGO
2013	May	68	9,786	NEWAYGO
2013	June	45	929	NEWAYGO
2013	July	67	1,936	NEWAYGO
2013	August	70	1,556	NEWAYGO
2013	September	43	602	NEWAYGO
2013	October	60	1,259	NEWAYGO
2013	November	152	4,179	NEWAYGO
2013	December	38	332	NEWAYGO
2013 Totals		724	31,283	
Year	Month	# Incidents	# Customers	County Name
2014	January	53	7,609	NEWAYGO
2014	February	30	1,516	NEWAYGO
2014	March	23	1,298	NEWAYGO
2014	April	213	7,785	NEWAYGO
2014	May	77	816	NEWAYGO
2014	June	119	1,575	NEWAYGO
2014	July	44	1,033	NEWAYGO
2014	August	43	645	NEWAYGO

As many areas within Newaygo County are rural in nature, a majority of the homes are heated using propane or wood. Residences in these areas rely on local distributors to provide them services. In more populated areas of Newaygo County, Michigan Consolidated Gas Company (MichCON) is the natural gas distributor servicing the area.



Phone Exchange Numbers

Map showing Phone Exchange Numbers in North Dakota, categorized by service area:

- AT&T Service Area (Yellow):**
 - 898 Troy
 - 873 Beaver
 - 854 Denver
 - 924 Fremont
 - 821 Sheridan
 - 834 Bridgeton
- Frontier Service Area (Green):**
 - 832 Barton
 - 796 Norwich
 - 823 Big Prairie
 - 856 Big Prairie
 - 937 Croton
 - 636 Ensley
- Carr Service Area (Red):**
 - 745 Merrill
 - 689 Lincoln
 - 652 Newaygo
 - 635 Grant

Other counties shown include Lilly, Home, Monroe, Wilcox, White Cloud, Sherman, Garfield, Brooks, and City of Grant.

Scale: 0 0.5 1 2 3 4 Miles

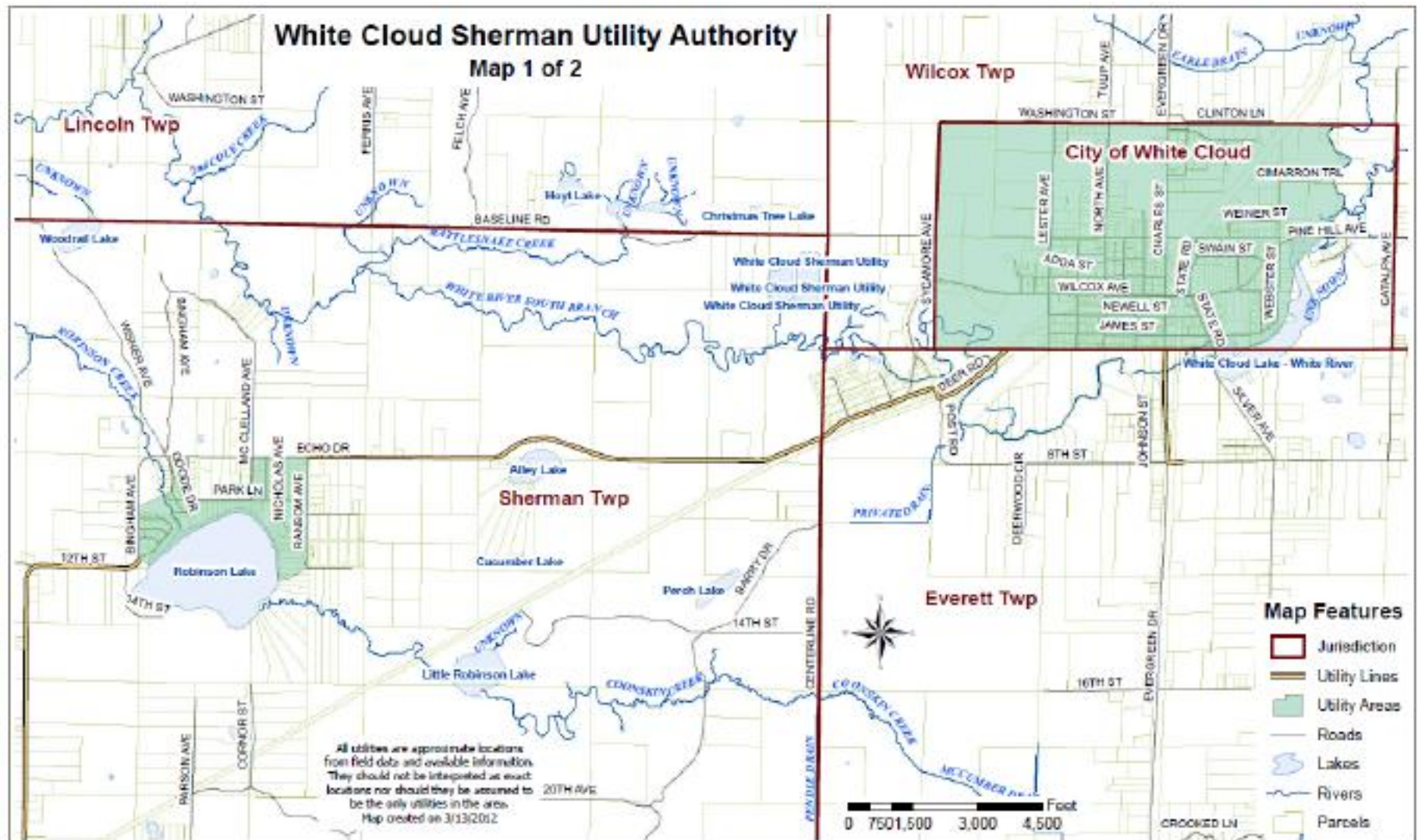
Legend:

- AT&T Service Area
- Frontier Service Area
- Carr Service Area

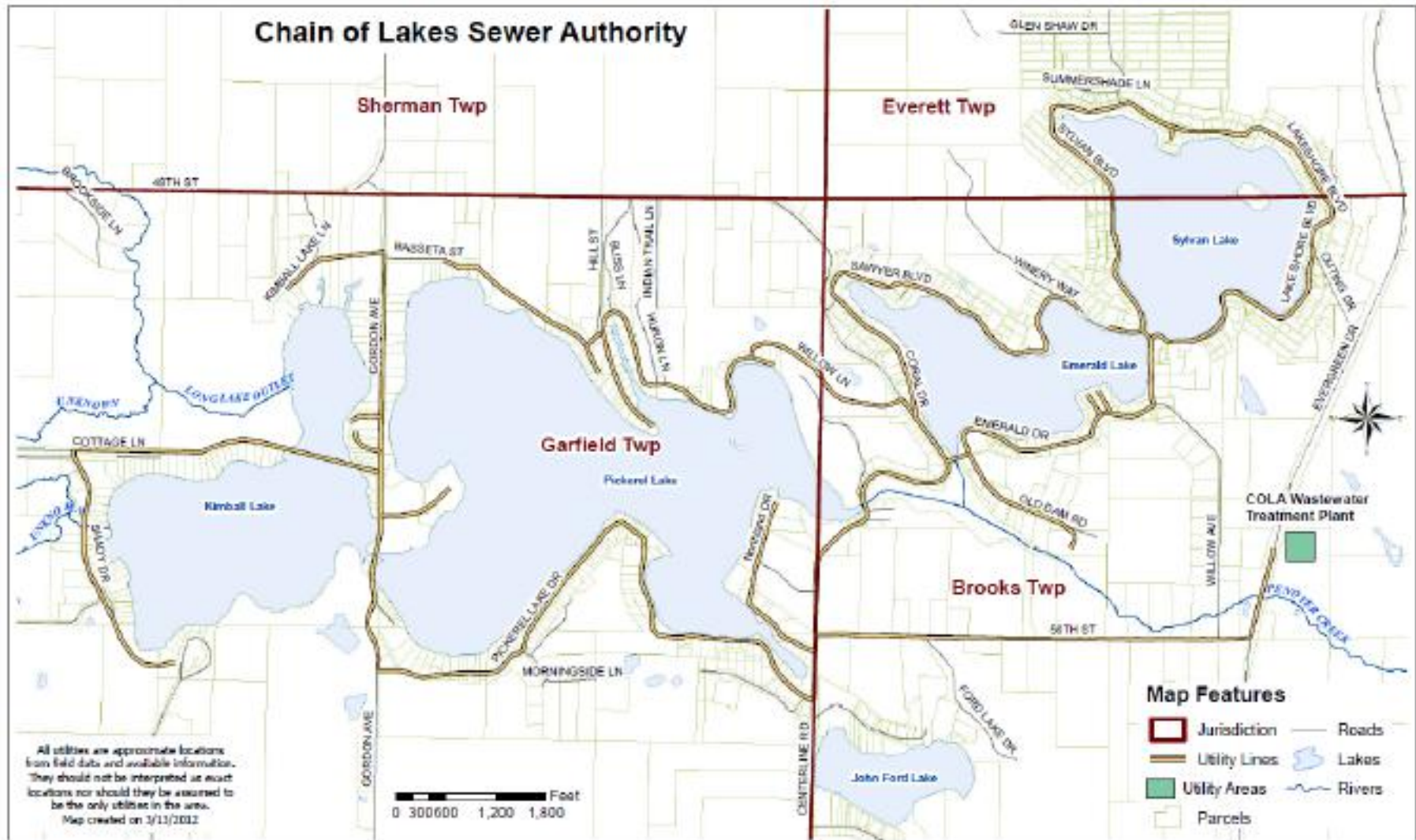
Being rural in nature, many residences within Newaygo County rely on privately owned well and septic systems for water and waste water. However, there are six municipal water and waste water systems within Newaygo County maintained by city or local authority boards. The City of Fremont maintains 3 water towers and 8 well houses as a part of their Water Supply and Treatment to the City of Fremont. The City of Grant and the City of Newaygo both maintain a single water tower and treatment facility. The City of White Cloud maintains three wells and two water towers. The Sherman Twp/White Cloud Sewer Authority manages the 1.1 million gallon per year waste water treatment facility just west of the City of White Cloud. The Chain of Lakes also maintains a Sewer Authority serving portions of Everett, Brooks, and Garfield Townships around Sylvan, Emerald, Pickerel, and Kimball Lakes.

It is rare to have a water or sewer interruption, however, in the spring of 2014, both the City of White Cloud and the City of Newaygo experienced water main breaks due to extreme winter weather causing a disruption in service to both communities.









TRANSPORTATION ACCIDENTS / MASS CASUALTY INCIDENTS

Transportation Accidents

A crash or accident involving an air, land, or water-based commercial passenger carrier causing a situation that stresses the emergency medical services resources and health care system.

Hazard Description

In the United States, transportation is facilitated by road, air, rail, and waterways. According to the Bureau of Transportation Statistics, 86% of passenger miles traveled occur by passenger vehicles including cars, trucks, vans, and motorcycles. The remaining 14% was handled by planes, trains, and buses.

Mode of passenger transport	Passenger-miles (millions)	Percent
Highway — total	4,884,557	88.79%
Passenger vehicles, motorcycles	4,520,810	82.18%
Trucks	222,836	4.05%
Buses	162,908	2.96%
Air Carriers	583,689	10.61%
Rail — total	30,972	0.56%
Transit	16,118	0.29%
Commuter	9,473	0.17%
Intercity/Amtrak	5,381	0.10%
All other modes (e.g., ferryboats)	2,091	0.04%
Source: 2005 estimates by the Bureau of Transportation Statistics ^[1]		

The following are specific types of transportation accidents:

Roadway Transportation Accidents

Passenger transportation is dominated by a network of over 3.9 million miles of highways. The overwhelming majority of roads in the United States are owned and maintained by state and local governments. The Interstate Highway System is partly funded by the federal government but owned and maintained by individual state governments. There are a few private highways in the United States, which use tolls to pay for construction and maintenance. However, a vast majority of the roads are local private roads, generally serving remote or insular residents.

A major roadway transportation accident has the potential to create a local emergency event, or to seriously strain or overwhelm local response and medical services. It

would involve a commercial passenger bus, a local public transit bus, a school bus or a church van. Although these modes of transportation have good safety records, an accident has a high potential of creating numerous injuries and shutting down portions of major roadways for an extended period of time.

Railway Transportation Accidents

Passenger trains were the dominant mode of transportation until the mid-twentieth century. The introduction of jet airplanes on major U.S. routes and the completion of the Interstate Highway system accelerated a decline in intercity rail passenger demand during the 1960s, resulting in the sharp curtailment of passenger service by private railroads. This led to the creation of National Railroad Passenger Corporation (branded as Amtrak) by the federal government in 1971 to maintain limited intercity rail passenger service in most parts of the country. Amtrak serves most major cities but, outside of the Northeast, California, and Illinois, often by only few trains per day. Amtrak does not serve several major destinations, including Las Vegas, Nevada, and Phoenix, Arizona.

According to Amtrak, during FY 2013, the railroad welcomed aboard nearly 31.6 million passengers, the largest annual total in its history, and the 10th annual ridership record in the last 11 years. Each day, an average of more than 86,000 passengers ride more than 300 Amtrak trains. More than half of its trains operate at tops speeds of 100 mph or greater. In December 2012, 135 miles of right of way between Kalamazoo and Dearborn, was purchased by Michigan. It is operated, maintained and dispatched by Amtrak, and is being improved for the state of Michigan as an integral part of our Michigan District. Much of the line will be upgraded for service at speeds of up to 110 mph (177 kph).

Air Transportation Accidents

The United States has an advanced air transportation infrastructure which utilizes approximately 5,000 paved runways and houses seventeen of the world's busiest airports. Civilian airlines are all privately owned and financed while most airports are owned and operated by local government authorities or privately owned. Circumstances that can result in an air transportation accident include collision with another aircraft while in flight or during taxi operations, mechanical problems during flight, and complications during takeoff or landing. Almost any accident occurring during flight results in multiple fatalities of passengers, fire, and issues with protection of evidence.

Waterway Transportation Accidents

Although the least used method of transportation, the United States has 25,482 miles of navigable inland channels, exclusive of the Great Lakes. In Michigan, there are 20 commercial marine passenger ferries operating from Michigan's Great Lakes shoreline communities. Most of these marine ferry services operate on a seasonal basis

(typically May through November). Vessel sizes vary, but it is not uncommon for 100-200 passengers or more to be on board many of the ferries at the peak of tourist season. In a typical year, these ferries make thousands of trips across Great Lakes waters. Although the vessels have an excellent safety record and must pass rigorous Coast Guard inspections, the potential for an accident is always present. Accidents in other states or countries involving similar vessels validate the need for rigorous emergency preparedness actions to prevent loss of life in an open water setting such as the Great Lakes. For instance, the Ethan Allen tour boat that capsized in Lake George, New York, in 2005 took the lives of 20 senior citizens.

Hazard Analysis

The one commonality all transportation accidents share, whether air, land, or water-based, is that they can result in mass casualties. Air transportation accidents, in particular, can result in tremendous numbers of deaths and injuries, and major victim identification and crash scene management problems. Water transportation accidents, on the other hand, may require a significant underwater rescue and recovery effort that few local jurisdictions may be equipped or trained to handle.

Roadway Transportation Accidents

More than 130 certified intercity carriers provide passenger, charter, commuter, and special bus service directly to 220 Michigan communities. Of these carriers, six offer regular route service. Michigan's intercity rail passenger system consists of 568 route miles, along three corridors, serving 22 Michigan communities. Although these modes of land transportation have an excellent safety record, the combination of large numbers of passengers, unpredictable weather conditions, potential mechanical problems, and human error always leaves open the potential for a transportation accident involving mass casualties. Such an incident could occur with any of the aforementioned transportation modes, in any of the communities served by these systems. Nationally, an average of about six persons die each year in charter and commuter bus crashes, and 11 school children die in school bus accidents. About 8,500 children are injured each year in school bus crashes.

Buses Involved in Fatal Crashes in the United States by Type

	2004	2005	2006	2007	2008	2009	2010	2011	2012
School	111	111	118	109	116	89	116	98	101
Intercity	35	38	33	35	20	38	36	41	34
Transit	85	83	105	113	92	77	84	68	77
Van-Based	0	0	0	0	0	0	0	25	30
Other	26	34	22	16	12	9	11	10	7
Unknown	22	14	27	8	11	8	4	3	2
	279	280	305	281	251	221	251	245	251

Data from the National Highway Traffic Safety Administration

Railway Transportation Accidents

The new high speed rail service between Detroit and Chicago will provide special challenges for communities located along that rail corridor. Although the rail infrastructure will be greatly enhanced and state-of-the-art safety improvements will be instituted, the possibility of a high speed collision between the train and an automobile or truck will still exist. Of special concern are the 360 public and private at-grade crossings in place along the 279 mile corridor. An at-grade crossing always involves the potential for a collision between the train and a vehicle attempting to drive across the tracks.

The U.S. Department of Transportation, through the Federal Railroad Administration, regulates the speed at which trains operate over highway/railroad at-grade crossings. These regulations allow trains to operate at up to 110 miles per hour over highway-railroad at-grade crossings with conventional warning devices only (cross buck signs, side of street and/or overhead flashing lights, and/or gates). At speeds between 110 and 125 miles per hour, positive barriers must be installed at highway-railroad crossings. At speeds above 125 miles per hour, all highways and railroads must be grade separated. These regulations were developed by evaluating the risk of accident damage, using the following philosophy:

- ◆ Up to 110 miles per hour: The highway vehicle occupant is most at-risk.
- ◆ 110 to 125 miles per hour: Possible injury to the train's occupants, due to rapid deceleration.
- ◆ Above 125 miles per hour:

Greater likelihood of injury to train occupants, and the train may be derailed. Amtrak, and high speed train manufacturers, have done computer simulations of accidents that could cause a significant rapid deceleration (similar to a highway vehicle-train accident). These simulations predict only minor injuries to the train's occupants. Based on the passenger train accident history in the state, the FRA regulations, and the computer simulations, the likelihood of a serious passenger rail transportation accident that results in significant casualties appears to be low. However, any collision between a train and a vehicle could result in casualties. Over a 10 year period from 2000 to 2009, there were 787 collisions in Michigan between trains and vehicles. It is only prudent that communities along the rail corridor be prepared to handle a mass casualty passenger rail accident as a worst-case scenario, and to plan for that contingency in their emergency preparedness efforts.

Transportation Accidents by Railroad in the United States

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Crossing	548	571	551	564	506	428	453	443	446
Railroad	11,438	11,245	10,861	11,158	10,529	9,311	9,578	9,423	9,011
Total	11,986	11,816	11,412	11,722	11,035	9,739	10,031	9,866	9,457

Air Transportation Accidents

Statistics from the NTSB and the airline industry show that the majority (over 75%) of airplane crashes and accidents occur during the takeoff or landing phases of a flight. As a result, developed areas that are adjacent to major airports, and along airport flight paths, are particularly vulnerable to this hazard. Accordingly, the greater the number of landings and takeoffs, the greater the probability of a crash or accident. The challenge for jurisdictions with a passenger air carrier airport is to develop adequate procedures to handle a mass casualty incident that could result from an airplane crash or accident.

According to MDOT statistics, in 2010 these airports collectively handled over 28.2 million passengers (24.4 million from Detroit Metro alone). Nineteen airports have a greater probability of experiencing a commercial passenger airplane crash or accident, either at the airport or in the immediate vicinity of the airport, since these are the main takeoff and landing spots for such commercial flights.

Transportation Accidents by Air in the United States

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Air Carrier	30	40	33	28	28	30	29	31	27
Commuter	4	6	3	3	7	2	6	4	4
Air Taxi	66	65	52	61	58	47	30	50	37
General	1,619	1,671	1,523	1,654	1,569	1,480	1,440	1,470	1,471
Total	1,719	1,782	1,611	1,746	1,662	1,559	1,505	1,555	1,539

Waterway Transportation Accidents

Within Michigan there are 20 marine passenger ferry services. These services have a good safety record, having never suffered a serious accident that resulted in loss of life or property. Nonetheless, given the large number of trips that are made over Great Lakes waters every year, the possibility of a water transportation accident involving one of these vessels is still a possibility. Furthermore, should such an accident occur, the often-turbulent Great Lakes waters, coupled with the potentially large number of passengers on board, could pose tremendous obstacles to carrying out an effective water rescue and recovery operation.

The U.S. Coast Guard, local law enforcement marine safety units, and the ferry operator would provide primary rescue response to a Great Lakes marine passenger ferry accident. These agencies are highly trained and skilled in water rescue operations, but their resources may not be sufficient or their efforts timely enough to save everyone should a fully loaded ferry sink. Even with on-board life-saving equipment, some loss of life might be inevitable—especially in inclement weather and/or rough lake waters. In addition, hypothermia is a real concern—even in balmy Great Lakes waters in the middle of summer.

Transportation Accidents by Water in the United States

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Vessel	4,962	4,977	4,598	4,694	4,756	4,458	5,285	5,837	5,298
Recreational	4,904	4,969	4,967	5,191	4,789	4,730	4,604	4,588	4,515
Total	9,866	9,946	9,565	9,885	9,545	9,188	9,889	10,425	9,813

Transportation Accidents in Michigan

As the following listings indicate, passenger transportation accidents occur with some regularity in Michigan. Fortunately, Michigan's recent transportation accidents have not been as deadly as accidents in many other parts of the country or around the world, but the possibility always exists for a major accident that results in multiple casualties. The following are incidents highlighted from the 2012 Michigan Hazard Analysis.

Case: October 28, 1942 Hamtramck (Wayne County) School Bus and Passenger Train Collision

During the morning of October 28, 1942, a major transportation accident occurred in Hamtramck when a school bus collided with a passenger train. The accident resulted in 16 fatalities and 27 injuries, and of the total of 45 bus passengers, only three were not injured. The driver of the bus claimed he did not see the approaching train because of an overcrowded doorway blocking clear visibility. The majority of the fatalities occurred near the back of the bus, and many of them were children headed for school.

Case: March 4, 1987 Detroit (Wayne County) Passenger Airplane Crash

On March 4, 1987, a plane bound from Cleveland to Detroit crashed and skidded into three ground vehicles and caught fire. The cause of the accident was the captain's inability to control the airplane while descending on the final approach for landing. Nine of the 22 passengers died from a post-crash fire, lack of fire-blocking material, and poorly designed aircraft components.

Case: August 16, 1987 Romulus (Wayne County) Passenger Airplane Crash

Michigan's worst commercial passenger airplane crash, and the seventh worst in U.S. aviation history occurred on August 16, 1987, at Detroit Metropolitan Airport. In that incident, Northwest Airlines Flight 255 was unable to gain sufficient altitude at takeoff and crashed into nearby highway I-94, killing 156 passengers and crew. A small child was the lone survivor. A Governor's Disaster Declaration was granted to the City of Romulus and numerous state resources were mobilized to assist in the recovery.

Case: July 9, 1999 Harrison (Clare County) Passenger Bus Accident

A tour bus filled with international exchange students slid off of rain-slicked highway U.S. 27 near Harrison, injuring 40 passengers. Most of the injured were treated and released at a nearby hospital. One passenger was hospitalized overnight, with an eye injury.

Case: January 21, 2002 Muskegon County School Bus Accident

One person was killed and nearly two dozen high school students were injured when a school bus collided with two cars. About 22 persons were taken to area hospitals with injuries.

Case: June 4, 2007 Lake Michigan Passenger Airplane Crash

An unfortunate incident occurred when a plane carrying a team of surgeons and technicians from Milwaukee to Ann Arbor crashed into Lake Michigan. All six passengers died in the incident, including the two pilots, two University of Michigan surgeons, and two technicians due to prepare an organ for transplant surgery at the University of Michigan Health System hospital in Ann Arbor that same afternoon. The National Transportation Safety Board said that one of the pilots had reported severe difficulty steering the plane because of trouble with its trim system, which controls bank and pitch.

Buses Involved in Fatal Crashes in the Michigan by Type

	2004	2005	2006	2007	2008	2009	2010	2011	2012
School	5	5	3	3	3	0	2	2	5
Intercity	1	2	0	0	0	0	2	0	2
Transit	2	0	6	3	6	4	3	4	1
Van-Based	0	0	0	0	0	0	0	1	1
Other	0	0	0	1	0	0	1	2	0
Unknown	2	1	0	0	0	0	0	0	0
	10	8	9	7	9	4	8	9	9

Data from the National Highway Traffic Safety Administration

Train Accidents and Vehicle–Rail Crashes in Michigan: 1990-2009

Year	Vehicle–Rail Crashes	Fatalities
1990	203	N/A
1991	176	N/A
1992	153	N/A
1993	133	N/A
1994	147	N/A
1995	121	N/A
1996	119	N/A
1997	124	N/A
1998	90	N/A
1999	110	N/A
2000	125	N/A
2001	97	9
2002	89	7
2003	104	7
2004	89	9
2005	67	4
2006	57	6
2007	61	3
2008	54	4
2009	44	10

The 2009 total of 44 vehicle-train crashes marked a decrease of 64.8 percent over the preceding 10 year period.

Transportation Accidents in Newaygo County

As Newaygo County is not an urban population center, located near a major transportation route or airport, or located near a marine passenger ferry service, the probability of a transportation accident involving an air, land, or water-based commercial passenger carrier is limited. However, Newaygo County does have five public school systems operating transportation services for students, two municipal airports, a freight train railway system, and three state highways (M-20, M-37, and M-82) within the jurisdiction increasing the risk of a localized transportation accident.

The major concern with transportation and mass casualty incidents in the jurisdiction results directly from limited ambulance and medical resources. Currently, only 3 full-time advanced life support ambulance units and 1 hospital are dedicated to serve Newaygo County. Additionally, the rural nature of the local hospital which allows limited emergency room services (20 rooms, with a surge capacity of 24) and requires frequent out of County (>30 miles) patient transfers to medical facilities that can provide more advanced services, potentially further limiting available ambulance resources.

As such, an incident with as few as 7-10 patients has the potential to overwhelm our existing medical service capabilities and prevent continued regular essential emergency medical services to the community. Incidents of higher magnitude require significant mutual aid from surrounding jurisdictions and possibly warrant the declaration of a local state of emergency.

There are historical areas of concern for producing mass casualty incidents that stem mainly from major transportation routes and special events. The following are highlighted examples of several mass causality incidents resulting from transportation accidents within Newaygo County.

Case: October 2006 Amish Buggy MCI

In October of 2006, there was an Amish Buggy accident at 48 St and Wisner Avenue east of the City of Fremont. An Intoxicated driver hit an Amish Buggy carrying a family of seven. All 7 people in the buggy were injured and 1 of them died from their injuries.

Case: October 2, 2007 Grant Public Schools Bus Accident

Two Grant Public School buses collided in front of the Grant High School on 120th Ave after school. Twelve Patients of High School Age were transported to Gerber Memorial Hospital for treatment of minor injuries.

Case: Friday, November 7, 2008 Newaygo Public Schools Bus Accident

Six children suffered minor injuries and were treated at Gerber Memorial Hospital after a Newaygo Public Schools bus and a truck collided at the corner of M-37 and M-82 in the city of Newaygo. The truck was heading southbound on M-37 and approached a traffic light on westbound M-82. The school bus, which had the right-of-way, was westbound on Croton Drive and turned south on to M-37 causing the accident.

Newaygo County contains no divided freeways and 3 Michigan State highways (M-20, M-37, and M-82). Additionally, many additional county and side roads have equal potential for producing a vehicle incident of significant magnitude to warrant a mass casualty response, especially during hazardous weather.

Case: July 28, 2014 Fatal Two Vehicle Head on Collision in Garfield Township

An 18 year old driver traveling on 48th Street crossed into incoming traffic and hit another vehicle head on near Wisner Ave. The driver of the first vehicle was transported to Spectrum Health Butterworth in Grand Rapids in stable condition. The driver of the second vehicle died from his injuries. His female passenger was transported to Spectrum Health Butterworth Hospital in Grand Rapids in critical condition. Four children passengers in the second vehicle were in stable condition, and a fifth child passenger was treated and released at Spectrum Health Gerber Memorial Hospital.

Fatal Motor Vehicle Traffic Crashes

	2004	2005	2006	2007	2008	2009	2010	2011	2012
National	38,444	37,252	38,648	37,435	34,174	30,862	30,296	29,867	30,800
Michigan	1,159	1,129	1,086	1,087	980	872	942	889	938
Newaygo	13	11	10	11	8	6	6	9	10

Data from the National Highway Traffic Safety Administration

PUBLIC HEALTH

Public Health Emergencies

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 - disease epidemics, large-scale incidents of food or water contamination, extended periods without adequate water and sewer services, harmful exposure to chemical, radiological or biological agents, or 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 a 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 a specific organization or segment of the population. Fortunately to date, Michigan has not experienced such a release aimed at mass destruction. However, Michigan has experienced hoaxes and it is probably only a matter of time before an actual incident of that nature and magnitude does occur. If and when it does, the public health implications – under the right set of circumstances – could be staggering.

Hazard Analysis

The primary types of public health impacts involve the threat or presence of either disease, contamination, or sanitation problems. Disease epidemics or pandemics have the potential to cause widespread debilitation or loss of life, associated medical expenditures, and decreases in productivity and quality of life. Contamination can at least temporarily lower property values as well. Sanitation problems require effort and expense to resolve. Contamination and sanitation issues increase the probability and variety of diseases that may affect the population. Facilities may be shut down, as a means of preventing disease transmission or of containing contamination, and thus cause a loss of the services being provided to the public (by schools, for example).

Communicable disease outbreaks or epidemics have the potential to rapidly overwhelm the local healthcare system. Medical resources may become overwhelmed and unable to deal with any additional needs. As traditional medical services become increasingly difficult to access (or if their quality declines due to overwork or understaffing) then increasing numbers may turn to less responsible and effective alternative means of treatment (or may forego treatment entirely).

Influenza is an example of a potential public health emergency of very large proportions. No one knows when the influenza virus might “shift” its structure to produce a virus to which no one will be

immune. Influenza can exact a terrible toll on communities. During a typical influenza season, approximately 1,188 deaths in Michigan are expected. However, during the next influenza pandemic (a worldwide epidemic), as many as 10 to 100 times that many might die, without an adequate and well-organized public/community health care system to combat the disease. As hard as the world public health community is trying to conduct influenza surveillance in order to provide the most advance notice possible, if pandemic influenza were to strike it would likely do so very early in the season and spread so rapidly that preparation would need to be done on an emergency basis.

In the northern hemisphere, the normal flu season starts in November and ends in May. Flu viruses are amenable to chilly weather, and therefore predominate around the winter season in temperate climates. (Contagion may also be assisted by persons spending more time in indoor areas with less ventilation from outside.)

The world's worst influenza pandemic—the “Spanish flu” of 1918-19—resulted in 500,000 to 675,000 deaths in the United States and 20 to 40 million worldwide. More than 25 million Americans—nearly one quarter of the population at the time—fell ill. Scientists speculate that the virus that caused that pandemic may have percolated for several years within humans, or possibly pigs, until it grew strong enough to kill millions worldwide. The virus spread rapidly—moving around the world in a matter of a few months—in a time period in which there was much less movement of people than there is today. The virus reached Michigan in the fall of 1918. Over 8,000 of the 2.8 million state residents fell ill and half of those eventually succumbed to the disease. In retrospect, the spread of the illness was felt to be exacerbated by behavior of important officials who had misguided concerns that the effects of “panic” might be more harmful than the disease itself—a notion that proved disastrous. The pandemic had an unusual aspect, however, in that many of those who died were persons who had been young and healthy, whereas the normal pattern for influenza deaths is to take a higher toll among those who are elderly or have compromised immune systems. (Note: As a sheer numerical comparison, the 1918-19 influenza pandemic worldwide death tolls came close to equaling the death tolls of the medieval Black [Bubonic] Plague that struck in the 6th, 14th, and 17th centuries. The number of U.S. deaths from the pandemic exceeded the number of U.S. soldiers killed on the battlefield in World Wars I and II, the Korean War, and the Vietnam War combined.)

Two other major influenza pandemics occurred during the 20th century—the 1957-58 “Asian flu” that killed 70,000 in the United States, and the 1968-69 “Hong-Kong flu” that resulted in 34,000 U.S. deaths—each spreading with the same rapidness as the 1918-19 pandemic. The possibility is always there that another pandemic could occur at any time. The speed and frequency of modern global travel could greatly exacerbate the spread and potential impacts of future pandemics, forcing public health officials to race against the clock to prevent the death tolls experienced in past pandemics.

Influenza viruses are designated with letters and numbers. Three main groups exist (A, B, and C), and Influenza A contains those viruses that have the capacity to cause human pandemics. Within that main classification are more specific letter-number designations that specify two types of proteins on the outer part of the virus—hemagglutinin (H) and neuraminidase (N). There are 16 known types of H

and 9 known varieties of N, and combinations of these protein types distinguish various strains of the Influenza A virus from each other. As of 2009, only three combinations—H1N1, H2N2, and H3N2—have been involved in viruses confirmed to spread directly from person to person. However, it is possible for other virus strains, such as those found in birds or swine, to change and become capable of infecting other species. In 1976, a swine flu outbreak occurred among humans stationed at the Fort Dix military facility in New Jersey, and was addressed with a mass vaccination program, although the vaccine itself was found to have a small (1 in 100,000) risk of causing the serious Guillain-Barré syndrome.

In 2005, an outbreak of influenza A (H5N1), also known as "avian flu" or "bird flu," was reported in several countries throughout Asia. First identified in 1997 Hong Kong, cases of avian influenza A (H5N1) in birds were later confirmed in Cambodia, China, Hong Kong, Indonesia, Japan, Laos, Pakistan, South Korea, Thailand, and Vietnam. Human cases of avian influenza were reported in Thailand and Vietnam. In an investigation, it was not determined that the avian flu was spread from person to person. The outbreak of avian influenza prompted the killing of more than 25 million birds in Asia. This strain of avian influenza A (H5N1) was not found in the United States. However, in February 2004, different strains of avian flu were detected among several flocks of birds in the U.S., and state officials ordered the destruction of hundreds of thousands of birds. The avian influenza strain found in Delaware was H7N2, in Pennsylvania the strain was H2N2, and the H5N2 strain was found in Texas. The strain found in Texas was determined to be "highly pathogenic" to birds. However, the strain of avian influenza in Texas was not the same as the strain in Asia.

The World Health Organization (WHO) announced a substantial risk of an influenza epidemic in the near future. One of the primary concerns is that the virus could quickly spread across the World. In response, many countries have begun planning in anticipation of an outbreak. During the spring of 2009, a new influenza virus was identified. Studies showed that this new virus was different from what had normally circulated throughout the world. Humans are especially vulnerable because their immune systems had not been previously exposed to this virus, therefore allowing limited immune response. H1N1 (also called "swine flu," in this case) has exhibited atypical presentation in human populations. Over 90% of detected cases are in persons under 65 years of age. In comparison to other flu viruses, hospitalizations and deaths associated with H1N1 are dramatically higher in children and young adults. Also of concern, the virus has demonstrated the ability to develop resistance to antiviral medications. Thousands of cases of influenza-like illness were reported in Michigan during the last week of October 2009 alone. However, according to an Associated Press wire report (of September 29, 2010) regarding CDC recent studies, that strain of the "swine flu" no longer represented a major threat in the United States because most citizens came to show signs of immunity.

Public Health Emergencies within Michigan

Michigan has had several large-scale public health emergencies in recent history, but fortunately nothing that caused widespread severe injury or death. The 1973 PBB contamination incident is unprecedented in U.S. history, but the long-term implications of contamination may be less than was

feared. 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.

The West Nile encephalitis virus, which arrived in Michigan in August 2001, presents an equally challenging scenario for public health officials. Transmitted to humans by the bite of an infected mosquito, the West Nile virus is commonly found in Africa, West and Central Asia, and the Middle East. Health officials do not know how the virus was introduced to the United States. However, in 1999 and 2000, it caused an outbreak of human encephalitis in and around New York City that created a national stir and raised fears across the country that it would cause a full-blown public health emergency. The virus eventually spread to Michigan in 2001. It peaked in Michigan in 2002 with 644 reported cases, including 51 deaths. There has been a decline in reported cases every year since then.

Although no area in Michigan (or elsewhere) is immune to public health emergencies, areas with high population concentrations will always be more vulnerable to the threat. In addition, the more vulnerable members of society—the elderly, children, impoverished individuals, and persons in poor health—are also more at risk than the general population.

Michigan is fortunate in that it has an excellent public health system that constantly monitors the threats that could lead to a widespread or significant public health emergency. However, even the best monitoring and surveillance programs cannot always prevent such incidents from occurring. When they do occur, Michigan's public health agencies have shown the ability to effectively muster the resources necessary to identify and isolate the problem, and mitigate its effects on the population. In addition, if the problem is such that a multi-agency and multi-jurisdictional response is required, the emergency management system in Michigan can be utilized to enhance coordination and effectiveness of the response and recovery effort.

The following are brief synopses of some of the more significant public health emergencies that have occurred in Michigan and other parts of the United States in recent years as highlighted in the 2012 Michigan Hazard Analysis:

Case: 1973 Chemical Contamination (Polybrominated Biphenyl Contamination)

One of Michigan's most serious statewide public health emergencies occurred in 1973 when a chemical company inadvertently sent bags of a fire retardant containing polybrominated biphenyl (PBB), a highly toxic chemical, along with a shipment of livestock feed supplement to Michigan Farm Bureau Services. After being mixed with the livestock feed, the contaminated mixture was distributed statewide for use by farmers in feeding livestock herds. The result was an environmental and public health disaster of unprecedented magnitude in Michigan. Thousands of cattle and other animals died from the poisoning and serious questions were raised regarding the long-term effects of this contamination on all Michigan residents.

Case: Spring 1997 Michigan Foodborne Pathogenic Contamination (Hepatitis A Outbreak)

In the spring of 1997, almost 300 cases of hepatitis A occurred in at least four Michigan school districts. A rapid epidemiological investigation by local, state and federal epidemiologists linked this outbreak to frozen strawberries distributed through the national school lunch program. Tracing of the implicated strawberries identified 13 different lots sent to several states in addition to Michigan. Several hundred Michigan schools were potentially affected. A massive program was instituted to evaluate risk at schools that received the frozen strawberries, to inform parents about immune globulin prophylaxis, and to provide it to recently exposed children. The prompt and insightful epidemiological investigation and rapid, well-organized response of the Michigan local health department system helped to prevent the occurrence of additional illnesses and to reduce community anxiety.

Case: November 2008 Holland, MI Norovirus Outbreak

About 420 Hope College students, faculty, and staff reported coming down with an illness from a noro-like virus in November 2008. Symptoms included diarrhea, nausea, and vomiting for 24 to 48 hours. The outbreak prompted the school and county health officials to close the campus and cancel activities starting November 7th, with students who stayed on campus restricted from gathering. Campus security and Holland police were asked to break up any parties or other student gatherings both on and off campus. The campus reopened four days later on November 11th and students were given a bag with plastic gloves, disposable wipes and bleach-based cleaning spray for sanitizing their rooms. Hand sanitizer dispensers were placed in about 40 locations on the Hope College campus to aid in the attempt to stop the spread of the norovirus outbreak.

Case: 2008 Multiple States Foodborne Pathogenic Contamination (Salmonella Outbreak)

In November 2008, Michigan joined a rapidly expanding investigation of a nationwide outbreak of Salmonella Typhimurium, which ultimately exceeded 700 cases from 46 U.S. States and from Canada. A total of 38 confirmed cases with onset dates between October 2008 and February 2009 were identified in Michigan from 15 widely dispersed counties in the lower peninsula of the State. Of these, there were 12 reported hospitalizations. Two unusual features of both the Michigan and

nationwide outbreak were noted very early in the investigation—the predominantly young distribution of the cases and the high frequency of exposure in institutional settings such as elementary schools, colleges, long term care facilities, and correctional centers.

Public Health Emergencies within Newaygo County

Newaygo County's concerns with Public Health emergencies result from a moderately low economic profile of the community and limited public health resources. Newaygo County contains extremely limited health care facilities including 1 rural hospital, 5 ambulances, less than 20 physician centers, and a public health department with limited resources and manpower. During even "usual" outbreaks of common illnesses, these resources become stretched to their maximum capabilities.

A contributing factor to this hazard lies in Newaygo County's position as a relatively moderate to low-income community with many families who are unable to take all steps necessary to insure primary health. This results in many citizens without current vaccinations, living in less than primary health conditions, and other factors (such as being unable to repair critical sanitary systems upon malfunction). In addition to Public Health emergencies, these factors are considered during planning other hazards that could be affected as a result of disease outbreaks, such as Mass Fatality Incidents and CBRNE Terrorism.

Most Public Health Emergencies will not be isolated to Newaygo County, but impact the entire state or Country as well. Based on historical occurrence, Newaygo County experiences a Public Health Emergency on average, approximately once per decade. District Health Department 10 is committed to providing timely, accurate, and practical information to the citizens to assist them in taking appropriate precautions and actions to protect self and family in a public health emergency. The following table is a list of diseases that may soon reach pandemic proportions.

Possible Future Pandemics (diseases that may possibly attain pandemic proportions)	
Disease	Description
Lassa fever	The infection is endemic in West African countries, causing many deaths. Outbreaks of the disease have been observed in Nigeria, Liberia, Sierra Leone, Guinea, and Central African Republic.
Rift Valley fever	Rift Valley fever is a viral zoonosis causing fever. It is spread by the bite of infected mosquitoes. Approximately 1% of human sufferers die of the disease. Among livestock the fatality level is significantly higher.
Ebola virus	Ebola hemorrhagic fever is a very rare, but severe, mostly fatal infectious disease occurring in humans and other primates, caused by the Ebola virus. It was first discovered in 1976. Epidemics with 50 to 80% mortality have occurred in the Democratic Republic of the Congo, Gabon, Uganda and Sudan.
Marburg virus	The Marburg virus is the causative agent of Marburg hemorrhagic fever. Both the disease and virus are related to Ebola and originate in the same part of Africa (Uganda and Eastern Congo). The zoonosis is of unknown origin, but some scientists believe it may be hosted by bats.
Bolivian haemorrhagic fever	The Bolivian haemorrhagic fever, also known as black typhus, is a hemorrhagic fever and zoonotic infectious disease occurring in Bolivia. First identified in 1959, black typhus is caused by the machupo virus.
Avian flu	In November 2004 the director for the western region of the World Health Organization said that an influenza pandemic was inevitable and called for urgent plans to combat the virus. The Centers for Disease Control (CDC) claims that a flu pandemic could kill more than 200,000 people in the United States.

Source: Wikipedia online encyclopedia

CRIMINAL INCIDENTS

Terrorism and Similar Criminal Activities

Terrorism: "...activities that involve violent...or life-threatening acts...that are a violation of the criminal laws of the United States or of any State and...appear to be intended (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping" Federal criminal code. 18 U.S.C. §2331

Hazard Description

Terrorism is the use of violence by individuals or groups to achieve political goals by creating fear. The political motives of terrorism distinguish it from ordinary crime. Terrorism is carried out for a cause; not for financial gain, personal revenge, or a desire for fame.

Terrorism is a long-established strategy that is practiced by many groups in many nations. The United States is threatened not only by international terrorists such as Al Qaeda, but also by home-grown domestic terrorist groups including racist, ecological, anti-abortion, and anti-government terrorists.

A wide range of techniques can be used by terrorists, including bombings, shootings, arson, and hijacking. Regardless of the specific tactics used, terrorists seek the greatest possible media exposure. The goal of terrorists is to frighten as many people as possible, not necessarily to cause the greatest damage possible. Media coverage allows terrorists to affect a much larger population than those who are directly attacked.

Non-terrorist criminal activity may resemble terrorism, but lacks a political objective. Emergency management is typically not concerned with routine, individual crimes, but does need to prepare for crimes that impact large portions of the population. Such attacks may require resources not available to local law enforcement agencies. Crimes of this sort include mass shootings, random sniper attacks, sabotage of infrastructure, and cyber-attacks. The types of criminal attacks considered in this section are those that resemble terrorism or that may cause widespread immediate disruption to society.

Hazard Analysis

Terrorism in the United States

Terrorists intend to use fear as a weapon to achieve their goals. This approach allows a small, weak group to potentially influence the actions of an entire nation or government. Terrorists lack the power to achieve their ultimate aims through the direct use of force, but by staging relatively small attacks in a spectacular fashion, they hope to have a major political impact. Their goals are effectively summarized by the proverb "Kill one, frighten 10,000." Terrorism can be an effective strategy for a weak group to use when fighting a strong opponent.

Terrorism has been used for thousands of years, but modern terrorism developed in the 19th Century. The United States has suffered from terrorist attacks for more than a century: U.S. President William McKinley was assassinated by an anarchist terrorist in 1901, the Los Angeles Times building was destroyed in 1910, and Wall Street was bombed in 1920. Racial and religiously-motivated terrorism continued throughout the 20th century. A new wave of terrorism was instigated in the 1960s

by left-wing radicals. This was followed by right-wing extremist terrorism in the 1980s and 1990s. All of these attacks were conducted by American domestic terrorists against other Americans.

The United States has also been the target of terrorists from other countries. Conflict in the Middle East led to many attacks on American targets overseas, primarily by Palestinian nationalist terrorists, as well as groups supported by Libya and Iran. Hijackings, kidnappings, and bombings of Americans occurred throughout the 1970s and 1980s, and into the 1990s. By the mid-Nineties the danger had shifted toward attacks by violent Islamic extremist groups such as al-Qaeda. Al-Qaeda successfully moved their terrorist campaign inside of the United States homeland with the World Trade Center bombing in 1993 and the devastating 9/11 attacks in 2001.

Terrorism in Michigan

Case: Bath School Disaster (1927)

On May 18, 1927, the Bath Consolidated School in Bath, Michigan, was the target of an attack with explosives. The bomber was probably motivated by personal revenge against the local school district (stemming from a taxation issue), and so this event is classified as criminal, rather than as a terrorist attack. Although many of the explosives failed to detonate, the bombs in the school killed dozens of students and teachers. The bomber also destroyed his home and farm with explosives. Immediately after the school attack, the bomber approached the rescue operations scene and detonated an explosive device carried in his vehicle, killing himself, local officials, and several bystanders. The final death toll was 45, with 58 additional persons injured. The Bath Disaster remains the second most deadly U.S. bombing attack, after the Oklahoma City Bombing, as well as the most lethal attack on an American school. This case also provides early examples of such tactics now in common use by terrorists, including a secondary device, suicide bombing, and car bomb.

Case: Oklahoma City Federal Building Bombing (1995)

On April 19, 1995, the Alfred P. Murrah Federal Building in Oklahoma City, Oklahoma, was attacked by a large truck bomb. The attack killed 168, injured more than 680, destroyed the building, and caused widespread destruction over a sixteen-block area. Although initially suspected of being carried out by international terrorists, the attackers were in fact anti-government domestic terrorists, one of whom had extensive Michigan connections. This attack is an example of right wing anti-government terrorism. It also demonstrates the extensive destruction that can be caused to large buildings which lack adequate target hardening and security measures.

Case: Michigan State University Agriculture Building Arson (1999)

On December 31, 1999, environmental terrorists affiliated with the Earth Liberation Front (ELF) set fire to the Agriculture Biotechnology Support Project, located in a classroom and office building at Michigan State University. The university was targeted because of its work on genetically modified crops. The fire was set when there were few people in the building. Damages to the building and research equipment totaled approximately \$1 million. Four domestic terrorists from Michigan and Ohio were later tried and convicted in federal court for carrying out this attack. This attack, a similar attack against Michigan State in 1992, and an attempted attack against the Michigan Technological University Forestry Center in 2001 are all typical of attacks by environmental terrorist groups. These attacks generally are designed to cause property damage but few deaths and injuries. These attacks also demonstrate the vulnerability of universities and research centers to terrorist attack.

Case: Northwest Airlines Flight 253 Bombing Attempt (2009)

On Christmas Day 2009, Umar Farouk Abdulmutallab attempted to destroy Northwest Airlines Flight 253, approaching Detroit Metropolitan Airport. The weapon used was an explosive device provided by the “al-Qaeda in the Arabian Peninsula” terrorist group and hidden in his underwear. The device was small and easy to conceal, but was capable of damaging or destroying the airliner. The explosive failed to detonate properly and instead 473 Human-Related Hazards – Sources Used for Update ignited and burned Mr. Abdulmutallab, who was then subdued by the plane’s passengers and crew. This attack demonstrates the potential effectiveness of even small bombs when used against vulnerable targets such as aircraft. It also demonstrates that international terrorism may be directed at targets in Michigan.

Case: Highway Shootings (2012)

During October 2012, a man shot at cars as they drove along and near a Michigan highway corridor in Oakland, Ingham, Shiawassee, and Livingston counties, over the span of several days. The first car was shot in Commerce Township on October 16th. On that same day, four more shootings occurred in Wixom. On the next day, another Commerce Township shooting took place near the same location as the first day. The northernmost shooting occurred in Perry on October 18th. On that same day, there were eight shootings near the I-96 exit in Webberville. There was also an October 18th shooting in Howell, and six shootings in Wixom. About a week later, on October 27th, two shootings occurred along Grand River and I-96 in the area of Fowlerville, and a driver on I-96 reported being injured by a bullet (the only such instance reported). During his trial, the shooter claimed that shooting at vehicles was connected to a condition of mental illness. Investigators connected him with 24 shooting incidents in the area. In 2014, a Livingston County jury convicted him of terrorism and he was sentenced to 16 to 40 years. This was in addition to a sentence of at least 6 years received in Oakland County. It is possible that additional charges may be sought in Ingham and Shiawassee County. NOTE: Media headlines often simplified these incidents by referring to them as involving “The I-96 Shooter,” even though most incidents did not involve Interstate traffic.

Terrorism in Newaygo County

Although Newaygo County has had limited history and experience with major criminal incidents, recent trends in school and work place violence, domestic and international terrorism, and other man-made criminal actions have resulted in a new hazard concern for local officials. Local issues regarding such events have generally resulted from high profile national events and focused on the following potential: 1) school violence; 2) work place violence; 3) sabotage/arson; 4) Prison Uprisings; 5) domestic/international terrorism. Based on historical occurrence, Newaygo County experiences a terrorism incident approximately once every decade.

In the late 1990’s, high profile school violence events in Jonesboro, Arkansas and Columbine, Colorado resulted in a nationwide epidemic of school emergencies causing significant social, political, and economic issues throughout the United States. Locally, Newaygo County’s largest schools of Fremont, Grant, Newaygo, White Cloud, and Hesperia experienced bomb threats and resulted in dramatic local efforts at school safety. Despite national attention on school violence diminishing, this hazard remains a primary aspect of the emergency management environment and local planning efforts focused on all-hazards safety for such public facilities.

Case: Gerber Products Mailroom Incident (2007)

Since Gerber Products was founded in the early 1920's, it has become Newaygo County's largest employer with close to 1,500 employees between the administrative building, the plant, bank, and insurance company. Gerber offers about 300 food products for babies, toddlers and infants, as well as a baby care line, wellness products and life insurance. Gerber is active in more than 50 countries. In 2006, Gerber had un-audited net sales of USD \$1.6 billion and operating income of USD \$307 million. The Gerber Plant in Fremont supplies product throughout the United States and Canada.

In 1994, Gerber merged with Sandoz Laboratories. In 1996, Sandoz merged with CIBA-Geigy to form Novartis, one of the largest pharmaceutical companies in the world. When Novartis merged Gerber in 1996 it moved Gerber's corporate office to Parsippany, New Jersey. Since 1994 when Gerber Products merged with Sandoz Laboratories, big corporations have controlled a majority of all employment decisions from a remote location for the Fremont facility causing tension amongst local employees unsure if there would be layoffs or other changes in job status locally.



On April 12, 2007 Novartis announced that it would sell Gerber to Nestle, the world's largest food and drink company for \$5.5 billion, giving Nestle Corporation the largest share of the global baby food market. Gerber Products is the largest employer in Newaygo County and it dominates the United States baby food market with a 70 percent share according to Morgan Stanley.

The same day as the sale to Nestle, an employee opening mail reported having a reaction, burning eyes and skin and a scratchy throat, to an unknown powdery substance contained in one envelope with a threatening note and no return address. Based on the conditions surrounding the threat, the Regional Response Teams from Muskegon and Grand Rapids who are specially trained to deal with Chemical, Biological, Radiological, Nuclear or energetic devices related to potential terrorist activities, were activated along with the F.B.I. to respond to the scene to assist first responders with the Incident. 12-15 employees exposed to the unknown substance, later identified by the Michigan State Police Crime Lab in July as Capsaicin, which is a brown powder that is used in pepper spray, were decontaminated and given courses of Ciprofloxacin and Doxycycline were given as a precautionary measure. After further investigation, it is believed the sale of Gerber Products to Nestle and the letter mailed from Boston containing the Capsaicin were not related. The investigation was turned over to the FBI.

Civil Disturbances

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

Hazard Description

Civil disturbances can be separated into several sub-categories of disturbance that could affect a community. 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.

1. Disturbances that center around a particular facility: the facility could be a prison, a courthouse or other center of government, a stadium or other public meeting place, where large numbers of people may at some point gather in a disruptive fashion that is threatening to the community, its businesses, residents, or quality of life. Typically, a risk assessment would examine the history of the facility, and similar facilities in other communities. Such historical information might identify particular conditions that may cause collective behavior to get out of hand. The degree to which a community contains facilities and conditions that have been associated with civil disturbances will indicate the amount of risk that it faces from civil disturbances.
2. Disturbances that arise in general areas experiencing conflict and hardship: This refers to neighborhoods or regions that have experienced one or more economic, social, or political stresses such as poverty, ethnic intimidation, corruption, and/or the notable presence of illegal activities. These ongoing conflicts and challenges may sometimes flare up into more widespread and blatant conflicts and unrest. The important things to recall about these sorts of civil disturbances is that it is the presence of these conflicts and problems (rather than a particular ethnic or demographic composition) that eventually generates broader disturbances. Care must be taken not to inappropriately "profile" areas based on the characteristics of their residents.
3. Disturbances that interfere with normal business functions: Sometimes, protests are organized in a way that is deliberately designed to disrupt the normal operations of one or more businesses, and may also happen to disrupt surrounding business operations or traffic flows nearby. Many such incidents are political, and eventually addressed through court actions or legislative proceedings. Labor negotiations may have associated employee unrest, including strikes. Protesters may object to the existence of specific facilities or businesses, or their location in a specific area, and while seeking to make such a business or its associated activities illegal, may attempt to take more direct action against its employees or patrons. Typically, the perceived harm from such businesses are either from environmental impacts or

injury to persons, or social impacts concerning the image or moral standards associated with an area. In other cases, a political demonstration may not have anything to do with the sorts of facilities or businesses in an area, but merely seeks the most crowded and inconvenient location so as to maximize the attention that it receives.

There is no specific "formula" recommended here for analyzing civil disturbance hazards, but it is probably helpful to include a historical approach that specifically addresses the social conflicts and political controversies affecting disturbance-prone areas of a community. The various costs of past events (crowd control, vandalism, arson, business disruption and closures, injuries, diverted traffic, negative economic impacts) can be estimated along with their past frequency (e.g. three times in the past hundred years) so as to produce an estimated annual cost. The history of cities with similar conditions can also be analyzed in this way, because the risk of a disturbance may be present even though there have not yet been any historic local events. This is particularly true for communities with newly-developed facilities, in rapidly growing areas, or experiencing significant social and economic changes. Their risk of civil disturbance may be increasing but there is not yet a local history of incidents that can be generalized from.

Impact on the Public

Civil disturbance impacts may include deaths and injuries, disruption of services, and short- and long-term damage to a community's tranquility and reputation (which may also affect its property values). Temporary or permanent business closures may be caused by broken windows, looting, arson, etc. Fear (and its associated security costs) may discourage visitors, shoppers, and tourists, and further cause economic impacts on the area (and associated declines in its property values). Direct property damage can be expected to cause inconvenience, at the very least, to area residents and businesses, and there is a further problem of impeded access to the area's services, and to residents' own personal property.

Impact on Public Confidence in State Government

If discontent underlies a disturbance, some persons may generalize, displace, or attribute the source of their discontent to local or state governments. Some discontent may actually be aimed toward government policies involving the environment, housing, land use, wealth distribution, taxation, military conscription, foreign affairs, labor issues, infrastructure provision, civil rights, or other issues. Although government programs often exist that attempt to address these types of concerns and to ensure that particular values (e.g. civil rights) are respected and supported throughout the jurisdiction, widespread or widely publicized disturbances or demonstrations may undermine the effectiveness of governmental programs and thus weaken public confidence in government. Other types of civil disturbance, such as wild festivities after a sporting event, may undermine public confidence in government if a pattern develops in which illegal behaviors become repetitive and widespread.

Impact on Responders

Frustration and anger may be displaced toward responders, and many citizens may not understand the nature of the motivations, rights, or responsibilities involved in either protest or policing actions.

Responders may face unwarranted hostility from citizens, for many reasons, and response activities may be impeded by disruptions taking place. Response, medical facilities, communications, or transport capabilities may be overwhelmed. Psychological impacts on responders may arise from role conflicts and the nature of some of the participants involved in the disturbance (which has some differences when compared with “ordinary crime”).

Impact on the Environment

Civil disturbances that stem from labor unrest (or other problems with industrial relations) may involve sabotage that causes the release of harmful substances or otherwise damages the ecosystem in an area. Civil disturbances that involve disruptive forms of collective behavior may include the lighting of fires that release toxins, especially when non-traditional manufactured items are used as fuels. Damage to property may, accidentally or deliberately, include sites that contain hazardous materials. Unruly crowds may disrupt or prevent needed maintenance activities by utility repairmen or industrial workers and thus inadvertently cause environmental problems to occur because of resulting infrastructure failures.

Hazard Analysis

Violent protests, disturbances, and riots have occurred throughout our nation’s history. The Stamp Act Riots in the American Colonies in the 1760s, the “Boston Tea Party,” and the Revolution itself involved riots and insurrection, as discontent escalated into organized international conflict. Though these events have occurred in the past, they are not considered an acceptable part of ordinary modern life. Although destructive civil disturbances are rare, the potential is always there for an incident to occur. It is possible that risks for future disturbances may be exacerbated today by the ability of modern mass media (television, radio, the Internet, and various wireless communication devices) to instantly relay information (factual or not), in real time, to large numbers of people. That coverage may help to spread awareness of protests, discontent, riots, disorderly “parties,” or other incidents to other areas or interested groups and persons, potentially exacerbating an already difficult situation. For example, media coverage of certain events has, in the past, spurred uprisings inside prisons. Communications technologies were also important in swelling the numbers of “Cedar Fest” revelers in recent East Lansing disturbances. Real-time media coverage of unfolding events is a fact of modern life that is inescapable. As a result, law enforcement officials must be skilled in monitoring all forms of media coverage to anticipate public and perpetrator actions and event progression.

Civil Disturbance in Michigan

Case: Detroit Connor’s Creek Labor Strike and uprising (April 18, 1894)

During the depression of the 1890s, an excavation project for a water main, just east of the city’s boundary at the time, was manned by some 300 workers, who revolted at the conditions for wage reimbursement that the city Water Board had set (estimated at only about one-third of already established wage rates). The workers demanded a higher wage, and stayed on the site throughout that day and the next, to prevent any other workers from being brought in to replace them. On the third day, men arrived from the Wayne County Sheriff’s Office, but only succeeded in annoying the workers. A project foreman was attacked by a worker, and the scene quickly exploded into violent

chaos when gunshots followed the attack. The mob of workers with picks and shovels surged around the armed lawmen and the project's foremen. Although the violence lasted only a few minutes (resulting in the beating of the foremen and law enforcement officers), there were about 20 serious injuries, and a total of three persons ended up dead from gunshot wounds. By the end of the day, 21 persons had been arrested. Mass meetings took place on April 22, at which many thousands of ethnic workers gathered to press for policy changes.

Case: 1981 Jackson, Marquette, and Ionia Counties Prison Uprising

The second major prison uprising in Michigan occurred over the Memorial Day weekend in 1981 at the State Prison of Southern Michigan in Jackson, Marquette Branch Prison in Marquette, and the Michigan Reformatory in Ionia. The uprisings, which occurred on May 22 at Jackson and Ionia, and again on May 26 at Jackson and Marquette, were thought to be related. Although all three facilities were damaged, the State Prison of Southern Michigan incurred the worst damage. The disturbances began when officials from the Michigan Corrections Organization at the State Prison of Southern Michigan attempted to take administrative control of the prison and lock down prisoners over the Memorial Day weekend. Rioting broke out at the facility, which then spread to the Michigan Reformatory in Ionia later in the day. The situation temporarily settled over the weekend, but rioting began again on May 26 at the State Prison of Southern Michigan, which then spread to Marquette Branch Prison. Both disturbances were quelled later in the evening, but only after major physical damage had been inflicted on the facilities. The final damage figures for the two days of rioting were significant. The May 22 disturbances at the State Prison of Southern Michigan and the Michigan Reformatory resulted in 67 inmates and 27 staff members being injured, many requiring hospitalization. The May 26 disturbances saw an additional 44 staff members injured, along with 42 inmates. Fortunately, no lives were lost in either disturbance. The physical damage to the three facilities totaled \$5 million, with another \$4.1 million in riot-related costs incurred. Damages at the State Prison of Southern Michigan included fire and smoke damage to eight cell blocks, destruction of eight modular units, and damage to the academic vocational building, the inmate store, and the food service facility. The master key system also had to be replaced. At the Michigan Reformatory, two cell blocks were damaged, in addition to the prison chapel, the food service building, and the school. The master key system also had to be replaced at this facility as well. At the Marquette Branch Prison, two vocational education buildings were destroyed, and the industries building, service building, and six cell blocks were damaged. It took many months for the damage at the three facilities to be totally repaired and services brought back to normal. In the end, legal and disciplinary actions were taken against 19 corrections personnel and numerous inmates for their roles in the two disturbances.

Case: 1980s-early 1990s East Lansing and Mt. Pleasant Civil Disturbances

Several clashes between large groups of students and police occurred in East Lansing in the late 1980s over an annual street party known as "Cedarfest." Injuries and property damage resulted from these disturbances, which also involved the use of tear gas to try to disperse rowdy and hostile crowds. Central Michigan University in Mt. Pleasant was also witness to a series of similar parties turned into riots in the 1980s and early 1990s, with the resulting clashes often involving hundreds of students and police.

Case: June 16-17, 2003 Benton Harbor Riot

The city of Benton Harbor erupted into riots on June 16-17, 2003, after a motorcyclist being chased by police crashed into an abandoned house and died. Two nights of violence brought hundreds of police to the area to calm the citizens who felt exasperated with community conditions and circumstances. Rioters roamed a six to eight block area, setting fires and attacking passers-by, police officers, and firefighters. One person was shot in the shoulder and others were beaten and stabbed. In all, about 15 people were injured. It was estimated that about 23 homes were damaged or destroyed by fire. A total of about 10 people were arrested.

Civil Disturbance in Newaygo County

Although, Newaygo County is mostly rural in nature and the history of civil unrest is minimal, the potential for a civil unrest event is still there. Local risk consists of: 1) major employers with a moderate amount of employees to cause a labor dispute; 2) large county jail housing over 250 inmates both federal and local 3) a moderate court size with the potential for high profile judicial proceedings; 4) a moderately diverse population with moderate potential for disagreements between special interest groups; 5) close proximity to college universities including Ferris State University and Grand Valley State University. Local vulnerability focuses on political and religious organizations which have strong ties in Newaygo County and have created dispute among residence in the past.

Case: Scott Allen Woodring July 7, 2003

According to Wikipedia Encyclopedia, the Michigan Militia was a loosely organized paramilitary organization founded by Norman Olson of Alanson, Michigan. The organization formed around 1994 in response to perceived encroachments by the Federal Government on the rights of citizens during the early Clinton Administration. The organization declined during the late 1990's and in the years after the Oklahoma City Bombing, the MMC slowly declined and the leadership fell into infighting. The organization was essentially defunct on a statewide basis by 2000 breaking up into smaller, more radical groups.

On July 7, 2003 the Michigan State Police found itself in a 14-hour standoff with a barricaded gunman, who had an affiliation to the Michigan Militia in Newaygo County. The standoff began the previous day when officers attempted to serve a solicitation of prostitution warrant on a male. The suspect indicated he had a gun and held officers at bay. The Michigan State Police Emergency



Response Unit was called to assist at the scene and attempted an entry after deploying tear gas inside the home. Trooper Kevin M. Marshall and seven other members of the Emergency Support (ES) Team entered the home in an attempt to arrest the suspect. Upon entry, the ES Team members were met by heavy rifle fire grazing one officer and striking Trooper Kevin Marshall four times. One of the rounds penetrated his bullet proof vest and one of the others struck him just below the vest.

Although the house was surrounded by dozens of law enforcement officers, the suspect was able to escape undetected after the shooting. A cache of weapons and survival gear was found in the rubble of his house, which caught fire and burned during the raid. The suspect was shot and killed one week

later after police received information on his whereabouts. The Michigan State Police Emergency Response Team arrived at the scene and located the suspect in a car. They ordered the man to stay inside the car but he exited with a semi-automatic rifle. He was shot and killed when he pointed the rifle at the officers. This standoff received national media attention and created a firestorm of dispute and dissension among Michigan Militia Members.

For additional information, please see the Officer Down Memorial Page for Trooper Kevin Michael Marshall at <http://www.odmp.org/officer/16910-trooper-kevin-michael-marshall>

Violent Crimes

Crime of violence means an offense that has an element of the use, attempted use, or threatened use of physical force against the person or property of another or any other offense that is a felony and that, by its nature, involves a substantial risk that physical force against the person or property of another may be used in the course of committing the offense. 18 U.S. Code §16 – Crime of violence defined.

Hazard Description

Violent crime is composed of four offenses: murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault. Violent crimes are defined in the Uniform Crime Reporting (UCR) Program as those offenses which involve force or threat of force. The data presented in *Crime in the United States* reflect the Hierarchy Rule, which requires that only the most serious offense in a multiple-offense criminal incident be counted. The descending order of UCR violent crimes are: murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

The cause of violent crimes many be attributed to many factors. According to a Police Executive Research forum document from 2009, police chiefs from across the country believe the following are the top ten factors contributing to violent crime:

1. Gangs 82 %
2. Juveniles / youth crime 80 %
3. Economy / poverty / unemployment 74 %
4. Impulsive violence / disrespect issues 74 %
5. Release of offenders from correctional institutions 69 %
6. Drugs-Cocaine 67 %
7. Poor parenting 63 %
8. Increased availability of guns 55 %
9. Reduced cooperation from witnesses / victims (not in top 10 last year) 37 %
10. Educational system-increasing dropout rates (not in top 10 last year) 36 %

Source: <http://www.policeforum.org/library/critical-issues-in-policing-series/VCrime&EconomyI.pdf>

Hazard Analysis

The following information and statistics are from the United States Department of Justice and Federal Bureau of Investigation Criminal Justice Information Services Division 2012 Crime in the United States Data available at <http://www.fbi.gov/stats-services/crimestats>.

- ♦ An estimated 1,214,462 violent crimes reported to law enforcement, including:
 - 14,827 murders
 - 84,376 forcible rapes
 - 354,520 robberies
 - 760,739 aggravated assaults.
- ♦ Violent Crimes increased 0.7 percent over 2011 figures.
- ♦ 43.5 percent of robberies occurred on streets or highways. Only 1.9 percent occurred at banks.
- ♦ Aggravated assaults accounted for 62.6 percent of reported violent crimes
- ♦ Firearms were used in 69.3 percent of the murders reported

Table 1: Crime in the United States

Source: United States Department of Justice and Federal Bureau of Investigation Criminal Justice Information Services Division 2012 Crime in the United States Data

Year	Violent crime	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault
1993	1,926,017	24,526	106,014	659,870	1,135,607
1994	1,857,670	23,326	102,216	618,949	1,113,179
1995	1,798,792	21,606	97,470	580,509	1,099,207
1996	1,688,540	19,645	96,252	535,594	1,037,049
1997	1,636,096	18,208	96,153	498,534	1,023,201
1998	1,533,887	16,974	93,144	447,186	976,583
1999	1,426,044	15,522	89,411	409,371	911,740
2000	1,425,486	15,586	90,178	408,016	911,706
² 2001	1,439,480	16,037	90,863	423,557	909,023
2002	1,423,677	16,229	95,235	420,806	891,407
2003	1,383,676	16,528	93,883	414,235	859,030
2004	1,360,088	16,148	95,089	401,470	847,381
2005	1,390,745	16,740	94,347	417,438	862,220
2006	1,435,123	17,309	94,472	449,246	874,096
2007	1,422,970	17,128	92,160	447,324	866,358
2008	1,394,461	16,465	90,750	443,563	843,683
2009	1,325,896	15,399	89,241	408,742	812,514
2010	1,251,248	14,722	85,593	369,089	781,844
³ 2011	1,206,005	14,661	84,175	354,746	752,423
2012	1,214,462	14,827	84,376	354,520	760,739

Violent Crimes in Michigan

The following information and statistics are from the United States Department of Justice and Federal Bureau of Investigation Criminal Justice Information Services Division 2012 Crime in Michigan Data available at <http://www.fbi.gov/stats-services/crimestats>.

Table 2: Crime in Michigan

Source: United States Department of Justice and Federal Bureau of Investigation Criminal Justice Information Services Division 2012 Crime in the United States by State Data

Year	Violent crime	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault
2011	43,731	617	4,344	10,263	28,507
2012	44,922	689	4,589	10,434	29,210
Percent Change	+2.7	+11.7	+5.6	+1.7	+2.5

Violent Crimes in Newaygo County

The following information and statistics are from the Newaygo County Sheriff's Office Reporting Database from 2012 and 2013. This data only includes reports taken by the Newaygo County Sheriff's Office. It does not cover the cities of Fremont, Newaygo, Grant, and White Cloud which maintain their own police department.

Table 3: Crime in Newaygo County

Source: Newaygo County Sheriff's Office

Year	Violent crime	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault
2012	53	2	16	0	35
2013	66	1	14	3	48
Percent Change	+24.5%	-50.0%	-12.5%	+300.0%	+37.1%

Table 4: Crime in Michigan by City, City of Fremont

Source: United States Department of Justice and Federal Bureau of Investigation Criminal Justice Information Services Division 2012 Crime in the United States by State Data

Year	Violent crime	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault
2011	NR				
2012	3	0	1	0	1
Percent Change					

Table 5: Crime in Michigan by City, City of Newaygo

Source: United States Department of Justice and Federal Bureau of Investigation Criminal Justice Information Services Division 2012 Crime in the United States by State Data

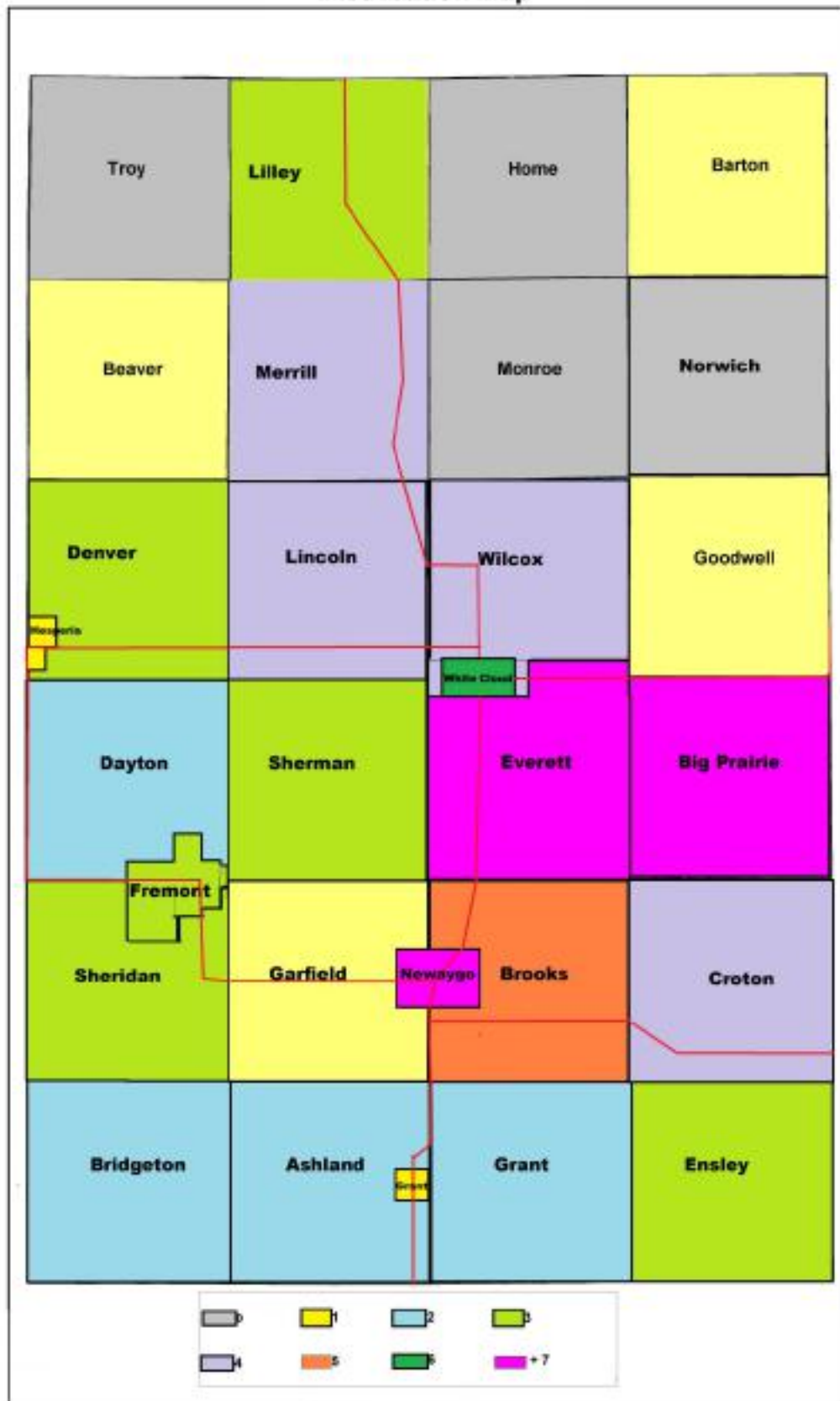
Year	Violent crime	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault
2011	19	2	1	0	16
2012	4	0	2	0	2
Percent Change	-78.9%	-100.0%	+100.0%	0.0%	-87.5%

Table 6: Crime in Michigan by City, City of White Cloud

Source: United States Department of Justice and Federal Bureau of Investigation Criminal Justice Information Services Division 2012 Crime in the United States by State Data

Year	Violent crime	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault
2011	5	1	1	0	3
2012	8	0	2	0	6
Percent Change	+60.0%	-100.0%	+100.0%	0.0%	+100.0%

**Newaygo County
Average Violent Crime
Distribution Map**



Hazards Evaluation Methodology

Although the MSP-EMD Pub201A Hazard Analysis Guidance Tool was utilized and followed as closely as possible, the following adjustments were necessary in order to make this document easy to utilize in the local emergency planning process utilized by Newaygo County Emergency Services.

Hazard Classification

Local planning considerations have resulted in Newaygo County's existing hazards being organized into major hazard classes. This method allows for focused evaluation and management of 12 hazard considerations while actually addressing 22 hazards identified in the MSP-EMD Pub 103 Michigan Hazard Analysis. This method has allowed for an effective planning approach for a variety of reasons.

First, the Newaygo County Emergency Operations Plan is an all-hazard document dependent on implementation of emergency functions, not related to specific hazard response. For example, many flood hazards require similar planning, response, and mitigation measures despite their specific type.

Second, Newaygo County is a moderately sized jurisdiction with its population and resources concentrated in villages and cities, creating a need to generalize hazards. Concentrating on the primary local considerations for the entire hazard class allows for a more efficient planning process than otherwise analyzing each of the individual hazards.

The following relates Newaygo County's Hazard Classes to the Michigan Hazard Analysis 2012 Document.

Newaygo Co Hazard Analysis	Michigan Hazard Analysis	
Natural Hazards		
Thunderstorm	⬆ Thunderstorm ⬆ Lightning	⬆ Hail
Tornadoes	⬆ Tornadoes	⬆ Severe Winds
Severe Winter Weather	⬆ Extreme Temp (Cold) ⬆ Snowstorms	⬆ Ice and Sleet Storms ⬆
Flooding	⬆ Riverine Flooding ⬆ Great Lakes Shoreline Hazards	⬆ Dam Failures ⬆
Drought	⬆ Drought	⬆ Extreme Temperatures (Heat)
Wildfires	⬆ Wildfires	

Newaygo Co Hazard Analysis	Michigan Hazard Analysis	
Technological Hazards		
Fires	✦ Structural Fires	✦ Scrap Tire Fires
Hazardous Materials	✦ Fixed Site (Industrial Accidents)	✦ Nuclear Power Plant Emergencies
	✦ Transportation	✦ Petroleum and Natural Gas Pipeline Accidents
	✦ Oil and Natural Gas Well Accidents	
Infrastructure Failure	✦ Infrastructure Failures	✦ Energy Emergencies
Transportation	✦ Transportation Accidents	✦
Human Related Hazards		
Public Health	✦ Public Health Emergencies	✦
Criminal Incidents	✦ Civil Disturbances	✦ Terrorism and Similar Criminal Activities

Hazard / Emergency Level Evaluations

All hazards were evaluated according to their emergency effect on the local jurisdiction. This has been defined as an emergency or disaster condition requiring significant level of coordination among local government, public, and private entities. This would be further defined locally as a Newaygo County Emergency Services “Alert” condition.

An example that demonstrates the difference between the local effect and standard state definition is best represented in the area of transportation accidents and mass casualty incidents. Although Newaygo County rarely experiences large airplane or bus accidents, frequently all EMS units and hospital capacity are dedicated to a single incident due to only having a maximum of 5 available ambulances housed between 4 different EMS services and 8 emergency care beds. As such, although the jurisdiction doesn’t frequently experience any large bus, airplane, or railway accidents, it frequently experiences small incidents that involve a 75%-100% capability response.

Multi-jurisdictional and Single Jurisdictional Hazard Evaluations

Based on the affected area, all hazards were broken down into two categories, Multi-jurisdictional or single jurisdictional. Multi-jurisdictional hazards impact a large area and are wide spread. These hazards were only ranked on Newaygo County’s Hazard Analysis. These hazards include:

- ♦ Thunderstorms
- ♦ Tornadoes
- ♦ Severe Winter Weather

- ◆ Public Health
- ◆ Drought

Single jurisdictional hazards impact a small area and are isolated or are increased on geography of jurisdiction. These hazards are ranked on the Newaygo County's Hazard Analysis and the individual local jurisdiction's hazard analysis. These hazards include:

- ◆ Infrastructure Failure
- ◆ Flooding
- ◆ Hazardous Materials
- ◆ Fires
- ◆ Wildfires
- ◆ Transportation
- ◆ Criminal

Evaluation Benchmarks

Once again, although MSP-EMHSD Pub201A was followed as closely as possible, several benchmarks had to be modified to accurately reflect their contribution to hazard ranking. Most noticeably, Population Impact, Economic Effects, and Collateral Damage were evaluated on their relation value (High, Medium, Low, None).

Evaluation Benchmark Weighting For Hazard Ranking

The benchmarks are also weighted according to their effect to local response efforts. A percentage is given to each benchmark to calculate the value of response organizations capability to handle the response locally or if the hazard will tax local response systems and require the need for mutual aid.

Hazard Ranking

As each hazard is unique in its dynamics, any of the listed hazards can be equally devastating in its occurrence. As such, the hazard rankings are listed for planning purposes only. They are in no way a scientific result demonstrating that one hazard should be focused on more than any other. Instead, it is important for the jurisdiction to focus on the most potentially hazardous aspects of the hazard itself. For example, tornadoes occur with minimal warning time but strike a small area. Flooding occurs with a slower time of onset yet affects a larger area. As such, local efforts should be focused on improving tornado warning systems and flooding mitigation measures and implementing them appropriately.

Advanced Hazards Profile and Evaluation

Evaluation Measures and Benchmark Factors for each Measure

This model uses a common set of 10 evaluation measures and 44 corresponding benchmark factors to evaluate each hazard facing the community. Those measures are:

- 1) Historical occurrence
- 2) Affected area
- 3) Speed of onset
- 4) Population impact (casualties)
- 5) Economic effects
- 6) Duration
- 7) Seasonal pattern
- 8) Predictability
- 9) Collateral damage potential
- 10) Availability of warnings.

Each corresponding benchmark factor has been assigned a specific point value (10, 7, 4 or 1 point), based on each individual factor's relative severity and negative impacts. Following is a synopsis of each hazard evaluation measure and benchmark factor used in this analysis:

(Note: The Michigan Hazard Analysis, EMD Pub. 103, serves as the baseline for information, supplemented by locally-obtained information.)

Historical Occurrence

Historical occurrence measures the frequency with which a particular hazard occurs in Michigan communities. The more frequently a hazard event occurs, the more potential there is for damage and negative impact on a community. The specific benchmark factors used in the historical occurrence analysis are:

Excessive Occurrence, indicating the hazard event is likely to occur 4 or more times in one year;

High Occurrence, indicating the hazard event is likely to occur 2-3 times per year;

Medium Occurrence, indicating the hazard event is likely to occur 1 time per year;

Low Occurrence, indicating the hazard event occurs less than 1 time per year (i.e., once every 4 years).

Weighted Value is 20%

Benchmark factor point values are:

1 pt	4 pts	7 pts	10 pts
Low	Medium	High	Excessive
<1 event / yr	1 event / yr	2-3 events / yr	4+ events / yr

Affected Area

Each hazard affects a geographic area. For example, a blizzard might affect an entire state or even several states, while a flood might only affect a portion of a county or municipality. Although size of the affected area is not always indicative of the destructive potential of the hazard (a tornado is a good example), generally the larger the affected area, the more problematic the hazard event is on a community. The specific benchmark factors used in the affected area analysis are:

Large Area, if a hazard event has the potential to impact 3 or more townships in a county, or 1/2 of a municipality;

Small Area, if the hazard event could impact 1 or 2 townships in a county, or 1/4 of a municipality;

Multiple Sites, if the hazard event could impact more than 1 village, city, or other sites within 1 township, or more than 1 neighborhood or other site within a municipality;

Single Site, if the hazard event is likely to impact only 1 village, city or other site within a county, or 1 neighborhood or other site within a municipality.

Weighted Value is 20%

Benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
Single Site	Multiple Sites	Small Area	Large Area

Speed of Onset

Speed of onset refers to the amount of time it typically takes for a hazard event to occur. Speed of onset is an important evaluation measure because the faster an event occurs, the less time local governmental agencies typically have to warn the potentially impacted population of appropriate protective actions. The specific benchmark factors used in the speed of onset analysis are:

Minimal or No Warning, indicating that the hazard event could occur without any advance notice or warning;

Less than 12 Hours, indicating the hazard event generally allows less than 12 hours advance notice before occurring;

12-24 Hours, indicating the hazard event generally allows 12-24 hours advance notice before occurring;

Greater than 24 Hours, indicating the hazard event generally allows more than 24 hours advance notice before occurrence.

Weighted value is 10%

Specific benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
> 24 Hours	12 – 24 Hours	< 12 Hours	Minimal / None

Casualty Effects

Casualty Effects refers to the number of casualties (deaths and injuries) that can be expected if a particular hazard event occurs. Specific benchmark factors used in the population impact analysis are:

High Impact, indicating 10 or more casualties can be expected;

Medium Impact, indicating 6-10 casualties can be expected;

Low Impact, indicating 1-5 casualties can be expected;

No Impact (none), indicating that no casualties can be expected.

Weighted Value is 10%

Specific benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
None	Low	Medium	High
No Casualties	1 – 5 Casualties	6 – 10 Casualties	10+ Casualties

Economic Effects

Economic effects are the monetary damages incurred from a hazard event, and include both public and private damage. Direct physical damage costs, as well as indirect impact costs such as lost business and tax revenue, are included as part of the total monetary damages. Specific benchmark factors used in the economic effects impact analysis are:

Significant Effects, indicating over \$100,000 in monetary damages incurred;

Medium Effects, indicating \$50,001-\$100,000 in monetary damages incurred;

Low Effects, indicating \$10,000-\$50,000 in monetary damages incurred;

Minimal Effects, indicating less than \$10,000 in monetary damages incurred.

Weighted value is 10%

Specific benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
Minimal	Low	Medium	High
<\$10,000	\$10,000 - \$50,000	\$50,000 - \$100,000	>\$100,000

Note: An alternative to this economic effects measure would be in a relational potential.

Duration

Duration refers to the time period the hazard event is actively present and causing damage (often referred to as the “time on the ground”.) Duration is not always indicative of the damaging potential of a hazard event (a tornado is a good example). However, in most cases, the longer an event is “active” and thus causing damage, the greater the total damages will be. Specific benchmark factors used in the duration analysis are:

Long Duration, indicating the hazard event is likely to last longer than 1 week;

Medium Duration, indicating the hazard event is likely to last from 1 day to 1 week;

Short Duration, indicating the hazard event is likely to last from 12-24 hours;

Minimal Duration, indicating the hazard event is likely to last less than 12 hours.

Weighted value is 5%

Specific benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
Minimal	Short	Medium	Long
<12 Hours	12 – 24 Hours	1 Day – 1 Week	> 1 Week

Seasonal Pattern

Seasonal pattern refers to the time of year in which a particular hazard event can reasonably be expected to occur. Some hazard events can occur at any time of the year, while others occur primarily during one particular season (i.e., blizzards in winter). Oftentimes, hazard patterns coincide with peak tourism seasons and other times of temporary population increases, greatly increasing the vulnerability of the population to the negative impacts of certain hazard events. The specific benchmark factors used in the seasonal pattern analysis are:

Year-round Occurrences, indicating the hazard event can occur at any time of the year;

Three Season Occurrences, indicating the hazard event can realistically occur during 3 seasons of the year;

Two Season Occurrences, indicating the hazard event can realistically occur during 2 seasons of the year;

One Season Occurrences, indicating the hazard event realistically occurs during only 1 season of the year.

Weighted value is 5%

Benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
1 Season	2 Seasons	3 Seasons	Year Round

Predictability

Predictability refers to the ease with which a particular hazard event can be predicted - in terms of time of occurrence, location, and magnitude. Predictability is important because the more predictable a hazard event is, the more likely it is a community will be able to warn the potentially impacted population and take other preventive measures to minimize loss of life and property. The specific benchmark factors used in the predictability analysis are:

Unpredictable, indicating the hazard is extremely difficult, if not impossible, to predict in terms of time of occurrence, location and magnitude;

Somewhat Predictable, indicating the time of occurrence, location and magnitude of the hazard can be predicted at less than 50% accuracy;

Fairly Predictable, indicating the time of occurrence, location and magnitude of the hazard can be predicted at 50% or greater accuracy;

Highly Predictable, indicating the time of occurrence, location and magnitude of the hazard is predictable virtually 100% of the time.

Weighted value is 5%

Benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
Highly Predictable	Fairly Predictable	Somewhat Predictable	Unpredictable
100% Accuracy	50% Accuracy	<50% Accuracy	Difficult / Impossible

Collateral Damage

Collateral damage refers to the possibility of a particular hazard event causing secondary damage and impacts. For example, blizzards and ice storms can cause power outages, which can cause loss of heat, which can lead to hypothermia and possible death or serious injury. Generally, the more collateral damage a hazard event causes, the more serious a threat the hazard is to a community. The specific benchmark factors used in the collateral damage analysis are:

High Possibility, indicating there is a great likelihood (76% or greater chance) that a particular hazard event will cause secondary hazard events and damage;

Good Possibility, indicating there is a higher than average likelihood (50-75% chance) that a particular hazard event will cause secondary hazard events and damage;

Some Possibility, indicating there is a less than average likelihood (less than 50% chance) that a particular hazard event will cause secondary hazard events and damage;

No Possibility, indicating there is virtually no likelihood (0% chance) that a particular hazard event will cause secondary hazard events and damage.

Weighted value is 10%

Benchmark factor point values are:

1 pt	4 pts	7 pts	10 pts
No Possibility 0% Chance	Some Possibility <50% Chance	Good Possibility 50% - 75% Chance	High Possibility >76% Chance

Availability of Warnings

Availability of warnings indicates the ease with which the public can be warned of a hazard. This measure does not address the availability of warning systems in a community, per se. Rather, it looks at the overall availability of warning in general for a particular hazard event. For example, a community might receive warning that a flood will occur within 24 hours, but receive no warning when a large structural fire occurs. Generally, hazards that have little or no availability of warning tend to be more problematic for a community from a population protection and response standpoint. The specific benchmark factors used in the availability of warnings analysis are:

Warnings Available, indicating that the nature of the hazard is such that warning of the hazard event is always available (100% of the time) and received in a timely manner;

Warnings Sometimes Available, indicating that the nature of the hazard is such that warning of the hazard event is available most of the time (50-99% of the time) and received in a timely manner;

Warnings Generally Not Available, indicating that the nature of the hazard is such that warning of the hazard event is generally not available much of the time (>50% of the time) and generally not received in a timely manner;

Warnings Unavailable, indicating that the nature of the hazard is such that warning of the hazard event is not available (0% of the time).

Weighted value is 5%

Benchmark factor values are:

1 pt	4 pts	7 pts	10 pts
Available	Sometimes	Generally Not	Unavailable
100% of time	50% – 99% of time	<50% of time	0% of time

EVALUATION MEASURES AND BENCHMARK FACTORS SUMMARY

Historical Occurrence

Excessive Occurrence	10 pts
High Occurrence	7 pts
Medium Occurrence	4 pts
Low Occurrence	1 pt

Speed of Onset

Minimal/No Warning	10 pts
Less than 12 Hours	7 pts
12 – 24 Hours	4 pts
Greater than 24 Hours	1 pt

Economic Effects

Significant Effects	10 pts
Medium Effects	7 pts
Low Effects	4 pts
Minimal Effects	1 pt

Seasonal Pattern

Year Round Occurrences	10 pts
Three Season Occurrences	7 pts
Two Season Occurrences	4 pts
One Season Occurrence	1 pt

Collateral Damage

High Possibility	10 pts
Good Possibility	7 pts
Some Possibility	4 pts
No Possibility	1 pt

Affected Area

Large Area	10 pts
Small Area	7 pts
Multiple Sites	4 pts
Single Site	1 pt

Casualty Impact

High Impact	10 pts
Medium Impact	7 pts
Low Impact	4 pts
No Impact	1 pt

Duration

Long Duration	10 pts
Medium Duration	7 pts
Short Duration	4 pts
Minimal Duration	1 pt

Predictability

Unpredictable	10 pts
Somewhat Predictable	7 pts
Predictable	4 pts
Highly Predictable	1 pt

Availability Of Warnings

Warnings Unavailable	10 pts
Generally Not Available	7 pts
Somewhat Available	4 pts
Warnings Available	1 pt

The following table reveals the results of the quantitative evaluation of Newaygo County hazards conducted for the 2014 edition of this plan. Similar evaluations were also conducted for municipal jurisdictions in the county, and can be found in the Annex section of this plan.

Hazards Profile and Evaluation – County of Newaygo, Michigan

Evaluation Criteria	Flooding / Dam Failure	Infrastructure Failure	Wildfires	Thunderstorm	Tornado	Severe Winter Weather
Historical Occurrence	High 2-3 events/yr 7 pts x 20%= 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2-3 events/yr 7 pts x 20%= 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20%= 0.2	Excessive 4+ events/yr 10 pts x20% = 2.0
Affected Area	Large Area >3 Juris. 10 pts x 20% = 2.0	Large Area >3 Juris. 10 pts x 20% = 2.0	Small Area 2-3 Juris. 7 pts x 20%= 1.4	Large Area >3 Juris. 10 pts x 20% = 2.0	Small Area 2-3 Juris. 7 pts x 20%= 1.4	Large Area >3 Juris. 10 pts x20% = 2.0
Speed of Onset	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Low <12 Hours 7 pts x 10% = 0.7	Minimal No Warning 10 pts x10% = 1.0	High >24 Hours 1 pt x 10% = 0.1
Casualty Effects	High Impact >10 injured 10 pts x10% = 1.0	No Impact 0 injured 1 pt x10%= 0.1	Medium <10 injured 7 pts x10%= 0.7	Low Impact <5 injured 4 pts x 10% = 0.4	Medium <10 injured 7 pts x10%= 0.7	Low Impact <5 injured 4 pts x 10% = 0.4
Economic Effects	High >\$100k 10 pts x10% = 1.0	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x10%= 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x10% = 1.0	Low <\$50k 4 pts x 10% = 0.4
Duration	Long > 1 Week 10 pts x5%= 0.5	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05	Minimal <12 Hours 1 pt x 5%= 0.05	Medium <1 Week 7 pts x5%= 0.35
Seasonal Pattern	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	¾ Year 3 Seasons 7 pts x5%= 0.35	¾ Year 3 Seasons 7 pts x5%= 0.35	¾ Year 3 Seasons 7 pts x5%= 0.35	¼ Year 1 Season 1 pt x 5%= 0.05
Predictability	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x5%= 0.5	Somewhat <50% Accuracy 7 pts x5%= 0.35	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Somewhat <50% Accuracy 7 pts x5%= 0.35	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2
Collateral Damage	High Poss. >75% 10 pts x5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Good <75% 7 pts x5%= 0.35	Good <75% 7 pts x5%= 0.35	High Poss. >75% 10 pts x5%= 0.5	Good <75% 7 pts x5%= 0.35
Availability of Warnings	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x5%= 0.5	Generally Not <50% 7 pts x5%= 0.35	Most of the time >75% 4 pts x 5%= 0.2	Generally Not <50% 7 pts x5%= 0.35	Available 100% 1 pt x 5%= 0.05
Hazard Score	7.55	7.40	6.95	6.65	5.90	5.90
Rank	1	2	3	4	5	6

Hazards Profile and Evaluation – County of Newaygo, Michigan (cont'd.)

Evaluation Criteria	Fires	Criminal	Hazardous Materials	Transport	Public Health	Drought
Historical Occurrence	High 2-3 events/yr 7 pts x 20%= 1.4	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2	High 2-3 events/yr 7 pts x 20%= 1.4	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2
Affected Area	Single Site <1 City 1 pt x 20%= 0.2	Single Site <1 City 1 pt x 20%= 0.2	Single Site <1 City 1 pt x 20%= 0.2	Single Site <1 City 1 pt x 20%= 0.2	Large Area >3 Juris. 10 pts x 20% = 2.0	Large Area >3 Juris. 10 pts x 20% = 2.0
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	High >24 Hours 1 pt x 10% = 0.1	High >24 Hours 1 pt x 10% = 0.1
Casualty Effects	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4
Economic Effects	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1	Medium <\$100k 7 pts x 10%= 0.7	Medium <\$100k 7 pts x 10%= 0.7
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x 5%= 0.35	Medium <1 Week 7 pts x 5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05	Long > 1 Week 10 pts x 5%= 0.5	Long > 1 Week 10 pts x 5%= 0.5
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	½ Year 2 Seasons 4 pts x 5%= 0.2
Predictability	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Highly Predict. 100% Accuracy 1 pt x 5%= 0.05	Highly Predict. 100% Accuracy 1 pt x 5%= 0.05
Collateral Damage	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x 5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2	Minimal Poss. <10% 1 pt x 5%= 0.05	Minimal Poss. <10% 1 pt x 5%= 0.05
Availability of Warnings	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Available 100% 1 pt x 5%= 0.05
Hazard Score	5.75	5.75	5.45	5.45	5.30	4.07
Rank	7	8	9	9	11	12

It should be noted that the hazard rankings resulting from this evaluation are different from the rankings found within the previous edition of this plan. *Flooding / Dam Failure* has replaced *Infrastructure Failure* as the #1 hazard in Newaygo County. The primary reason is that a marked increase in flood occurrences has been observed in recent years. Other significant changes in ranking include the promotion of *Wildfire* to #3 (previously #6), and the demotion of *Hazardous Materials* to #9 (previously #4).

2014 Rank	Hazard	2008 Rank	Change
1	Flooding / Dam Failure	2	↑1
2	Infrastructure Failures	1	↓1
3	Wildfire	6	↑3
4	Thunderstorm	3	↓1
5	Tornado	4	↓1
6	Severe Winter Weather	7	↑1
7	Fires	8	↑1
8	Criminal	11	↑3
9	Hazardous Materials	4	↓5
9	Transport	9	-
11	Public Health	10	↓1
12	Drought	12	-

HAZARD MITIGATION GOALS AND OBJECTIVES

Goals are general guidelines that explain what the county wants to achieve. They are usually long-term and represent global visions such as “protect public health and safety.” Objectives define strategies or implementation steps to attain the identified goals. Objectives are more specific and measurable than goals, making them more likely to have a defined completion date. The development of clear goals and objectives helps clarify problems, issues, and opportunities in hazard mitigation, as well as other areas. An important feature of developing them is raising community awareness of the relationship between community development practices and the level of hazard vulnerability and risk. Raising citizen awareness can also help gain support for ongoing mitigation planning efforts.

The following goals and objectives were established for hazard mitigation efforts in Newaygo County in the inaugural edition of the Newaygo County Hazard Management Plan (approved by FEMA in 2008). They were based on input from county officials, local media, emergency management officials, fire and police officials, local planning and zoning officials, elected officials, and critical facility managers, as well as from LEPT members.

For the 2015 updated edition of this plan, the inherited goals and objectives were reviewed by the Newaygo County Hazard Mitigation Advisory Team. It was determined that the goals and objectives remain valid, as therefore no significant changes or additions were proposed during this review. The two foremost factors contributing to this conclusion were that: 1) conditions within the county have remained generally the same since the previous edition of this plan; and 2) the results of the hazards evaluation were comparable to the previous hazards evaluation.

The overall goal of hazard mitigation is to reduce or eliminate the long-term risk to human life and property from the full range of disasters.

Goal 1 – Protect public health and safety.

- Objective 1.1 Assure that threat recognition (watches) and warning systems are adequate and appropriate and that they utilize the latest technology.
- Objective 1.2 Protect infrastructure and services.
- Objective 1.3 Build and support local capacity, commitment and partnerships to continuously become less vulnerable to hazards.
- Objective 1.4 Enlist support of committed volunteers to safeguard the community before, during, and after a disaster.

Goal 2 – Protect existing and new properties.

- Objective 2.1 Use the most cost-effective approaches to protect existing buildings and facilities from hazards.
- Objective 2.2 Use the most cost-effective approaches to protect existing buildings and sites from hazards.

Objective 2.3 Maximize insurance coverage to provide financial protection against hazard events.

Objective 2.4 Maximize the resources for investment in hazard mitigation, including the use of outside sources of funding.

Goal 3 – Promote growth in a sustainable, hazard-free manner.

Objective 3.1 Incorporate hazard provisions in building code standards, ordinances, and procedures.

Objective 3.2 Incorporate hazard mitigation into land use and capital improvement planning and development activities.

Objective 3.3 Incorporate hazard mitigation into existing land use regulation mechanisms to ensure that development will not put people in danger or increase threats to existing properties.

Objective 3.4 Research, recommend, adopt and enforce other plans and ordinances that protect natural resources so that they can, in turn, provide hazard protection.

Goal 1 – Increase public understanding, support, and participation in hazard mitigation.

Objective 4.1 Heighten public awareness of the full range of existing natural and man-made hazards and actions they can take to prevent or reduce the risk to life or property from them.

Objective 4.2 Encourage local communities, agencies, organizations and businesses to participate in the hazard mitigation process.

Objective 4.3 Encourage cooperation and communication between planning and emergency management officials.

In order for the identified goals and objectives to succeed, they must be integrated into and compatible with other community goals. They must also be divided into attainable components, or actions, which can be prioritized so local officials can better focus their attention on developing alternatives.

The following sections guide and encourage concrete actions to be taken and contain alternatives which can be utilized by the county to accomplish hazard mitigation. In addition, the following sections explain how action items are selected from these alternatives and list the action items.

HAZARD MITIGATION ALTERNATIVES

The identification of risks and vulnerabilities, paired with established goals and objectives, should lead planners directly to consider various mitigation alternatives that might be applied to improve the safety and security of residents, property, the environment, the economy, and quality of life. A mitigation alternative is not the same as a project or action that will definitely be implemented. Rather, it is one in a set of potential actions or strategies that will be evaluated and compared.

It is important to recognize that “hazard mitigation” is often presented as something entirely distinct from “preparedness, response, and recovery,” (known together as the four phases of emergency management). However, state planners in Michigan prefer to not place clear limits or distinctions around the mitigation alternatives, since all phases of emergency management share the same ultimate goals of protecting life and property, etc. Many of the mitigation alternatives discussed in this section may seem to include other aspects of emergency management. Alternatives for mitigating hazards can be organized into the following basic strategies:

Basic Hazard Mitigation Strategies

Mitigation Strategy	Description	Examples of Measures	Advantages / Limitations
MODIFYING THE HAZARD	Modifying the hazard itself (which involves removing or eliminating the hazard), reducing its size or amount, or controlling the rate of release of the hazard. In the right circumstances, this strategy can be successful but it is often difficult to do.	<ul style="list-style-type: none"> • Cloud seeding to modify precipitation • Slope planting to prevent erosion or collapse • Stream modification or widening to divert or improve water flow • Dredging to deepen water channel or body to improve water flow and capacity 	<ul style="list-style-type: none"> • Can be cost-effective in many situations • Application is limited and therefore may not be as effective as other strategies • Does not always reduce or eliminate damage on a wide scale • Some hazards simply cannot be modified
SEGREGATING THE HAZARD	Attempts to “keep the hazard away from people.” Primarily for flood hazards but also has applicability to other hazards. Measures are designed to redirect the impacts of a hazard away from people and development	<ul style="list-style-type: none"> • Dams • Dikes / Levees • Floodwalls • Flood drainage channels • Debris basins • Designated routes for hazardous transport • Buffer zones around hazard sites • Defensible space around development • Safe rooms (indoor shelter space) to protect building occupants from harm 	<ul style="list-style-type: none"> • Can be effective for some hazard situations • Some measures can be expensive • Some measures may cause or exacerbate environmental problems • May protect one community but cause problems for adjacent communities • Economically marginal for many situations and locations
PREVENTING OR LIMITING DEVELOPMENT	Preventing or limiting development in locations where people and development would be at risk. This strategy is based on “keeping the people away from the hazard” and includes a variety of land use planning and development regulation tools. Attempts to reduce or eliminate community hazard vulnerability through wise and prudent land use and development decision-making.	<ul style="list-style-type: none"> • Comprehensive planning • Zoning ordinances • Building codes • Subdivision regulations • Floodplain management ordinances and other special area, use and design regulations • Capital improvements planning • Disclosure laws • Acquisition and relocation of hazard prone properties 	<ul style="list-style-type: none"> • Can be highly effective in promoting safe, sustainable development • Widespread application (i.e., statewide, regional, local) • Proactive – seeks to prevent or reduce future vulnerabilities • Reduces future incident response / recovery costs • Administrative tools have minimal associated costs • May in some cases reduce future tax revenue if development does not occur
ALTERING DESIGN OR CONSTRUCTION	Altering the design or construction of development to make it less vulnerable (more resilient) to disaster damage. This strategy allows hazards to interact with human systems that have been designed and planned to withstand potentially destructive impacts. This strategy allows development in hazard prone areas, but requires that the development meet stringent disaster resistant performance criteria.	<ul style="list-style-type: none"> • Elevating flood-prone structures • Wet / dry flood proofing to improve flood damage resistance • Defensible space (vegetation buffer zones) in urban / wildland intermix areas • Wind bracing to improve wind damage resistance • Insulating water and sewer lines to prevent ground freeze damage 	<ul style="list-style-type: none"> • Balances the dual needs of enhancing a community's economic base while at the same time reducing community hazard vulnerability • Can result in safe, sustainable development if done properly • Reduces future incident response / recovery costs • Allows for maximum land use potential • Resilient structures “rebound” better from incident impacts
EARLY WARNING AND PUBLIC EDUCATION	Seeks to ensure that the public is aware of the hazards it faces, and that proper warning and communication systems and practices are in place to save lives and protect property.	<ul style="list-style-type: none"> • Community hazard identification / analysis • Early warning systems (indoor and outdoor) • Tailored public awareness / education campaigns regarding hazards, warning systems and protective actions • Warning devices in congregate facilities • Special needs population warning systems 	<ul style="list-style-type: none"> • Universal strategy – should be applied in all communities • Typically the last line of defense against serious disaster related injury, loss of life and property damage • Recognizes that some hazards cannot be prevented and therefore must be dealt with using proper safety precautions • Enhances community awareness of and support for emergency management efforts

Source: MSP/EMHSD Pub. 106a, Michigan Hazard Mitigation Success Stories, 2011

The remainder of this chapter considers a variety of mitigation alternatives for the county's top hazards. They are presented in one or more of the following groups: Preventative Measures, Corrective Measures, Resource Protection, Emergency Services, and Public Education and Awareness. Much of the following narrative was either borrowed from, or supplemented by information compiled in the Michigan Hazard Mitigation Plan.

Updates conducted on this section in 2014 included review and revision of mitigation alternative descriptions, including how alternatives are being utilized within Newaygo County (the capabilities of the community). Other updates included a revised description of basic mitigation strategies (see table on previous page), and the inclusion of common mitigation funding sources. Appropriate information from the Michigan Hazard Mitigation Plan (MSP/EMHSD Publication 106) was included as well.

Preventive Measures

Preventive mitigation is desirable because it seeks to prevent future problems from occurring. Wise land use planning and building design, small-scale retrofitting, and early warning and public education fall under this category. Doing it right the first time is almost always preferable to going back and trying to correct recurring problems at a later date. Preventive mitigation is generally easier to implement than other types of mitigation because the administrative mechanisms that guide the land development process – planning and plan review, zoning, capital improvements programming, building codes and standards, etc. – are available to every local community and only require adoption and consistent application to be highly effective in reducing or eliminating hazard vulnerability. Prevention is also generally more flexible and cost-effective and can significantly reduce or eliminate future hazard vulnerability. Preventive mitigation can help ensure that, at the very least, responsible agencies do not contribute to the increasing severity of the problem through unwise decision-making.

Preventive measures protect new construction from hazards and assure that future development does not increase the potential for losses. They are particularly important where there is an abundance of undeveloped land, such as in Newaygo County. Planning, zoning, and code-enforcement officials usually administer preventive measures.

Building Codes

Building codes are designed to ensure that a structure will be constructed in such a manner as to be safe for occupancy and use. These codes also regulate health and sanitation requirements for water, ventilation, plumbing, electricity, mechanical equipment, and air conditioning, and contain minimum construction standards for natural hazard resistance. Building codes, used in concert with other available land use / development guidance measures, can be effective in reducing or eliminating damage caused by many natural hazards such as high winds, wildfire, and flooding. In communities where comprehensive planning is not done or not done properly, the building code may essentially be the only land use regulatory measure available.

Building codes provide one of the best methods of addressing the hazards in this plan, and are a prime measure to protect new construction from damage caused by natural hazards. Many times, minimum building code requirements make the difference between a structure that suffers minimal or no damage and one that suffers major damage or is a total loss. Hazard protection standards for all

new and improved or repaired buildings can be incorporated into the local building code. Such standards may include:

- Making sure roofing systems will handle high winds and expected snow/ice/sleet/hail loads;
- Making sure windows, doors and siding can handle high winds;
- Providing special standards for tying the roof, walls and foundation together (crossbracing and anchoring walls to foundations, and roof rafters to walls) to resist the effects of wind;
- Requiring new buildings to have tornado “safe rooms”;
- Making sure electrical systems are grounded and fire walls and sprinklers are installed in attached structures;
- Including insulation standards that ensure protection from extreme heat and cold;
- Securing the “envelope” of a structure, to reduce water-related damage; and
- Mandating overhead sewers for all new basements to prevent sewer backup.

Newaygo County currently enforces the 2009 Michigan Residential and the 2009 Michigan Building codes, along with the 2009 International Energy Conservation Code, Plumbing, Electrical, and Mechanical codes. Building codes such as these provide the basis for good building safety programs, especially protection from fire and electrical hazards, and are constantly being evaluated and updated to reflect new information and recommended practices. The county employs a building inspector, a plumbing inspector, a mechanical inspector, and an electrical inspector to enforce codes throughout the county. Refer to the following table for a list of communities covered by Newaygo County Inspection Services. The county Building Official and plan reviewer is also responsible for reviewing and approving all the FEMA and NFIP requests for substantial improvement costs for notices of determination.

Newaygo County Inspection Services

	Ashland T.	Barton T.	Beaver T.	Big Prairie T.	Bridgeton T.	Brooks T.	Croton T.	Dayton T.	Denver T.	Ensley T.	Everett T.	Garfield T.	Goodwell T.	Grant T.	Home T.	Lilley T.	Lincoln T.	Merrill T.	Monroe T.	Norwich T.	Sheridan T.	Sherman T.	Troy T.	Wilcox T.	Fremont	Grant	Newaygo	White Cloud	Hesperia
Building, Mechanical, Electrical & Plumbing	x		x		x	x	x		x				x	x	x			x	x	x			x	x	x	x			x
Mechanical & Plumbing		x		x						x																			
Not Serviced								x			x	x				x	x				x	x					x	x	

Services provided as of April 10, 2013 - Source: Newaygo County website <http://www.countyofnewaygo.com/BuildingInspector.aspx>

Pursuant to 1972 PA 230, adopted November 5, 1974 and amended by 1999 PA 245, all communities in Michigan are subject to the State Construction Code, which establishes general minimum construction standards for buildings and structures in all Michigan municipalities. The State Construction Code is a compilation of the International Residential Code, the International Building Code, the International Mechanical Code, the International Plumbing Code published by the International Code Council, the National Electrical Code published by the National Fire Prevention Association, and the Michigan Uniform Energy Code with amendments, additions, or deletions as the Michigan Department of Energy, Labor and Economic Growth determines appropriate. The Code became effective statewide on July 31, 2001. The State Construction Code provides for statewide uniformity of application and implementation of rules governing the construction, use, and occupancy of buildings and structures.

FEMA, the Insurance Institute for Business and Home Safety (IBHS), and Insurance Services Office (ISO) are three national organizations that conduct evaluations, and then suggest revisions for insufficient or inappropriate codes. For example, FEMA often utilizes a Building Performance Assistance Team (BPAT) to assess tornado damages to code-conforming structures. If building performance is deemed inadequate, the BPAT may then recommend revisions to the codes to protect structures from future hazard damage.

The IBHS is a non-profit insurance industry research center that is dedicated to maintaining specific building code standards to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters such as wildfire, tornadoes, freezing weather, and hail. Its “FORTIFIED for Safer Living” program is one component of the IBHS suite of “FORTIFIED” programs dedicated to improving the quality of residential and light commercial buildings. The “Safer Living” section specifies construction, design, and landscaping guidelines to increase a new home’s resistance to disaster from the ground up. A bevy of FORTIFIED resources for governments, business owners, and homeowners are available on the IBHS website, [www.http://www.disastersafety.org/fortified/](http://www.disastersafety.org/fortified/).

The ISO administers the Building Code Effectiveness Grading Schedule (BCEGS), a program designed to foster better building code enforcement and thereby reduce natural hazard damage. Local building departments are “graded” on their building codes and how those codes are enforced, with special emphasis on mitigation of losses from natural hazards. Communities with good codes and code enforcement programs in place will receive a better grade than those communities that don’t, and property owners in the higher-graded communities will be rewarded with homeowners’ insurance premium credits. ISO began implementing the program in states with high exposure to wind (hurricane) hazards, then moved to states with high seismic exposure, and then continued through the rest of the country.

The BCEGS was developed after determining that much of the construction failure resulting from natural disasters was due, in large part, to construction not built to comply with codes. The insurance industry’s experience has shown that communities with effective codes and code enforcement have a more favorable (lower) insurance loss experience because they have less disaster-related damage to structures. BCEGS is modeled after a similar and long-standing ISO fire-grading program, which assesses local fire departments and water supplies. It is similar to and acknowledged by the Community Rating System (CRS) of the National Flood Insurance Program (NFIP), which awards CRS credit according to BCEGS rating. The BCEGS and CRS operate under the assumption that communities with well-enforced, up-to-date codes will experience fewer damages. Homeowners within the participating communities can therefore receive lower insurance rates. This often provides communities with enough incentive to rigorously enforce their building codes.

Over 1,100 Michigan communities have received a BCEGS rating. Fire chiefs, chief building officials, and community chief administrative officials may request a single copy of the BCEGS free of charge. If a community has not yet received a BCEGS grading, or if the community has recently made improvements in its building code enforcement services, it may be eligible for a BCEGS survey.

Standards for Manufactured Homes

Manufactured or “mobile” homes are usually not regulated by local building codes since they are built in out-of-state factories and then shipped to sites. However, they must comply with the U.S. Department of Housing and Urban Development’s National Manufactured Home Construction and Safety Standards (effective June 15, 1976) and meet local standards for on-site installation, both in terms of location and technique. The greatest mitigation concern with manufactured housing is protection from wind damage, which is best achieved through appropriate installation. FEMA’s Building Performance Assistance Team (BPAT) found that newer manufactured housing, designed to better transmit wind up-lift and overturning forces to the foundation, performed better when anchored to permanent foundations. Unfortunately, they also found that building officials were often unaware of manufacturer’s installation guidelines with respect to permanent foundations.

The Michigan Manufactured Housing Commission Act of 1987 (PA 96, as amended) 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 by high wind), and be elevated above the 100-year elevation. These provisions are highly effective when properly carried out and enforced.

As of the 2010-2012 American Community Survey 3-year Estimates, about 21% of all housing units in Newaygo County are mobile homes. This is down from the 23.8% reported by the 2000 U.S. Census.

Planning, Zoning, and Capital Improvements

While building codes provide guidance on *how* to build in hazardous areas, planning and zoning activities direct development *away* from these areas, especially floodplains and wetlands. They do this by designating land uses that are suitable to the natural conditions of the land, such as open space or recreation in a flood plain, or by simply allowing developers more flexibility in arranging structures on a parcel of land through the planned development approach.

Comprehensive Planning

The purpose of a comprehensive plan is to establish an orderly, convenient, efficient and enjoyable environment in a community, and to improve the quality of life for all its citizens. A comprehensive plan provides for future development or improvement of the land use pattern and public service program of the community. In Michigan, planning commissions are required to prepare and adopt a comprehensive plan if the community is enforcing a zoning ordinance. (The zoning ordinance must be based on an adopted comprehensive plan to be legally defensible and enforceable.) This may be the most significant responsibility of the planning commission. Once adopted (by the planning commission and/or the community’s legislative body), the comprehensive plan serves as the foundation document for the preparation and subsequent implementation of other land use / development measures such as the zoning ordinance, capital improvements planning, subdivision regulations, and special area use or design regulations. All of these other measures can be used to implement hazard mitigation measures, so the importance of the comprehensive plan in relation to mitigation cannot be understated.

The Newaygo County Master Plan (2010) provides county and local decision makers with common guidelines for future development. Although the Master Plan promotes land use and development policy and proposes land use arrangements, it has no regulatory power. It must therefore be implemented by county and local decisions, public facility and infrastructure improvements, and the actions of private property owners. All local governments in Newaygo County have adopted master plans, with exception of Goodwell, Lincoln, and Troy townships.

Zoning

A zoning ordinance is probably the most effective measure a community has for guiding and regulating development and the land use pattern, and it can be very effective in mitigating hazard risk and vulnerability. The zoning ordinance provides a mechanism for implementing the policy decisions articulated in the comprehensive plan concerning the desired locations of various land uses and public facilities. The zoning ordinance is based on the comprehensive plan and therefore is developed and adopted after the comprehensive plan has been formally adopted by the community. One major difference between the two mechanisms is the timeframe upon which they are based. Generally, the comprehensive plan is designed to guide development for the next 20-30 years, whereas the zoning ordinance will typically be adopted on the basis of a 7-10 year land use development need projection.

A zoning ordinance typically addresses three areas: 1) the use of land and structures and the height and bulk of structures; 2) the density of population and intensity of land and structural use; and 3) the provision for space around structures (i.e., requirements for side yards, rear yards, open space, building setback lines, etc.)

Some zoning ordinances may specifically address potential hazards to life and property, although there is no requirement to do this. The ordinance itself consists of a map or maps delineating the zoning districts in the community where various land uses will be allowed, and an accompanying set of administrative procedures, standards and methods for enforcing the zoning regulations. Zoning districts typically include various types of industrial, commercial, residential, agricultural, and public facility uses. Specific zoning districts are tailored to the particular needs of the community. For example, communities that have a significant amount of lakefront properties may have a special zoning district for residential development around lakes.

Through zoning, communities can also prohibit development in some areas; such as in flood plains, along shorelines, or in the hydraulic shadow of dams (where flooding would occur if a dam failed). Zoning ordinances usually set minimum lot sizes for each zoning district but communities can allow flexibility in lot sizes and location so that developers can avoid hazardous areas. One way to encourage such flexibility is to use the planned unit development (PUD) approach, which allows the developer to easily incorporate flood hazard mitigation measures into the project. Open space and/or floodplain preservation can be accommodated with site design standards and adjusted land use densities. Granting larger minimum lot sizes, i.e., four or five acres, for areas next to water courses allows streams to run near lot lines, and gives developers flexibility to build on higher ground while still including floodplains in backyards.

Newaygo County does not oversee zoning; therefore all municipalities in the county are responsible for establishing their own ordinance. Each municipality has its own zoning official.

Capital Improvements

A Capital Improvements Plan (CIP) is the mechanism through which a community identifies, prioritizes, and establishes financing methods for needed public improvements such as new or improved public buildings, roads, bridges, treatment plants, water and sewer infrastructure, etc. Under Michigan law, planning commissions are required to annually prepare and adopt a CIP and recommend it to the legislative body for their use in considering public works projects. Generally, public improvements included in the CIP are those that require a substantial expenditure of public funds. (Each jurisdiction must decide what constitutes a substantial expenditure.) The CIP can be an effective implementing mechanism for the community's comprehensive plan and zoning ordinance because it dictates the nature and timing of public facility expenditures. Normally, the CIP is established for a six-year period. The first year of the CIP becomes the year's capital budget and is the basis for making appropriations for capital improvements. As a result, the annually approved items are the highest priority public improvements to be built in planned areas.

From a hazard mitigation perspective, the CIP, if coordinated with the community's comprehensive plan and zoning ordinance, can be an effective mechanism for creating a desirable, less vulnerable land use and development pattern. Planning commissions, because they create and adopt each of the three mechanisms, are instrumental in ensuring that public investment is done in such a way that it helps reduce or eliminate the community's risk and vulnerability to hazards. Capital expenditures may include acquisition of open space within hazardous areas; extension of public services into hazardous areas; installing or improving storm sewers and drainage ditches, culverts and spillways; increasing the depth of water lines; retrofitting existing public structures to withstand hazards; tree management; water detention and retention basins, debris detention basins, debris removal, bridge construction and modification, etc.

Subdivision Regulations

Subdivision regulations are the legally established standards of design and construction for dividing a land parcel into smaller ones for the purpose of selling or leasing the property. The Land Division Act (1967 PA 288, as amended by 1996 PA 591, 1997 PA 87, and 2004 PA 524) governs the subdivision of land in Michigan. The Act requires that the land being subdivided be suitable for building sites and public improvements, that there be adequate drainage and proper ingress and egress to lots, and that reviews be conducted at the local, county and state levels to ensure that the land being subdivided is suitable for development. The Act also requires conformance with all local planning codes. From a hazard mitigation standpoint, that point is important because it gives the local planning commission the authority to approve subdivision development in accordance with the local comprehensive plan and regulatory standards.

In terms of process, the subdivision of land has three major phases. The first involves a preliminary review of the engineering aspects of the project – roads, drainage, utilities, and other necessary services, by local and county reviewing agencies. The second phase involves a review of the proposal by the Michigan Department of Environmental Quality, the Michigan Department of Transportation, and the Michigan Department of Energy, Labor and Economic Growth to ensure compliance with state standards regarding location and engineering. At the end of this phase, the developer can obtain tentative approval from the local governing body of the jurisdiction in which the project is located. The final phase involves preparation of the final plat or map of the subdivision.

Local and state reviewing agencies again review the final design to ensure compliance with local and state standards. Once approved, the plat is registered with the county register of deeds.

Subdivision regulations can be an effective tool in reducing risk and vulnerability to certain hazards, such as flooding and wildfires, if mitigation factors are incorporated into the subdivision process through mechanisms such as local planning codes. For example, a community may allow a subdivision to be placed in a heavily wooded area susceptible to wildfire if proper engineering measures are taken regarding lot size and ingress and egress, thereby providing a basic level of protection to developed home sites and the residents occupying those home sites.

From a flood hazards viewpoint, proposed subdivisions are typically reviewed by the County Drain Commissioner for proper drainage. Newaygo County elects a Drain Commissioner every four years. The Michigan Department of Environmental Quality / Land and Water Management Division reviews subdivisions for floodplain impacts. (Refer to the Riverine Flooding chapter of the Michigan Hazard Analysis section in the MHMP for specific MDEQ provisions that directly address flood mitigation.)

Like any regulation, the Land Division Act can be effective if it is enforced and coordinated with other land use / development mechanisms in an effort to reduce overall community risk and vulnerability to hazards.

The subdivision rules relating to flooding are implemented through a review process and use of restrictive deed covenants. However, the restrictive deed covenants that are filed under the Act are only effective if the local building official is aware of and enforces the restrictions. Continuing education for the local building officials is essential for effective implementation of the Act.

The rules currently allow the construction of basements below the 100-year flood elevation, but these basements must be flood proofed, or it must be demonstrated by an engineering analysis that the basement will not be adversely impacted by hydrostatic pressures exerted by floodwaters. The developer must also obtain a letter of map revision (LOMR) from FEMA, certifying that the property has been filled above the 100-year flood elevation and the soil has been properly compacted. The LOMR officially removes the property from the 100-year floodplain.

The design standards for a flood proofed basement are fairly involved. Unless the building official is aware of the restrictive deed covenants and the design standards, and is enforcing these requirements, there is considerable potential for flood damage to basements even in subdivisions platted under the current act. Thus, as noted earlier, continuing education is essential.

Other examples of hazard protection standards that may be addressed through subdivision regulation may include:

- Identification of all hazardous areas;
- Road standards that allow passage of firefighting equipment and snow plows and are no more than one foot below flood elevation;
- Buried power or phone lines;
- Minimum water pressures adequate for firefighting; and
- Lots with building sites above the flood level.

Open Space Preservation

The best approach to preventing damage to new developments is to limit, prevent, or remove development within flood plains and other hazard areas. Open space can be maintained in agricultural use or can serve as parks, greenway corridors, and golf courses. Capital improvement plans and comprehensive land use plans can identify areas to be preserved through any or all of the following means:

- Acquisition;
- Dedication by developers;
- Dedicating or purchasing an easement to keep the land open; or
- Specifying setbacks or buffer zones where development is not allowed.

Additional examples of special area, use and design regulations include:

- Local floodplain management ordinances;
- Coastal zone management regulations;
- Watershed management regulations;
- Special infrastructure design standards and regulations;
- Drainage regulations;
- Housing regulations;
- Wetland protection regulations;
- Natural rivers protection regulations;
- Farmland and open space protection regulations;
- Endangered species / habitat regulations; and
- Historic preservation regulations (among many others).

These regulations (most of which are administered by a state or federal agency in cooperation with local officials) are designed to regulate a certain aspect of the natural or built environment to ensure protection of the public health, safety and welfare, or some significant or unique natural feature. Not surprisingly, most of the regulations have goals that are remarkably similar to those of hazard mitigation. They provide valuable mechanisms for achieving mitigation objectives. These regulations are discussed in greater detail in the following sections of this plan.

To be effective, the provisions of these special regulations must be fully integrated into the comprehensive planning process at the local level. Major provisions of pertinent regulations must be included or addressed in the comprehensive plan and primary implementing mechanisms such as the zoning ordinance, capital improvements plan, etc.

Two programs administered by the State of Michigan provide good examples of special area / use measures that, while originally designed to accomplish something else, also contribute to a reduction in a community's risk and vulnerability to hazards (flooding and wildfires in these two instances):

Natural Rivers Program

This program, administered by the Michigan Department of Environmental Quality, seeks to establish a system of outstanding rivers in Michigan and to preserve, protect and enhance their wildlife, fisheries, scenic, historical, recreational and other values. Through the natural rivers designation process, a natural river district is established 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, although they all have building setback requirements and vegetative strip requirements.

Although not specifically designed to reduce flood losses, the program nonetheless has flood hazard mitigation benefits by requiring building to be constructed away from the river and out of the floodplain. The program is very effective when administered as intended. Like any regulatory program, if the administrator and the variance board are aware of the requirements of the program and their duties, it is very effective.

The White River is the lone Newaygo County river currently included in the Michigan Natural Rivers Program. The county also has tributaries of another natural river, the Pere Marquette.

Farmland and Open Space Preservation Program

This program, administered by the Michigan Department of Agriculture and Rural Development, has the primary goal of preserving unique and beneficial open space. It does this by transferring development rights and acquiring easements. There are two categories of land eligible. The first category makes up historic, riverfront, and shoreland areas. The second category includes land that conserves natural or scenic resources, enhances recreational opportunities, promotes the conservation of soils, wetlands and beaches, or preserves historic sites and idle farmland.

The largest component of the program provides landowners with an opportunity to get a break on their property taxes for designating parcels of land that will remain undeveloped. Thus, this mechanism could be used to reduce risk and vulnerability to wildfires by preventing development in heavily forested areas. It could also reduce vulnerability to flooding by preventing development along rivers and in floodplains. However, the program does have a drawback in that the agreements are not in perpetuity and may be relinquished under certain circumstances. The land can be removed from the program under certain circumstances, with the payment of a penalty. Over the short-term, the program is very effective at slowing the development of the special open spaces. It does not, however, necessarily eliminate future development on the parcels and therefore should not be considered an effective long-term mitigation tool. However, there is also a Purchase of Development Rights program, which does purchase development rights in perpetuity. In addition, landowners may donate development rights to the State and to local conservation programs.

Stormwater Management

New construction in a floodplain increases the amount of development exposed to damage and can aggravate flooding on neighboring properties. Development outside a floodplain can also contribute to flooding problems since stormwater runoff is increased when natural ground cover is replaced by development. Development in a watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality. Stormwater management encompasses two approaches to protecting new construction from damage by surface water:

- Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties; and

- Regulating all development to ensure that the post-development peak runoff will not be greater than under pre-development conditions.

The National Flood Insurance Program (NFIP) and the Michigan Department of Natural Resources (MDNR) set minimum requirements for regulating development in identified floodplains. All new buildings must be protected from base elevations or 100-year floodplains and no development may cause an increase in flood heights or velocities. As of December 2014, there were thirteen jurisdictions in Newaygo County participating in the NFIP, including: the cities of Fremont, Newaygo, and White Cloud; the Village of Hesperia; and the townships of Ashland, Bridgeton, Brooks, Croton, Ensley, Garfield, Lincoln, Sherman, and Wilcox.

The Michigan Drain Code (1956), administered by county drain commissioners, contains regulations regarding set-backs from the established drain channels to assure proper carrying capacity of the drains. The code officially “establishes laws relating to the laying out of drainage districts, the consolidation of drainage districts, the construction and maintenance of drains, sewers, pumping equipment, bridges, culverts, fords, and the structures and the mechanical devices to properly purify the flow of drains.” It also “gives authority to provide for flood control projects, to provide for water management, water management districts and sub-districts, and for flood control and drainage projects within the districts.”

Stormwater runoff regulations supplement other efforts to regulate development by requiring developers to build retention or detention basins to minimize the increases in the runoff rate caused by impervious surfaces and new drainage systems. In general, each development must not let stormwater leave at a rate higher than it did under pre-development conditions.

Stormwater ordinances set requirements for managing runoff from new developments and may require storage facilities based on the size of the development and capacity. The ordinance and proper site planning reduce runoff and the impact of the development on the surrounding area. Examples include:

- Promoting the use of native vegetation within the runoff storage basins;
- Requiring buffers along streams, lakes, wetlands, etc.;
- Requiring retention or infiltration of the initial runoff; and
- Requiring existing depressional storage (areas not designated as floodplains) to be compensated for at a 1:1 ratio.

Stormwater ordinances may also provide for the development of watershed plans. Watershed plans examine the unique characteristics of each watershed and may adopt more or less stringent requirements. The ordinances can also provide for a fee, in lieu of site runoff storage, in the event a watershed plan recommends the use of a larger central basin.

Corrective Measures

Corrective mitigation can be expensive, resource intensive, time consuming, and sometimes only marginally effective. Structural protection measures, hazard modification, and large-scale retrofitting fall under this category. Attempting to go back and fix something that is problematic is almost always more difficult than doing it right the first time. However, when dealing with hazard prone property (i.e.,

structures in a floodway, floodplain or other hazard area), it is often necessary to go back and try to correct the problem in order to protect the affected community and individual property owners from future harm.

When structures and communities are located in hazardous areas, corrective measures are directed at working with current conditions. They are emphasized for areas that suffer recurring or particularly severe disaster damages and impacts or that offer unique mitigation opportunities that can be addressed with existing resources. Examples of the more common corrective measures include:

Modifications. Modifications to a site and/or to a structure. Examples include landscape grading, or retrofitting existing structures to be damage resistant (i.e. floodproofing existing buildings, adding structural braces to buildings to improve earthquake or wind resistance, etc.).

Relocation. Permanent evacuation of hazard-prone areas through movement of existing hazard-prone development and population to safer areas. The two common approaches to relocation are physical removal of buildings to a safer area with future use of the vacated area limited to permanent open space, and replacing existing land uses with others that are less vulnerable to the hazard.

Acquisition. Public acquisition and management of lands that are vulnerable to damage from local hazards. Following acquisition, land uses more appropriate to the degree of risk may be chosen. Public acquisition has been achieved by: a) purchase at full market value; b) purchase at less than full market value through such methods as foreclosure of tax delinquent property, bargain sales, purchase and lease back, etc.; c) donation, through reserved real estate, donation by will, donation and lease back; d) leases; and e) easements.

Modification measures are normally implemented by property owners and include actions to modify the site to keep the hazard from reaching the building; to modify the building/site, or retrofit it, so that it can withstand the impacts of the hazard; and to insure the property to provide financial relief after damage occurs. Relocation and acquisition measures can be implemented by property owners and/or governments through technical and financial assistance.

Site Modifications (Keeping the Hazard Away)

Natural hazards generally do not damage vacant areas but instead threaten people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements.

For example, a home may survive a wildfire because a “defensible space” was created and maintained between it and adjacent wild lands. This “defensible space” is similar in concept to that of “firebreaks,” wherein brush and other fuel are cleared away in areas of state and national forests. A clearing around homes for at least 30 feet on all sides will discourage wildfires from spreading directly to them. Proper maintenance of adjacent property including short grass, thinned trees, removal of low-hanging branches, selection of fire-resistant vegetation, etc. is also helpful in keeping wildfires away. The need for local homeowners to “fireproof” their properties is probably the county’s primary wildfire vulnerability.

Flooding is another hazard that can be kept away from a building. Four common methods to accomplish this include:

- Erect a barrier between the building and the source of flooding;
- Move the building out of the floodprone area;
- Elevate the building above the flood level; and
- Demolish the building.

A flood protection barrier can be built of dirt or soil (berm or levee), or concrete or steel (floodwall). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on the porosity of the ground, if floodwaters stay up for more than an hour or two, the design must account for leaks, seepage of water underneath, and rainwater that falls inside the perimeter. This is usually done with a sump and/or drain to collect the internal groundwater and surface water, and a pump and pipe to remove the internal drainage over the barrier. Barriers can only be built so high and can therefore be overtopped by floods higher than expected. Berms can settle over time, and are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and maintained, lowering their protection level. Floodwalls can crack, weaken, and lose their watertight seals. Therefore, barriers need careful design and maintenance and should be insured in case of failure.

The surest and safest way to protect a building from flooding is to move it to higher ground. Almost any building can be moved but the cost climbs for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. In areas subject to flash flooding, deep waters, or other high hazard, relocation is often the only safe approach. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot or portion of the existing lot available.

Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation. On the other hand, elevating a building will change its appearance. If the required amount of elevation is low, the result is similar to putting a building on a 2' or 3' high crawlspace. If the building is raised 4', 6', or more; owners are often concerned about its appearance and may decline to implement an elevation project. Another problem with this approach is with basements. Only the first floor and higher are elevated. The basement remains as the foundation. All utilities are elevated and the basement is filled in to protect the walls from water pressure. The owner loses the use of the basement, which may deter him or her from trying this approach. A third problem with elevation is that it may expose the structure to greater impacts from other hazards. If not braced and anchored properly, an elevated building may have less resistance to the shaking of an earthquake and the pressures of high winds. A fourth problem is that access can be lost when floodwaters overtop local roads, driveways, and culverts or ditches. If this happens frequently and alternate access is not available, roadways might have to be elevated and crossing points improved.

Some buildings, especially heavily damaged or repetitively flooded ones (such as those in the floodways, the most dangerous portions of the floodplains that naturally carry the majority of fast moving waters), are not worth the expense to protect them from future damage (floodways have many code requirements for repair, expansion or replacement of structures). It is cheaper to

demolish them and either replace them with new, flood-protected structures, or relocate the occupants to a safer site. In general, demolition projects are undertaken by a government agency so the cost is not borne by the property owner. The land may then be converted to public use, such as a park. Acquisition, followed by demolition, is most appropriate for buildings that are difficult to move such as larger slab foundation or masonry structures, and for dilapidated structures that are not worth protecting. One problem sometimes resulting from an acquisition and demolition project is a “checkerboard” pattern in which non-adjacent properties are acquired. This can occur when some owners, especially those who have and prefer a waterfront location, prove reluctant to relocate. Following the flooding of September 1986, Newaygo County experienced both an acquisition project and a relocation project. In Everett Township, a parcel was acquired and flood-damaged structures were demolished. In the City of Newaygo, a wastewater treatment plant was relocated out of the floodplain.

Building or Site Modification (Retrofitting)

An alternative to modifying the site to keep the hazard away is to modify or “retrofit” the site or building to minimize or even prevent damage. There are a variety of techniques to do this. This section looks at the measures that can be implemented to protect existing buildings from damage by wildfires, structural fires, floods, sewer backup, tornadoes, high winds, winter storms, hail, and extreme temperatures.

Modifications to prevent damages from wildfires not only include the creation of a “defensible space” but also a number of other very effective actions such as the use of fire-resistant siding and roofing materials, as well as functional shutters and heavy fire-resistant drapes. Homeowners can sweep clean their roofs, decks and eaves to prevent blowing embers from igniting twigs and leaves. They can move woodpiles and combustibles away from buildings, enclose eaves and any openings under structures that would allow blown embers in, and clean up yard and house waste and flammable oils and spills, which are generally in garages and driveways. They can assure that driveways are wide, high, and level enough and bridges are strong enough for fire equipment to access the property particularly in hilly areas where space can be limited, and can clearly display their addresses so that fire fighters can identify them. Homeowners can also make sure that adequate water supply has been identified for fire-fighters.

The National Fire Protection Association administers the Firewise Communities Program which encourages local solutions for safety by involving homeowners in taking individual responsibility for preparing their homes from the risk of wildfire. Firewise is a key component of Fire Adapted Communities – a collaborative approach that connects all those who play a role in wildfire education, planning and action with comprehensive resources to help reduce risk. The program is co-sponsored by the USDA Forest Service, the US Department of the Interior, and the National Association of State Foresters.

The Firewise Communities/USA Recognition Program is a process that empowers neighbors to work together in reducing their wildfire risk. Communities may pursue this using a five-step process to develop an action plan that guides their residential risk reduction activities, while engaging and encouraging their neighbors to become active participants:

- Obtain a wildfire risk assessment as a written document from your state forestry agency or fire department.

- Form a board or committee, and create an action plan based on the assessment.
- Conduct a “Firewise Day” event.
- Invest a minimum of \$2 per capita in local Firewise actions for the year.
- Submit an application to your state Firewise liaison.

Modifications to prevent damages from structural fires include: the safe installation and maintenance of electrical outlets and wiring; the installation of firewalls; and provision of equipment needed to inhibit fire dangers (such as sprinkler systems, smoke alarms, and fire extinguishers). In urban areas, the denser pattern of development may allow a fire in one structure to spread to one or more other structures. Appropriate firewall use in connected units or downtown commercial/pedestrian strips can help to protect property against the spread of fire. Older attached structures especially should be checked for safety and code compliance. Any special facility such as a nursing home, day care center, or health clinic should ensure that it has a workable fire plan and is equipped with the equipment needed to inhibit fire dangers, such as sprinkler systems, functioning smoke alarms, and usable fire extinguishers. In rural areas, proper education on and maintenance of non-utility heat sources will help allay this hazard. The National Fire Protection Association has information available for homeowners on how to prevent fires. Proper cleaning of chimneys, fire places and wood stoves, keeping objects away from heating sources to prevent malfunction or ignition, and proper installation and fueling of heaters are all important. Space heaters should be at least three feet from objects.

Flood retrofitting measures include dry floodproofing where all areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings such as doors, windows, and vents are closed, either permanently, or with removable shields or sandbags. Sump pumps are used to remove any water that enters. Dry floodproofing of new and existing non-residential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Dry floodproofing is also a viable option for homes located outside the regulatory floodplain.

The alternative to dry floodproofing is wet floodproofing, where water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater, and laundry facilities are permanently relocated to a higher floor or raised on blocks or platforms where the flooding is not deep. Simply moving furniture and electrical appliances out of a basement can prevent a great deal of damage.

A third flood protection modification addresses flooding caused by overloaded sanitary or combined sewers. Four approaches may be used to protect a structure against sewer backup: floor drain plugs, floor drain stand-pipes, overhead sewers, and backflow protection valves. The first two devices keep water from discharging out of the lowest opening into the building, the floor drain, and are inexpensive. However, if water becomes deep enough in the sewer system, it can flow out of the next lowest opening, such as a toilet or tub, or it can overwhelm a drain plug by hydrostatic pressure and flow into the building through the floor drain. The other two measures, overhead sewers and backflow protection valves keep water in the sewer line during a backup. They are more secure but more expensive.

Other considerations for the minimization of flooding damages include: stronger anchoring requirements for propane tanks and hazardous materials in the floodplain/floodway; assurance of proper location, cleaning and maintenance of septic tanks; and back-up power for sump pumps. Critical facilities should have written flood response and recovery plans to identify the equipment and materials necessary to protect them. Cost-sharing programs, such as rebates, to encourage low cost (under \$10,000) property protection measures on private property (surface and sub-surface drainage, sewer back-up protections, berms and regrading, sewer back-up protection, furnace and water heater relocations, lightning rods, etc.) should be considered.

Tornado and severe wind retrofitting measures include constructing underground shelters or “safe rooms” in residences and constructing shelter areas for those who live in mobile homes or temporary, seasonal locations. Another retrofitting approach for tornadoes and high winds is to secure the roof, walls, and foundation with adequate fasteners or tie downs and cross-bracing. These devices help hold the building together when the combination of high wind and barometric pressure differences work to pull the building apart. A third tornado and high wind protection modification is to strengthen garage doors, windows and other large openings. If winds break the building’s “envelope”, the pressures on the structure are greatly increased. Trailers and mobile homes can be secured to foundations, functional wind shutters can be installed over windows, and yard items can be secured or brought inside to avoid damage. Inter-locking shingles on roofs can offer much additional protection against wind and hail damage. Workplaces, remote hunting lodges, campgrounds, fairgrounds, mobile homes, and other such facilities may still have vulnerabilities for proper warning and shelter. It is important to provide inhabitants with safe and accessible sheltering options before, during and after severe weather events.

Retrofitting approaches to protect buildings from the effects of thunderstorms include storm shutters, lightning rods, and strengthening connections and tie-downs (similar to tornado retrofitting). Roofs could be replaced with materials less susceptible to damage by hail, such as modified asphalt or formed steel shingles. Loose materials and yard items should also be secured so that they can’t blow away.

Burying utility lines is a retrofitting measure that addresses the impacts of severe winds, tornadoes, and winter storms. Installing or incorporating backup power supplies minimizes the effects of power losses caused by downed lines. Surge suppressors protect delicate appliances from lightning damage. Another option is “Retrofitting” trees that hang over power lines, as mentioned later in the discussion on Urban Forestry.

Winter storm retrofitting measures include improving insulation on older buildings and relocating water lines from outside walls to interior spaces. Windows can be sealed or covered with an extra layer of glass (storm windows) or plastic sheeting. Roofs can be retrofitted to shed heavy loads of snow and prevent ice dams that form when snow melts. Water and sewer lines can be buried below the frost line or insulated to protect against ground freeze. Roads can be protected from blowing snow by the installation of snow fences beside them, especially along highways and in residential developments with limited access. These may be “living” fences, composed of lines of trees.

Air conditioning is probably the most effective measure for mitigating the effects of extreme summer heat on people. Unfortunately, those most vulnerable to heat often do not live or work in air-conditioned environments. 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. However, air circulation is important and is limited for those unwilling to open windows because of security concerns. In these instances, inexpensive safety latches can be installed to allow windows to be opened far enough for air to circulate, while at the same time preventing them from being completely opened from the outside.

Insurance

Insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild and afford to incorporate some of the other mitigation measures in the process. A standard homeowner's insurance policy will cover a property for the hazards of tornado, wind, hail, and winter storms. Separate endorsements are usually needed for damages from sump pump failure, sewer back-up, and earth movement and can be added to a homeowner's insurance policy. Each company has different amounts of coverage, exclusions, deductibles, arrangements, and costs. Most exclude damage from surface flooding and owners must purchase such coverage through the National Flood Insurance Program, which is available if they live in communities participating in the program. Banks and mortgage companies require flood insurance when loans are for purchase or repair of properties located in flood plains if the loans are federally insured.

Critical facilities should be inventoried and proper insurance coverage should be reviewed and insured. Larger local governments can self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can be a major drain on the treasury. Communities cannot expect federal disaster assistance to make up the difference. Under Section 406(d) of the Stafford Act "if an eligible insurable facility damaged by flooding is located in a [mapped floodplain] ... and the facility is not covered or is underinsured by flood insurance on the date of such flooding, FEMA is required to reduce Federal disaster assistance by the *maximum* amount of insurance proceeds that would have been received had the buildings and contents been fully covered under a National Flood Insurance Program (NFIP) standard flood insurance policy". Generally, the maximum amount of proceeds for a non-residential property is \$500,000. In other words, the law expects public agencies to be fully insured as a condition of receiving federal disaster assistance.

Technical and Financial Assistance

Property protection measures are usually considered the responsibility of the property owner. However, there are various roles the county or a municipality can play in encouraging and supporting implementation of these measures.

One of the first duties of a local government is to protect its own facilities. Critical facilities should be a high priority for retrofitting projects and insurance coverage. Often public agencies discover after the disaster that their "all-hazard" insurance policies did not cover the property for the type of damage incurred. Flood insurance is even more important as a mitigation measure because of the Stafford Act provisions discussed above.

Providing basic information to property owners is an important action that can be taken to support property protection measures. Another step is to help pay for a retrofitting project. Financial assistance can range from full funding of a project to helping residents find money from other programs. Some communities assume responsibility for sewer backups, street flooding, and other

problems that arise from an inadequate public sewer or public drainage system. Less expensive community programs include low-interest loans, forgivable (after a certain period of occupancy) loans and rebates. These approaches don't always fully fund the project but they either cost the community less or increase the owner's commitment to the retrofitting project. In addition, communities can assist residents with referrals to home repair programs and heating assistance programs.

The community can be the focal point of a project, such as floodplain property acquisition. Most funding programs require a local public agency to sponsor the project. The county or a municipality could process the funding application, work with the owners, and/or provide some or the entire local share. In some cases, the local government would be the ultimate owner of the property, but in other cases a public agency could assume ownership and maintenance responsibilities. The West Michigan Land Conservancy is an organization that can help by purchasing and holding certain lands until a government agency or other party can take possession.

Mandates are considered a last resort if information, funding, and incentives aren't enough to cause protective actions. Examples of retrofitting mandates are the requirements that downspouts be disconnected from sanitary sewer lines or that buildings in flood plains be elevated or brought up to current flood protection codes if "substantial" repair costs equal or exceed 50% of the value of the original building. Another possible mandate is to require less expensive hazard protection steps as a condition of approval for a home improvement project. For example, if a person were to apply for a permit for major rehabilitation, the community could require that the service box be moved above the base flood elevation or that separate ground fault interpreter circuits be installed in the basement. An extreme mandate would be to "Fill Your Basement With Water." If the mandate were issued in an NFIP community during flood conditions, under FEMA procedures, FEMA funds would later be made available to assist with repairs. However, those repairs would be less expensive since filling the basement would equalize pressure from saturated soils on building walls with water tight, near water tight, or pumped out basements. It would also facilitate clean-up because there is clean water instead of silt and sewage-laden muddy water in the structure.

Repetitive Loss properties deserve special attention because they are more prone to damage by natural hazards than other properties and protecting such buildings is a priority with FEMA and MSP-EMHSD mitigation funding programs. (As of October 2013, Newaygo County had experienced 14 repetitive losses: 3 in Ashland Township, 8 in Bridgeton Township, and 3 in Garfield Township.) Appropriate property protection measures are based on studies of flood and building conditions. General guidelines, which are not site specific, are as follows.

- Buildings in high hazard areas (in the floodway or where the 100-year flood is two or more feet over the first floor) or in less than good condition should be acquired and demolished.
- Buildings with basements and split level foundations in high hazard areas should be acquired and demolished. They are too difficult to elevate and the hydrostatic pressures on the walls from deeper flooding make them too risky to protect in place.
- Buildings subject to shallow flooding from local drainage should be protected through area-wide flood control or sewer improvement projects.
- Buildings in good condition on crawlspaces should be elevated or relocated.
- Buildings in good condition on slab, basement or split level foundations subject to shallow flooding (less than 2 feet) can be protected by barriers and dry floodproofing.

The most common sources for hazard mitigation assistance are listed in the table below. Unfortunately some are only available after a disaster, not before, when damage could be prevented. Following a disaster declaration, FEMA, the MSP Emergency Management and Homeland Security Division, and the Michigan DNR may provide guidance on how to qualify and apply for these funds.

Common Hazard Mitigation Sources

Program	Eligibility	Eligible Activities	Program Type / Cost Share
HAZARD MITIGATION GRANT PROGRAM (HMGP) HMGP grants are provided to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.	Eligible Subapplicants: · State agencies · Tribal governments · Local governments · Private nonprofit orgs	· Property acquisition / structure demolition or relocation · Structure elevation · Dry floodproofing of historic residential structures · Dry floodproofing of non-residential structures · Minor localized flood reduction projects · Structural / non-structural retrofitting · Safe room construction · Infrastructure retrofitting · Soil stabilization · Wildfire mitigation · Post-disaster code enforcement · Hazard mitigation planning	Disaster Based (Stafford Act Major Disaster Declaration Required) 75% Federal 25% Non-Federal
PRE-DISASTER MITIGATION PROGRAM (PDMP) PDMP funds are provided for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. Funding these plans and projects reduces overall risks to the population and structures from future hazard events, while also reducing reliance on federal funding from future major disaster declarations.	Eligible Subapplicants: · State agencies · Tribal governments · Local governments · Universities	· Property acquisition / structure demolition or relocation · Structure elevation · Dry floodproofing of historic residential structures · Dry floodproofing of non-residential structures · Minor localized flood reduction projects · Structural / non-structural retrofitting · Safe room construction · Infrastructure retrofitting · Soil stabilization · Wildfire mitigation · Hazard mitigation planning	Annual Appropriation 75% Federal 25% Non-Federal 90% Federal 10% Non-Federal if subgrantee is a small impoverished community
FLOOD MITIGATION ASSISTANCE PROGRAM (FMAP) FMAP funds are provided to implement measures that reduce or eliminate the long term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program (NFIP). The goal of the FMAP is to reduce or eliminate claims under the NFIP.	Eligible Subapplicants: · State agencies · Tribal governments · Local governments	· Property acquisition / structure demolition or relocation · Structure elevation · Dry floodproofing of historic residential structures · Dry floodproofing of non-residential structures · Minor localized flood reduction projects · Hazard mitigation planning	Annual Appropriation 75% Federal 25% Non-Federal
REPETITIVE FLOOD CLAIMS PROGRAM (RFCP) RFCP funds are provided to reduce flood damages to insured properties that have had one or more claims under the NFIP and that will result in the greatest savings to the National Flood Insurance Fund (NFIF) in the shortest period of time. (Note: RFCP funds are only available to sub-applicants who cannot meet the cost share requirements of the FMAP.)	Eligible Subapplicants: · State agencies · Tribal governments · Local governments	· Property acquisition / structure demolition or relocation · Structure elevation · Dry floodproofing of historic residential structures · Dry floodproofing of non-residential structures · Minor localized flood reduction projects	Annual Appropriation 100% Federal
SEVERE REPETITIVE LOSS PROGRAM (SRLP) SRLP funds are provided to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the NFIP, and that will result in the greatest amount of savings to the NFIF in the shortest period of time.	Eligible Subapplicants: · State agencies · Tribal governments · Local governments	· Property acquisition / structure demolition or relocation · Structure elevation · Mitigation reconstruction · Dry floodproofing of historic residential structures · Minor localized flood reduction projects	Annual Appropriation 75% Federal 25% Non-Federal
*States, Territories and Indian Tribal Governments are eligible HMA applicants. Interested and eligible subapplicants must apply to the applicant for HMA funding consideration. Individuals and businesses are not eligible to apply for HMA funds; however, an eligible subapplicant may apply for funding to mitigate private structures.			

Source: MSP/EMHSD Pub. 106a, Michigan Hazard Mitigation Success Stories, 2011

Resource Protection

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas as development occurs so that these areas can, in turn, provide hazard protection. For instance, watersheds, floodplains, and wetlands can reduce run-off from rainwater and snow melt in pervious areas; reduce overland flood flow and store floodwaters; remove and filter excess nutrients, pollutants and sediments; absorb flood energy and reduce flood scour; and recharge groundwater. These natural benefits can be preserved through regulatory steps for protecting natural areas or

natural functions. General regulatory programs are discussed in the section on Preventive Measures. This section covers resource protection programs and standards, including the following:

- Wetland protection;
- Erosion and sedimentation control;
- River restoration;
- Best management practices;
- Dumping regulations;
- Urban forestry; and
- Farmland protection.

Wetland Protection

Wetlands are often found in floodplains and depressional areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as natural filters, helping to improve water quality. Wetlands that are part of the waters of the United States are regulated by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (U.S. EPA) under Section 404 of the Clean Water Act. Proposed development in these wetlands requires a “404” permit, which can’t be issued until plans are reviewed and approved by several agencies including the Corps and the U.S. Fish and Wildlife Service. Small projects that meet certain criteria, as well as projects that are not in the Corps’ wetlands, may proceed under nationwide permits instead of under individual permits and are regulated by local authorities (i.e. the Michigan Department of Environmental Quality (MDEQ)).

Wetland mitigation, as defined in each issued permit, can include creation, restoration, enhancement or preservation of wetlands on the site or elsewhere – even in another watershed. It should be noted that, when a wetland is mitigated at another site, there are drawbacks to consider. First, it takes many years for a new wetland to approach the same quality as an existing one. Second, a new wetland in a different location will not have the same flood damage reduction benefits as the original one did. Some developers and government agencies mitigate by buying into wetland banks, which are large wetlands created for the purpose of mitigation. The bank accepts money to reimburse the owner for setting the land aside from development.

River Restoration

Approaches such as “stream conservation,” “bioengineering,” and “riparian corridor restoration” aim to return streams, streambanks and adjacent lands to more natural conditions. “Ecological restoration” aims to restore native indigenous plants and animals to an area. Native plantings along banks; such as willow cuttings, wetland plants, and/or rolls of landscape material covered with natural fabric that decomposes after plants take root; resist erosion. Studies have shown that, after establishing appropriate vegetation on banks, long-term maintenance costs are lower than for maintenance of concrete banks or conventional landscape (e.g., mowing turf grass). These approaches are not required but are recommended by economics.

Another restoration option is to improve culverts. Restoring the natural flow of a watercourse through culvert improvements and streambank treatments around the culvert can have numerous benefits that may appeal to a variety of governmental and environmental groups. Potential benefits include:

water quality improvement; coldwater tributary protection / restoration; fish habitat improvement; and decreased risk of culvert failure which may lead to flooding and washouts.

There are numerous watershed groups that include Newaygo County within their borders, including: Muskegon River Watershed Assembly, Pere Marquette River Watershed Council, and White River Watershed Partnership.

Best Management Practices

Point source pollutants are discharged from pipes such as the outfall of a municipal wastewater treatment plant and are regulated by the U.S. EPA and the MDEQ. *Non-point source* pollutants come from non-specific locations and are harder to regulate. Examples of non-point source pollutants are lawn fertilizers, pesticides, and other farm chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. The term “best management practices” (BMP’s) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff, prevent erosion, protect natural resources and capture non-point source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, maintain natural base flows, and provide multiple uses of drainage and storage facilities.

The Brooks Lake Improvement Board is one example of an organization that promotes BMP’s in Newaygo County.

Dumping Regulations

BMP’s usually address pollutants that are liquids or are suspended in water while dumping regulations address solid matter, such as shopping carts, appliances, and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels’ and wetlands’ ability to convey or clean stormwater. Nuisance ordinances can prohibit dumping garbage or other “objectionable waste” on public or private property. Waterway dumping regulations can prohibit “non-objectionable” waste (grass clippings or tree branches), which can kill ground cover or cause obstructions in channels. These regulations can be enforced with penalties but programs should have public information components since property owners might not be aware of the impact of their actions (i.e. re-grading their yards, discarding leaves or branches in a watercourse, etc.). Voluntary compliance by property owners and annual “clean-up” programs sponsored by local communities can be quite effective.

Urban Forestry

The major damage caused by winds and snow/ice/sleet storms is to trees. Downed trees and branches break utility lines and damage buildings, vehicles, and anything else under them. An urban forestry program, developed by a municipality, can reduce the damage potential of trees by addressing proper tree care prior to a storm and recommend actions for managing trees before, during, and after a storm. Urban foresters or arborists can select hardier trees that better withstand high wind and ice accumulation and trees that are shorter than utility lines for use in power and telephone line rights-of-way. They can review damaged trees to determine if they should be pruned or removed.

A properly written and enforced urban forestry plan can lessen the frequency of fallen trees and limbs caused by wind and ice build-up, reduce liability, assist in assuring that utility lines are not damaged, and provide guidance on repairs and pruning after a storm. Such a plan helps a community qualify to be a “Tree City USA.” “Tree City USA” is a program sponsored by The National Arbor Day Foundation, in cooperation with the USDA Forest Service and the National Association of State Foresters, to ensure that every qualifying community has a viable tree management plan and program. It provides direction, technical assistance, public attention, and national recognition for urban and community forestry programs. The City of Fremont is the only municipality in Newaygo County to achieve the “Tree City USA” endorsement.

In addition, utility companies are heavily involved in tree management. A recent Consumers Energy brochure states that; since the company is responsible for providing safe, reliable electricity; employees (and companies hired to help) “are sent out on a planned, rotating schedule to clear trees and bushes from electric rights-of-way.” Following guidelines from the American National Standards Institute (ANSI) and working under required permits, Consumers Energy promises the following actions.

- Trees next to distribution lines, which carry electricity from pole to pole, will be trimmed a safe, clear distance from lines.
- The safety of employees and the public, particularly children, may require removal of a tree. A tree may have to be removed because it is dead, dying, damaged, or subject to falling because of wind or a shallow root system-making it a safety and power outage threat. Some fast-growing trees can be a continuing hazard and may have to be removed.
- Trimming methods are aimed at helping the tree heal, decreasing future trimming needs, and directing future growth away from electric lines.

The need for these activities is eliminated when utility lines are buried. Burying the lines is recommended when they are being upgraded or installed for new developments.

Farmland Protection

The purpose of farmland protection is to provide planning and zoning mechanisms for preserving prime, unique, or important agricultural land from conversion to non-agricultural uses. Farm owners feel forced to sell their land to residential or commercial developers if it is taxed based on the value of the property if developed instead of farmed and the increased taxation can't be afforded. The ensuing development brings more buildings, roads, and other infrastructure that can create additional stormwater runoff and emergency management difficulties. To offset this situation, the Farmland Protection Program in the U.S. Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to states, tribes, local governments, and non-profit organizations to help purchase easements on agricultural land to protect against the development of the land. Eligible lands include cropland, range land, grass land, pasture land, and forestland that are part of an agricultural operation. Certain lands with historical or archaeological resources are also included. The hazard mitigation benefits of farmland protection are similar to those of open space preservation.

In addition to protecting farmland, efforts can be made to protect crops. These efforts can include the support of agricultural programs that promote soil health, preserve soil moisture, and monitor soil moisture levels to help minimize loss of crops and topsoil during drought conditions. They can also

include recommendations for water supply infrastructure that is not vulnerable to drought and planting crops tolerant of low moisture levels. Drought ordinances can prioritize or control water use during drought conditions. Drought mitigation plans can be developed which include:

- Collection and analysis of drought-related information;
- Criteria for declaring drought emergencies and triggering various mitigation and response activities;
- Information flow between and within levels of government;
- Definition of the duties and responsibilities of all agencies with respect to drought;
- A current inventory of state and federal programs used in assessing and responding to drought emergencies;
- Identification of drought-prone areas and vulnerable economic sectors, individuals, or environments;
- Identification of mitigation actions to address vulnerabilities and reduce drought impacts; a mechanism to ensure timely and accurate assessment of drought's impacts on agriculture, industry, municipalities, wildlife, tourism and recreation, health, and other areas;
- Public information methods; and
- A strategy to remove obstacles to the equitable allocation of water during shortages and establish requirements or provide incentives to encourage water conservation.

Emergency Services

Emergency service measures protect people during and after a disaster. A good emergency management program addresses all hazards and involves all departments. At the state level, programs are coordinated by the Michigan State Police, Emergency Management and Homeland Security Division (MSP-EMHSD); while at the county level, programs are coordinated through Newaygo County Emergency Services in White Cloud. These measures can be divided into four stages:

- Threat Recognition (Watch);
- Warning;
- Response; and
- Post-Disaster Recovery and Mitigation.

Threat Recognition (Watch)

The first step in responding to a snowstorm, windstorm, tornado, flood, or other natural hazard is to know when weather conditions are such that an event could occur and issuing a "watch." Proper and timely threat recognition systems allow for adequate warnings to be disseminated. Systems are described below for flooding, tornadoes and thunderstorms, and winter storms.

A flood threat recognition system predicts the time and height of the flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels. On smaller rivers, local rainfall and river gauges are needed. In the absence of gauges, local personnel and/or volunteers monitor rainfall and stream conditions. While specific flood crests and times are not predicted, advance notice of potential local or flash flooding is provided. On larger rivers, measuring and calculating is done by the National Weather Service

(NWS), which is in the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), with support from cooperating state and local partners. Forecasts are made through the Advanced Hydrologic Prediction Service (AHPS), which utilizes river gauges for information. Newaygo County has two river monitoring stations located in Croton Township on the Muskegon River and the Little Muskegon River. There is also an electronic flood gauge at the Croton Dam, which can be accessed by telephone.

Flood threat predictions are broadcasted on the NOAA Weather Wire and Weather Radio, the official source for weather information, to those who have equipment to receive it (state police, 911 and dispatch centers, municipalities, and critical facilities). Weather radios can be tone-activated through the Emergency Alert Radio System (EARS). Predictions are also transmitted through social media, and by television, radio, and cable television through the Emergency Alert System (EAS), previously known as the Emergency Broadcast System.

The NWS is the prime agency for detecting meteorological threats, such as tornadoes and thunderstorms, and uses a transmitter located south of Hesperia to relay weather information to Newaygo County. Severe weather warnings are first transmitted through the NOAA Weather Radio System and then subsequently relayed through the Michigan State Police's Law Enforcement Information Network (LEIN). The network includes law enforcement agencies and emergency service providers such as "911" who then issue their own warnings. However, NWS coverage is done on a large scale and only considers if conditions are appropriate for formation of a tornado or thunderstorm. More site-specific and timely recognition is provided by sending out NWS trained spotters to watch and report on the weather when the NWS issues a watch or warning. Training for spotters is provided annually, generally in the spring, through cooperation of Newaygo County Emergency Services, fire departments, and NWS office in Grand Rapids.

The NWS is also the prime agency for predicting winter storms. Severe snowstorms can often be forecasted days in advance of the expected event, which allows time for warning and preparation. Though more difficult, the NWS can also forecast ice storms.

In summation, Newaygo County receives threat recognition information from NOAA weather radios or from the Michigan State Police who monitor the NOAA Weather Wire. The NWS also activates public notice through EAS when the hazard impacts a large area. The Michigan State Police disseminate weather threats through the LEIN system to 911 and other dispatch centers around the state. Police and fire stations, schools and other public facilities may also receive alerts from 911. When conditions are appropriate, Newaygo County Emergency Services and NWS use their formal organization of weather spotters.

Warning

When the NWS determines that a flood, tornado, thunderstorm, winter storm or other hazard has been observed or is imminent, a warning is issued to take immediate action and the systems described above are again utilized to notify police, 911 and dispatch centers, municipalities, the public, and staff of other agencies and critical facilities. Early warning allows for a greater number of people to implement protection measures. More specific warnings may be issued by communities and are included on the following list, which contains methods already discussed, as well as common and cutting edge methods.

- NOAA Weather Radio;
- The Weather Channel;
- Commercial or public radio or TV stations;
- Cable TV emergency news inserts;
- Tone activated receivers in key facilities;
- Outdoor warning sirens and fire department call-in sirens;
- Sirens on public safety vehicles;
- Mobile public address systems;
- E-mail notifications;
- Broadcast faxes;
- Pocket paging services for the hearing impaired;
- AT&T language line for those who speak a different language;
- Automated telephone notification services;
- Telephone trees/mass telephone notification;
- Mobile device text messages and apps;
- Social media outlets; and
- Door-to-door contact.

Warning systems need to be evaluated, updated to include new technologies, and expanded to include warnings to people with “special needs” continually and should include warnings for slow onset, as well as fast onset hazards. Different warning systems are required for different hazards, some of which are location-specific and some of which are area-wide. In addition, any confusion over warnings needs to be eliminated. The public is often confused by fire station alarms and doesn’t know if the alarm indicates a hazard, or if it is just calling in firefighters.

Multiple or redundant systems are most effective. If people do not hear one warning, they may still get the message from another. Also more effective are warnings that provide public information about the hazard and what to do. However, each method has advantages and disadvantages that are partially described below.

- Radio and television, when turned on, provide useful information.
- NOAA Weather Radio, where available, can provide short messages of any impending weather hazard or emergency and advise people to turn on their radios or televisions, or to access the internet.
- Outdoor warning sirens can quickly reach many people, particularly those who are outside, and trigger them to turn on a radio or television or to access the internet to find out what hazard is coming. They do not reach people in tightly insulated buildings or those surrounded by loud noise, such as in a factory, during a thunderstorm, or near an air conditioning unit.
- Automated telephone notification services are also fast, but can be expensive and do not work when phone lines are down or for unlisted numbers and calling screener services.
- Going door-to-door and conducting manual “telephone trees” can be effective but require a longer lead time.
- Social media alerts require individuals to be active on those networks and require access to the internet.
- Mobile device alerts are only effective if there is adequate cell phone service, and when devices are turned on.

The Newaygo County civil defense warning system includes nine sirens which are listed in the table below. All sirens may be operated by the fire districts themselves and four of them can also be activated by Newaygo County Central Dispatch. These locations include: Ashland-Grant Fire District (from 7:00 am to 2:00 pm only), Croton Township Fire Department, Lilley Township Fire Department, and White Cloud Fire Department.

Newaygo County Warning Sirens

Fremont DPW	805 Oak Street, Fremont	Tornado Only
Newaygo (North)	40 Centerline Road	Tornado Only
Newaygo (South)	355 Clay Street	Tornado Only
Grant Fire Department	62 W State Street, Grant	Fire and Tornado
Croton Township	6464 S Croton-Hardy Drive, Newaygo	Fire and Tornado
Big Prairie Fire Department	2815 S Elm Street	Fire and Tornado
Lilley Fire Department	10730 N Prospect, Bitely	Fire and Tornado
White Cloud Fire Department	1020 Wilcox Ave, White Cloud	Fire and Tornado
Hesperia Village Hall	33 E Michigan Street, Hesperia	Tornado Only

Newaygo County utilizes and maintains a variety of available warning tools to alert and notify the general public of emergency events and/or hazardous situations. Warning tools include, but are not limited to, NOAA Weather Radios, Emergency Alert System (EAS), Tone Alert Monitors, Tornado Sirens, door-to-door notification, and other specialized systems including Citywatch, Nixle, websites, email, and social media. Depending on the nature of the incident, emergency services personnel will reference established guidance within the Newaygo County Emergency Operations Plan to determine the appropriate warning tools to utilize. Regardless of the situation, the primary warning tool for Newaygo County is Nixle. Nixle connects public safety agencies to their community residents via text, web, and email to distribute out alert, advisories, and community messages. Alerts can be sent out to the entire area or a predefined contact list. Nixle is integrated into IPAWS and has the capability to automate NWS Rebroadcasts and link social media accounts together.

The NWS established the “StormReady” program to help local governments improve the timeliness and effectiveness of hazardous weather-related warnings for the public. A community must satisfy a set of guidelines to receive “StormReady” recognition. The guidelines are organized into six categories:

- Communications;
- NWS Information Reception;
- Hydrometeorological Monitoring;
- Local Warning Dissemination;
- Community Preparedness; and
- Administrative.

Certain requirements for each guideline may vary depending on the population of the community. More information on the program is available at <http://www.stormready.noaa.gov/index.html>.

NWS also established the Turn Around Don't Drown (TADD) campaign “to warn people of the hazards of walking or driving a vehicle through flood waters.” One activity is to warn motorists of the dangers of flooded roads, particularly when there are barricades, since it is impossible to tell the

depth of the water or the condition of the road under the water. Barricades are very definite warnings and should never be ignored. An additional and inexpensive warning technique is the use of PVC markers on roads prone to flooding which show the depth at which motorists should not attempt passage.

Response

The protection of life and property is the foremost task of emergency responders. A community should respond to hazards with threat recognition, warnings and actions that can prevent or reduce damage and injuries. Typical actions and responding parties in a flooding event include the following:

- Activating the emergency operations center (emergency management);
- Closing streets or bridges (police or public works);
- Shutting off power to threatened areas (utility company);
- Passing out sand and sandbags (public works);
- Ordering an evacuation (governor upon local recommendation);
- Holding children at school/releasing children from school (school district);
- Opening evacuation shelters (Red Cross);
- Activating volunteers to check on/assist vulnerable populations;
- Monitoring water levels (engineering); and
- Security and other protection measures (police).

Additional activities for different types of events include: advertising heating and cooling shelters when extreme temperatures occur; having volunteers check on those needing assistance when there are infrastructure failures; sending vulnerable people (in parks, campgrounds, mobile home parks, shopping malls, and large public or private buildings) to tornado shelters when high winds are predicted; etc.

An emergency action plan ensures that all bases are covered and that response activities are appropriate for the expected threat. These plans can be developed for municipalities, critical facilities, SARA sites, businesses, etc. and should include coordination with all of the agencies, offices, first responders and service providers that are given various responsibilities. Emergency response plans should be updated annually to keep contact names and telephone numbers current and to make sure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and changing conditions. They should also consider the possibility of “mutual aid” and utilize volunteer groups such as Radio Amateur Civil Emergency Services (RACES) and the Medical Reserve Corps (MRC) of Newaygo County. The mission of the MRC is to be the catalyst for trained medical and supportive service volunteers to serve Newaygo County when disasters or emergencies strike. The MRC, consisting of medical, health-related and other professionals, is designed to supplement local emergency plans and resources already in place in Newaygo County.

Newaygo County utilizes and maintains an Emergency Operations Plan to for dealing with existing and potential emergency incidents within Newaygo County. In accordance with Michigan Public Act 390, this plan sets forth the emergency response organizational structure and management system under which Newaygo County will operate. It describes how different government and non-government entities will interact with each other to respond effectively during any disaster or emergency situation. In addition, this plan assigns various emergency objectives and responsibilities

that may need to be performed when circumstances call for response and recovery measures outside the realm of normal operations. Newaygo County's Emergency Operations Plan meets planning guidance established by the Michigan State Police Emergency Management and Homeland Security Division. The introduction, program policy, and basic plan sections are public documents available online and the functional and hazard-specific annexes are secured documents containing checklists, attachments, forms, and guidance to mitigate, prevent, prepare for, respond to, and recover from incidents.

Planning is best done with adequate data. One of the best tools in a flooding event is a flood stage forecast map that shows what areas would be under water at various flood stages. Emergency management staff can identify the number of properties flooded, which roads will be under water, which critical facilities will be affected, etc. With this information, an advanced plan can be prepared that shows problem sites and determines what resources will be needed to respond to the predicted flood level.

A Geographic Information System (GIS) allows for this type of analysis as it works with computerized layers of mapped data. For instance, the locations of buildings can be overlaid with areas of concern for development (topography, infrastructure, land use, zoning, fire service areas, etc.) and areas of concern for flooding (floodplains, hydraulic shadows of dams, etc.). A GIS can model the effects of different levels of flooding and be used for hydrologic monitoring and modeling of the effects of removing/raising bridges over rivers to remove constriction to the flow of floodwater. Newaygo County has a developed GIS program which has been integrated into Newaygo County operations, including Emergency Services.

Protecting critical facilities during a disaster is the responsibility of the facility owner or operator. Some critical facilities have their own emergency response plans. Michigan law requires hospitals, nursing homes, and other public health facilities to develop such plans. Many facilities would benefit from early warning, response planning, and coordination with community response efforts. If critical facilities are not prepared for an emergency and are damaged, workers and resources may be unnecessarily drawn away from other disaster response efforts. If the owner or operator adequately prepares them, the community's emergency response efforts will be better supported.

Recovery and Mitigation

After a disaster, communities should undertake activities to protect public health and safety, facilitate recovery, and help prepare people and property for the next disaster. Throughout the recovery phase, everyone wants to get "back to normal." However, "normal" can't mean the way things were before the disaster or there would again be the same exposure to future disasters. Here are some examples of potential recovery actions:

- Patrolling evacuated areas to prevent looting (police).
- Providing safe drinking water (public works).
- Monitoring for diseases (health department).
- Vaccinating residents for tetanus (health department).
- Clearing streets (road commission).
- Cleaning up debris and garbage (road commission).
- Providing referrals to recovery vendors for post-disaster goods and services (emergency services).

- Regulating reconstruction to ensure that it meets all code requirements (building inspectors).

Requiring permits for building repairs and conducting inspections are vital activities to ensure that damaged structures are safe for people to re-enter and repair. There is a special requirement to do this in identified floodplains, regardless of the type of disaster or cause of damage. The National Flood Insurance Program (NFIP) directs local officials to enforce the substantial damage regulations. These rules require that if the cost to repair a building in the mapped floodplain equals or exceeds 50% of the building's market value, the building must be retrofitted to meet the standards of a new building in the floodplain. In most cases, this means that a substantially damaged building must be elevated above the base flood elevation. This requirement can be very difficult for understaffed and overworked offices after a disaster. If these activities are not carried out properly, not only does the community miss a tremendous opportunity to redevelop or clear out a hazardous area, it may be violating its obligations under the NFIP.

A chance is also available to assess the strength of buildings; the effectiveness of emergency action plans for communities, critical facilities, and businesses; and the readiness of responders. Should efforts be deemed inadequate, improvements can be recommended such as revisions to building codes, increased training for responders, and improvements to existing plans or creation of sample plans.

Reviews of emergency response plans and programs should focus on whether all involved communities had coordinators and liaisons, if all information was provided (flood plain map, critical facilities, etc.), if there were post-disaster procedures for public information, and if adequate warnings were provided. Model business disaster plans can include details on response such as evacuation plans; data protections, security, and recovery; property security; drills; and first-aid training and CPR. They could also include post-disaster mitigation actions such as facilities management, damage assessment, relocation of both services and people, insurance, contractors, list of resources for assistance both public and private, and evaluation, testing and update plans. Reviews of building strengths should be similar to FEMA's, wherein a Building Performance Assessment Team (BPAT) may recommend revisions after a disaster. Other considerations for revisions could include the following.

- Did fire fighters have adequate detection and firefighting equipment?
- Did critical facilities have necessary back-up generators?
- Did electrical distribution systems have built-in redundancies to limit the impact of failures?
- Did the Road Commission have the equipment and personnel to be able to clear the roads?
- Was there a place to store personal property?
- Were there detention areas for debris disposal (snow, ice, branches, power/phone lines, etc.)?
- Were critical facilities protected with lightning rods and surge protection devices?
- Was the Health Department able to monitor threats and take the necessary steps to prevent or limit the scope and magnitude of threats?
- Were emergency responders sufficiently trained and able to communicate?

An assessment of damages is necessary and can be provided by state and federal officials, as is the case in flooding events, or by local emergency responders and emergency staff. Assessments can be facilitated by a GIS, which could detail damages, identify mitigation projects, establish environmental baselines, and monitor changes in land use. FEMA offers courses, free of charge, to emergency staff for evaluation training. In addition to identifying the amount of damage, communities

can acquire substantially or repeatedly damaged properties from willing sellers, plan for long-term mitigation activities, and apply for post-disaster mitigation funds.

Public Education and Awareness

Public education and awareness programs are necessary to periodically inform the public (property owners, renters, businesses and local officials) about the county's hazards, the measures necessary to minimize potential damage and injury, and what actions are being taken. This information is primarily intended to precipitate appropriate actions. Information can be disseminated through the media (newspapers, newsletters, websites, television, radio, etc.) and at public forums and civic meetings. It can be distributed through schools and made available in public buildings or shopping areas. Brochures can be available at libraries and government offices, including building inspection offices. Special populations can be reached through direct mailings, workshops, and seminars. Signage along hazardous areas can also be effective.

Distribution of Existing Information

There is a great deal of information regarding hazards and hazard mitigation available to communities and the public on the national level. Both FEMA and American Red Cross present information on the Internet and in documents and brochures. The NWS makes information available through its "Storm Ready" and "Turn Around Don't Drown" programs, to name just a few.

Insurance companies and non-profit programs have been heavily involved in identifying and responding to hazards. The Institute for Business and Home Safety (IBHS) gives detailed information on how to increase a home, business, or new construction's resistance to disaster through its suite of FORTIFIED programs. The National Fire Protection Association (NFPA) provides information about co-existing with wildfire along with mitigation information through its Firewise Communities program. The NFPA also has information available for homeowners on how to prevent fires. The National Arbor Day Federation provides direction on tree management.

Unfortunately, this information doesn't always reach the intended target audience; whether that audience is communities, the general public, or specific populations. Local efforts can be made to select pertinent information and get it to places and people where it is needed (such as wildfire hazard information to campers). Programs and web sites can be publicized. Brochures can be stockpiled and distributed. This information can be very helpful, although it is not specific to the community.

Distribution of Local Information

In addition to the national-level information discussed above, there is an abundance of information available locally to educate and warn the public of hazards. Local newspapers and television stations frequently update the public on hazards. Newaygo County Emergency Services is an excellent source of information on a variety of topics as varied as the location of shelters or financial assistance in hazard response and mitigation. Local building inspectors can provide advice regarding protection measures, property compliance, and required building permits. District health department reports may also prove to be valuable resources for local hazard information.

Mitigation efforts the county takes to protect its residents, including the creation and adoption of this plan to qualify itself (and local communities which participate in the planning process and adopt the plan) for federal disaster funding, can be publicized. The general public, or eligible target groups, can be notified when financial resources for hazard response and mitigation become available.

Technical Assistance

Communities often have information that can assist homeowners. If they have FEMA's Flood Insurance Rate Maps and Flood Insurance Studies available, they can provide information to residents and can assist them in submitting requests for map amendments and revisions (Letter of Map Revision, or LOMR) when a building is not in the flood plain but a part of the property is. Lenders will notify applicants for federally insured loans if the involved property is in the flood plain and require flood insurance as a condition of the loan.

Local building inspectors can provide advice regarding protection measures, property compliance and required building permits.

The local Emergency Management department can recommend that residents develop Family Emergency Plans, including the preparation of Disaster Supply Kits, identification of emergency telephone numbers, and the preparation of pre-planned escape routes. The county can assist local communities through the provision of local information regarding hazards, risks and protections. For example, a GIS system could lay out the location of homes in floodplains so that mitigation measures can be considered. It can also assist communities in the development of the plans identified in this document by researching and providing model plans to them.

POTENTIAL HAZARD MITIGATION ACTIONS

The previous chapter identified a multitude of alternatives for addressing hazard concerns; some of which may not be economically feasible or appropriate for a county with limited financial and professional resources, such as Newaygo. In addition, many of Newaygo County's top hazards are natural and weather-related and cannot be easily mitigated. Nothing can be done to eliminate severe winds or snow/ice/sleet storms or to alter their frequency, intensity or spatial distribution across the landscape. Mitigation actions associated with natural hazards must focus on limiting the impacts on the populations or structures that are being affected. For instance, power failures caused by severe winds and snow/sleet/ice storms can be reduced by several mitigation activities and the impacts on residents and properties from the power failures can be alleviated.

The potential actions in this section are presented because they may potentially help to save lives and protect communities and important agencies, rather than because they are considered pure "mitigation actions" distinct from other types of emergency management actions. However, in the final selection of strategies for any hazard mitigation plan, care should be taken to ensure the inclusion of at least some strategies that are clearly hazard mitigation. That is, a true hazard mitigation strategy is an effort to prevent hazard impacts, or to take advance, proactive steps toward the long-term reduction of the impacts of hazards on a community. If some of these take place during the response or recovery phases of a disaster, or happen to also increase an agency's preparedness, the existence of such overlap is primarily of academic interest so long as the community's safety is being served. On occasion, specific criteria for hazard mitigation must be met to satisfy the requirements of a given grant. Thus it is useful to be aware of both the distinctions and the overlap between hazard mitigation and other types of emergency management activities.

Identification of a possible mitigation measure does not necessarily mean that it can or even should be implemented. Implementation (and the desirability) of a mitigation measure is highly dependent on a number of factors – environmental, social, economic and political. Just because a measure may reduce or eliminate the effects of a hazard does not necessarily mean that it should be implemented. There may be extenuating factors or circumstances that could (or even should) preclude its implementation. Those decisions will be made in the local and state political arenas and in the land use / land development decision-making processes. Typically, mitigation measures will be implemented if they are able to balance environmental, social, economic and political factors, and are cost-effective. It does not make sense to implement a measure that will not be supported by state and/or local officials and the citizenry, or that cannot be economically justified. Although implementability cannot (and should not) always be the final litmus test for a potential mitigation measure, it certainly should be considered when identifying and developing measures. In general, those mitigation opportunities that could not pass this basic litmus test have been excluded from this plan.

The following potential actions are presented according to the county's hazard mitigation Goals and

Objectives. For each goal, there are several objectives; and under each objective, there are several potential action items. These potential action items are “snapshots” of some of the alternatives discussed in the previous chapter. From this set of potential actions, the highest priority action items are selected and presented as a “Recommended Action Agenda” in the Plan Implementation chapter.

For the updated edition of this plan, many of the potential action items remain the same. A few action items were added or removed, and other minor revisions were made to improve the readability of the action items. Care was taken to ensure that there are numerous potential action items presented to address each of the county’s top priority hazards.

Goal 1.
Protect public health and safety.

Objective 1.1 Assure that threat recognition (watches) and warning systems are adequate and appropriate and that they utilize the latest technology.

Potential Action Items:

- 1) Regularly evaluate the effectiveness of the public warning system including the threat detection process, management system, communications links, and methods of dissemination. Evaluation should consider warning for slow onset as well as short onset hazards, new technologies, public views of the warning system and the effect this has on response to warnings, disseminating warnings to people with “special needs,” redundancies, and effective methods of risk communication.
- 2) Implement improvements to the warning system as deemed necessary for improving coverage and effectiveness.
- 3) Maintain a description of the public warning process and coordinate actions in a section of the Newaygo County Emergency Operations Plan (EOP).
- 4) Increase the coverage and use of NOAA All-Hazards radios and weather alert systems (Emergency Alert Radio System, etc.) to people and communities in need.
- 5) Encourage the MDNR, U. S. Geological Survey, National Weather Service, and U. S. Army Corps of Engineers to continue to operate and monitor stream gauging stations and groundwater monitoring wells and consider whether the exposure to flooding on smaller rivers and streams warrants additional Advanced Hydrologic Prediction Services (AHPS) or local rain and stream gauging and flood threat recognition systems.
- 6) Maintain adequate monitoring and surveillance capabilities by the District Health Department to monitor public health threats and take the necessary steps to prevent or limit the scope and magnitude of threats.
- 7) Utilize the NWS “Turn Around Don’t Drown” system to warn motorists and pedestrians to not enter or cross flooded areas, and install PVC markers alongside roads to illustrate dangerous water levels.

Objective 1.2 Protect infrastructure and services.

Potential Action Items:

- 8) Encourage electrical utilities to place power lines underground wherever possible, but especially when upgrading lines or running power to new developments.
- 9) Recommend design of the electrical distribution system with built-in redundancies such that isolated failures do not lead to wide scale outages; recommend consideration of back-up generators powered with wind, sun, gasoline, or natural gas; and assess and improve, electric service system reliability as needed.
- 10) Install back-up generators, as needed for short-term relief from power failures, at critical facilities such as sewage pump stations, municipal wells, municipal buildings, road commissions, hospitals and medical centers, nursing home facilities, schools, and shelters.
- 11) Bury water/sewer lines below the frost line or insulate and maintain lines to protect against ground freeze.
- 12) Establish safe and appropriate locations for temporary debris disposal sites.
- 13) Assure the county has adequate personnel and equipment (road barriers, sand bags, portable lighting, snow plows, etc.) to respond to widespread weather events.
- 14) Continue to refine state, county and local road, bridge and culvert maintenance / vegetation management programs to maintain visibilities, provide for living snow fences, reduce erosion, slow stormwater runoff, and maintain the structural integrity of transportation infrastructure.

Objective 1.3 Build and support local capacity, commitment and partnerships to continuously become less vulnerable to hazards.

Potential Action Items:

- 15) Explore funding options for a Hazard Mitigation Coordinator position, either on a county or regional level, to facilitate the actions contained in this plan.
- 16) Develop and review coordinated response plans and programs across service providers, agencies and local governments, and assure both mutual aid and the ability to communicate during emergencies.
- 17) Refer emergency responders and emergency staff to FEMA and MSP/EMHSD training for conducting Damage Assessments and determining "Substantial Damage" for an efficient and accurate assessment of building damages.
- 18) Design and plan for water supply infrastructure systems that include a consideration of, and are more resistant to, drought events.
- 19) Continue to maintain, and acquire as necessary, firefighting and rescue equipment; including dry fire hydrants in rural areas and specialized equipment for water and ice rescue, limited access areas, and snow-blocked areas.

- 20) Construct and/or designate storm shelters/tornado shelters in parks, campgrounds, mobile home parks, and developments that do not have shelters. Consider retrofitting existing or constructing public buildings, industrial sites, and other large businesses or complexes to include shelters.
- 21) Coordinate with the Newaygo Conservation District, local watershed councils, and lake improvement boards to maintain healthy, free-flowing watercourses with minimal erosion and sedimentation, and to restore / preserve wetlands.
- 22) Adopt the recommendations and strategies of the "Firewise" program, which include encouraging all residents living in the wildland/urban interface area to become acquainted with Firewise mitigation strategies to protect their property from wildfire hazards and recommending to production companies and land owners that they employ Firewise principles of proper grounds maintenance, equipment storage, vegetation clearance, and other techniques.
- 23) Meet the criteria to become a NWS-approved "Storm Ready" community.

Objective 1.4 Enlist support of committed volunteers to safeguard the community before, during, and after a disaster.

Potential Action Items:

- 24) Utilize volunteer communication networks by amateur radio operators (RACES) to facilitate communication during emergencies.
- 25) Designate amateur radio operators to relay information on "immediately dangerous" weather situations and storm damage reports to the NWS, Central Dispatch, and/or Emergency Management.
- 26) Coordinate with local volunteer organizations such as Newaygo County Community Services' Medical Reserve Corps and local amateur radio operator groups to supplement local emergency plans; aid emergency responders; and also to address the needs of elderly, disabled, homebound, and other special-needs groups during and after severe weather conditions.
- 27) Utilize NWS-trained weather spotters to watch for developing storms, take flood water measurements, and monitor stream conditions.
- 28) Conduct an annual "clean-up" program when trash, limbs, barrels, shopping carts and other potential blockages are removed from drainage culverts, channels and adjacent lands.

Goal 2.
Protect existing and new properties.

Objective 2.1 Use the most cost-effective approaches to protect existing buildings and facilities from hazards.

Potential Action Items:

- 29) Assess the capacity of storm water systems to handle both storm waters and high water tables and make necessary improvements and expansions to assure the protection of property and infrastructure.
- 30) Raise or relocate buildings above the 100-year flood level, and/or acquire properties in flood and high-risk erosion areas for demolition and re-use of the land as open space.
- 31) Identify structural projects to channel water away from people and property (e.g. berms, dikes, levees, or floodwalls), or to improve drainage capabilities (e.g. culvert improvements, bridge modifications, spillways, relief drains, or floodgates).
- 32) Identify environmental restoration projects to lessen the impacts of flooding and improve water quality and wildlife habitat, such as erosion control techniques (streambank modification), dredging / clearance of sediment and debris from drainage channels, and protection / restoration of wetlands and natural water retention areas.
- 33) Employ Firewise principles of proper grounds maintenance, equipment storage, vegetation clearance, and other techniques.
- 34) Create firebreaks, wherein brush and other fuel is cleared away, in wildland areas.
- 35) Maintain the Newaygo County Community Wildfire Protection Plan (CWPP), and work to implement its recommendations.

Objective 2.2 Use the most cost-effective approaches to protect existing buildings and facilities from hazards.

Potential Action Items:

- 36) Encourage property owners and public facility operators to increase their property's resilience and resistance to hazards.
- 37) Adopt and enforce the Michigan Rehabilitation Code to hold repaired buildings to higher standards for protection against natural hazards, similar to the standards for newly constructed buildings.
- 38) Utilize mandates for upgrading homes, such as requiring upgraded electrical work for substantial rehabilitation of existing properties or for issuing "Fill Your Basement With Water" orders.
- 39) Review the energy efficiency, winter readiness, and electrical protection of critical facilities and government buildings in the community and consider replacing aged facilities and equipment.

- 40) Install lightning protection devices on the community's communications infrastructure and appropriate public facilities; and lightning grade surge protection devices on critical electronic components used by government, public service, and public safety facilities.

Objective 2.3 Maximize insurance coverage to provide financial protection against hazard events.

Potential Action Items:

- 41) Assure insurance coverage on properties and obtain additional insurance coverage as appropriate (sump pump failure, sewer back-up, wildfire, dam failure, etc.).
- 42) Encourage and assist municipalities that are at risk to flooding, or that have been exposed to flooding in the past, to join the National Flood Insurance Program (NFIP) so that residents can obtain flood insurance.
- 43) Encourage NFIP-participant municipalities to join the NFIP's Community Rating System (CRS), implement the CRS minimum standards, and implement additional flood loss reduction activities to reduce the cost of NFIP flood insurance.
- 44) Inventory critical facilities and assure proper insurance coverage, both type and amount, including deductibles and policy limits. Evaluate self-insurance coverage in light of its expense and NFIP policies.

Objective 2.4 Maximize the resources for investment in hazard mitigation, including the use of outside sources of funding.

Potential Action Items:

- 45) Utilize federal programs; such as but not limited to FEMA's Pre-Disaster Mitigation Program, Flood Mitigation Assistance Program, and Hazard Mitigation Grant Program; to address community needs for hazard mitigation.
- 46) Utilize, and assist those with special needs to utilize, available programs for assistance with home repairs, weatherization, and heating costs to address hazards for persons and properties.
- 47) Establish a voluntary floodway property acquisition and land re-use program, with corresponding changes in zoning, and purchase/transfer of development rights for properties.
- 48) Assess the need for and use of state and federal funding and technical assistance for dam / spillway repairs.
- 49) Investigate the availability of resources and need for creating firebreaks and the availability of resources for acquiring land as necessary to achieve continuity of needed firebreak areas.

Goal 3.***Promote growth in a sustainable, hazard-free manner.*****Objective 3.1 Incorporate hazard provisions in building code standards, ordinances, and procedures.**

Potential Action Items:

- 50) Review local building codes to determine if revisions are needed to improve structural ability to withstand greater wind velocities, snow weight, ice, and hail; to provide better protection against structural fires; and to provide better protection to occupants against extreme temperatures.
- 51) Contact Insurance Services Office (ISO) to request a copy of the community's Building Code Effectiveness Grading Scale (BCEGS), and work to improve the BCEGS rating through improvements to building codes and enforcement.
- 52) Utilize the Institute for Business and Home Safety (IBHS) guidelines provided through the "FORTIFIED" programs to guard new and existing structures against hazards, and consider incorporating them into existing codes.
- 53) Review code requirements for the installation of mobile homes and manufactured homes to assure protection against severe winds and tornadoes.
- 54) Assess the need to strengthen anchoring requirements for propane tanks and hazardous materials in the floodplain/floodway.
- 55) Assure proper location, installation, cleaning and maintenance of septic tanks, particularly in the floodplain/floodway and around lakes.

Objective 3.2 Incorporate hazard mitigation into land use and capital improvement planning and development activities.

Potential Action Items:

- 56) Incorporate mitigation provisions into comprehensive plans and land use plans; such as identification of acceptable land uses and densities based on consideration of flood-prone areas, soil types, topography, and etc.
- 57) Integrate hazard mitigation into the capital improvement planning process so that public infrastructure does not lead to development in hazard areas and so that possible set-asides for planned and engineered structural projects (berms, levees, floodwalls, detention and retention ponds, debris storage areas, culvert replacement, etc.) are considered.

Objective 3.3 Incorporate hazard mitigation into existing land use regulation mechanisms to ensure that development will not put people in danger or increase threats to existing properties.

Potential Action Items:

- 58) Incorporate hazard mitigation provisions and recommendations into local zoning ordinances and resolutions as they restrict or direct development; with consideration given to dams, floodplains, soil type and topography; and as they allow flexibility in lot sizes and locations, such as in Planned Unit Developments (PUD).
- 59) Enforce the existing Michigan Drain Code requirement for “set-back” from the drain channel, thereby assuring proper carrying capacity of the drain.
- 60) Enforce Michigan’s Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act, regarding earth changes affecting an acre or more or within 500’ of a lake or stream, and consider adopting and enforcing more stringent local regulations.
- 61) Enforce Michigan’s Land Division Act as it furthers the orderly layout and use of land, provides for proper ingress and egress to lots and parcels, controls residential building development within floodplain areas, provides for reserving easements for utilities, and governs internal drainage.
- 62) Consider regulation of development in the hydraulic shadows of dams (where flooding would occur if there was a severe dam failure).

Objective 3.4 Research, recommend, adopt and enforce other plans and ordinances that protect natural resources so that they can, in turn, provide hazard protection.

Potential Action Items:

- 63) Develop a Stormwater Management Plan to identify best management practices (BMP’s), and to assess the efficacy of local stormwater ordinances and rules.
- 64) Develop, adopt, and enforce a Nuisance Ordinance to prevent dumping “objectionable” solid matter into channels and wetlands and Waterway Dumping Regulations to prevent dumping “non-objectionable” waste.
- 65) Develop and enact a Community Forestry Program to reduce the damage potential of trees by addressing proper tree care prior to a storm (pruning, maintenance, removal, and replacement) by communities and property owners and by managing trees before, during, and after a storm.
- 66) Develop policies or ordinances aimed at mitigating the impacts of drought conditions, such as: the promotion of planting crops tolerant of low moisture levels; partner with programs that promote soil health and monitor and preserve soil moisture; and prioritize or control water use during drought conditions.

Goal 4.***Increase public understanding, support, and participation in hazard mitigation.***

Objective 4.1 **Heighten public awareness of the full range of existing natural and man-made hazards and actions they can take to prevent or reduce the risk to life or property from them.**

Potential Action Items:

- 67) Obtain and distribute available information on hazards and cost-effective mitigation actions individuals can implement (for example, Firewise pamphlets), and post-disaster repair and cleanup guidance.
- 68) Produce and distribute local emergency preparedness and safety information to the general public and/or targeted groups (seasonal populations, floodplain residents, developers and builders, farm owners and operators, decision makers, Spanish speaking, etc.). Include local resources for information such as fire stations, local radio stations and utilities.
- 69) Produce and distribute information on mitigation measures the county is taking/will take, as identified in this hazard mitigation plan, to local units of government and encourage them to participate in the plan and take mitigation actions.
- 70) Encourage residents to develop a Family Emergency Preparedness Plan; including the preparation of a Disaster Supply Kit, the posting of emergency telephone numbers, and pre-planned escape routes.
- 71) Promote public awareness on fire hazards such as recreational fires (especially in resort/vacation home areas), smoking, fireworks, campfires, wood stoves, and outdoor burning; and support safe disposal of yard and house waste rather than open burning.
- 72) Research availability of local and Michigan-based recovery “vendors” for post-disaster goods and services (e.g., cleaning, drying, pumps, repairs, construction supplies, portable refrigeration units, disaster recovery experts) to support disaster recovery efforts.
- 73) Identify and advertise a list of available heated and cooled shelters to the elderly and other special populations who may be at risk to extreme temperature events.
- 74) Provide local units of government and builders with information and guidance on methods of protecting new construction from wind damage. Encourage builders and contractors to design wind resistance into the construction of new homes and major home renovation projects.
- 75) Through coordination with the District Health Department, increase public awareness of the causes, symptoms and protective actions for disease outbreaks and other potential public health emergencies.

Objective 4.2 Encourage local communities, agencies, organizations and businesses to participate in the hazard mitigation process.**Potential Action Items:**

- 76) Participate in programs such as NFIP, CRS, Firewise, Tree City USA, StormReady, etc. and respond to concerns regarding program requirements and obstacles to participation.
- 77) Develop model hazard mitigation and contingency plans and regulations (such as stormwater ordinance, nuisance ordinance, waterway dumping regulations, community forestry program, drought plan and ordinance, etc.) and provide them to interested communities.
- 78) Develop model business and critical facility disaster plans that include details on disaster response (evacuation plans; data protection, security, and recovery; property security; drills; first-aid training and CPR; and post disaster mitigation actions), facilities management, damage assessment, relocation of both services and people, insurance, contractors, list of resources for assistance, and evaluation, testing, and updating plans. Inform business owners about available disaster-recovery training programs.
- 79) Notify communities of hazard mitigation funds, as they become available, and assist them in applying for funds.
- 80) Encourage meetings between utility providers and local Public Works and Road Commission Departments to determine the resources and funding required to mitigate recurring infrastructure failures.
- 81) Support agricultural programs that promote soil health, preserve soil moisture, and monitor soil moisture levels to help to minimize loss of crops and topsoil during drought conditions and promote educational programming relating to water conservation, especially in irrigation and farming, during periods of drought.

Objective 4.3 Encourage cooperation and communication between planning and emergency management officials.**Potential Action Items:**

- 82) Assist Newaygo County Emergency Services in its activities related to developing and continually revising Emergency Operations Plan (EOP) detailing coordinated response plans of emergency responders.
- 83) Strengthen the role of the LEPT in the land development process, with input into land use plans, comprehensive plans, and zoning ordinances.
- 84) Utilize the County Geographic Information System (GIS) capabilities to support pre-disaster planning (such as flood stage forecast maps, and maps showing the locations of secluded, gated, and seasonal homes), disaster response, and post-disaster recovery activities.
- 85) Coordinate with American Red Cross to ensure the county-wide availability of designated and accessible emergency shelters and assure facilities are inspected, certified, and have back-up power.

CRITERIA TO SELECT AND PRIORITIZE ACTION ITEMS

The selection of appropriate evaluation criteria is intended to ensure that the recommended implementation action items reflect the values, policies, and desires of the community; and to communicate to governing officials which measures are the most meritorious and desirable.

Local input and planning principles were used to select action items for implementation from the list of potential actions presented in the previous chapter. Common mitigation criteria helped guide the selection process, and included evaluation of each action item's *economic justifiability*, *technical feasibility*, *social equitability*, and *environmental soundness*. If, for example, relocation of a structure is proposed, the following conditions must be met in order to satisfy the criteria:

- The cost of relocation must be less than the cost of the repetitive repairs that would be necessary (along with other costs from displacement, loss of services, etc.) if there were no relocation.
- The structures must be able to be moved from their present location to a suitable site.
- The relocation must be acceptable to those who are to participate.
- The relocation must be affordable to all it affects, and not discriminate against those who are unable to bear the cost of either moving the structure, or finding comparable housing.
- In the case of a public facility, such as a fire station, the relocation should not result in an inequitable distribution of fire protection services.
- The project must meet appropriate environmental regulations, and not cause any adverse effects.

Additional considerations used in selecting action items for implementation included: 1) ensuring an appropriate number of mitigation actions be selected to address each of the county's top-priority hazards; and 2) ensuring that an appropriate number of measures be selected to accomplish each of the four hazard mitigation goals established by this plan. Bonus consideration was given to action items that also addressed the goals of other community planning initiatives, and action items that provide clear and obvious solutions for hazard mitigation.

The next chapter presents a schedule of recommended action items for implementation. For each measure, the plan identifies basic details needed in order for it to be accomplished, including who will take the action and when it will be taken. Possible sources of technical or financial assistance are matched to the actions as well.

In some cases, a local government may be able to implement an action, while the county can only make recommendations. Therefore applicability of each action item is assigned to the appropriate governments in a table on the last page. As a result, objectives will work on multiple scales and can be overseen by several governments. The benefits of combining all of the objectives into one plan include: the ability to recognize contradictions in policy more easily; the ability to cooperate in shared objectives; the ability to eliminate or reduce redundancy in efforts; and the fact that local governments will have a local-level plan for adoption and implementation, qualifying those governments for hazard mitigation funding.

PLAN IMPLEMENTATION

The previous edition of this hazard mitigation plan included 15 action items that were recommended for implementation and then assigned to the appropriate jurisdictions within Newaygo County. This chapter contains a review of the 2007 Action Agenda, as well as a revised Action Agenda for this updated edition.

Review of Hazard Mitigation Progress

To identify any mitigation progress that had been made on the 2007 Action Agenda, discussions were held with county officials and the LEPT / Advisory Team. A questionnaire was also sent to Newaygo County Emergency Services, LEPT / Advisory Team members, and the chief elected official of each township that had adopted the 2007 plan. The questionnaire listed the 2007 Action Agenda, along with a place for the respondent to identify whether each item on the agenda was *Complete, Ongoing or In-Progress, Action Pending, or Incomplete* within his or her jurisdiction. If a particular action item was incomplete, the respondent was encouraged to explain why. This review process revealed the following:

- 1) At least some progress has been made on most of the action items.
- 2) Many inherited items on the Action Agenda remained priorities as of the time this plan was updated.
- 3) 2006 action items #38 (involving CRS participation) and #71 (participation in special programs) are no longer considered priority action items and will not be included on the revised Action Agenda.

Questionnaire respondents included Brooks and Goodwell townships, Newaygo County Emergency Services, and District Health Department #10. At least some progress was reported for 13 out of the 15 items on the Action Agenda. The results of the questionnaire exercise are compiled into the following table, which summarizes the status of items on the 2007 Action Agenda and reports any additional comments or information gleaned from the questionnaire.

**2007 Action Agenda
STATUS REPORT**

2007 Action Items	Status as of 2014				Comments
	Complete	Ongoing or In-Progress	Pending	Incomplete or Unknown	
#10. Install back-up generators, as needed for short-term relief from power failures, at critical facilities such as sewage pump stations, municipal wells, municipal buildings, road commissions, hospitals and medical centers, nursing home facilities, schools, and shelters.		✓		✓	Brooks Twp – Applied for “Risk Reduction” grant from Michigan Township Participating Plan (PAR Plan) in fall 2013, but did not receive grant.
#13. Continue and refine State, County, and local road maintenance programs (including management of bridges and vegetation), assure that road commissions have adequate equipment (including road barriers, sand bags, portable lighting, etc.) to respond to widespread weather events, and promote living snow fences beside highways and other roads to decrease snow on roads (focusing on residential developments with limited road access).				X	Newaygo Co. Em. Services – Unsure / unaware. Brooks Twp – These activities are handled by the Newaygo County Road Commission.
#18. Obtain extra fire fighting and rescue equipment; including dry fire hydrants in rural areas and specialized equipment for water and ice rescue, limited access areas (such as urban/forest intermix areas), and snow-blocked areas.		✓			Brooks Twp – Newaygo Fire District member, along with Newaygo City and Garfield Twp. Each provides funding for personnel, equipment and supplies. Special equipment owned by the district includes 4-wheel drive limited access response vehicle, water rescue boat, rescue basket, ice water suits, and multi-purpose wildfire helmets.
#19. Construct and/or designate storm shelters/tornado shelters in parks, campgrounds, mobile home parks, and communities that do not have shelters. Consider retrofitting existing or constructing public buildings, industrial sites and other large businesses or complexes (such as strip malls, fairgrounds, and other vulnerable public areas) to include shelters.		✓			Newaygo Co. Em. Services – Worked with local municipal and public campgrounds to develop campground emergency plans including designated storm shelters, notification methods, and evacuation routes. Brooks Twp – Township Hall is a designated shelter as defined in the agreement between the township and the Red Cross.
#31. Maximize the participation of property owners in protecting their properties from natural hazards.		✓			Newaygo Co. Em. Services – Newaygo County has an active Firewise project within identified Community Wildfire Protection Areas and works directly with homeowners to promote ways to floodproof homes along the Muskegon River.
#37. Encourage municipalities to join the National Flood Insurance Program (NFIP) so that residents can obtain flood insurance.			✓		Newaygo Co. Em. Services – Newaygo County’s revised Flood Inundation Maps will be approved in 2015. During the current review process, no jurisdictions can request to be added to the NFIP until the new maps are approved. Brooks Twp – We provide information on the township’s website about the NFIP and flood conditions, and keep record of all building elevation certificates received at the township.
#38. Encourage municipalities to join the NFIP’s Community Rating System (CRS), implement the CRS minimum standards, and implement additional flood loss reduction activities (such as the adoption of this plan) to reduce the cost of NFIP flood insurance.	✓		✓		Newaygo Co. Em. Services – Brooks Township is a part of the CRS. Further action is pending map revisions. See above for additional comments. Brooks Twp – We stay current on CRS minimum standards through review of bulletins issues to reduce the cost of flood insurance.
#40. Utilize federal programs; such as but not limited to FEMA’s Pre-Disaster Mitigation Program, Flood Mitigation Assistance Program, and Hazard Mitigation Program; to address community needs for hazard mitigation.		✓			Newaygo Co. Em. Services – A number of townships will be seeking assistance following the completion of this plan update. Bridgeton Twp – FMA plan adopted in 2008.
#46. Encourage participation in ISO’s Building Code Effectiveness Grading Schedule (BCEGS), as recognized by FEMA for the Community Rating System of the NFIP.				X	
#51. Incorporate mitigation provisions into comprehensive plans and land use plans, especially as they address open space preservation and development restrictions (particularly in flood plains and the hydraulic shadows of dams).	✓				Brooks Twp – The township’s Master Plan, updated in 2013, addresses the need for open space preservation and development restrictions.

#53. Incorporate hazard mitigation provisions and recommendations into local zoning ordinances as they restrict or direct development; with consideration given to dams, flood plains, soil type and topography; and as they allow flexibility in lot sizes and locations, such as in Planned Unit Developments (PUD).	✓				Brooks Twp – The township’s Zoning Ordinance contains regulations for land use and structures that are within the various zoning districts. Building setbacks vary depending upon whether the structures are near a water body and topographical factors are also addressed. The township is currently in the process of establishing a PUD for a development on Petit Lake.
#62. Distribute already produced information on hazards and cost-effective mitigation actions individuals can implement to county residents and/or targeted groups most likely to experience significant impacts due to natural hazards, including the actions identified in Objective 2.2.		✓			Newaygo Co. Em. Services – Newaygo County Emergency Services does this on a regular basis for targeted populations living in the floodplain along the Muskegon River and in identified Community Wildfire Protection Areas. Brooks Twp – The township posts information from FEMA and the county about flood hazard mitigation on its website.
#63. Produce and distribute local emergency preparedness and safety information concerning all natural hazards to the general public and/or targeted groups (seasonal populations, floodplain residents, developers and builders, farm owners and operators, decision makers, Spanish speaking, etc.), as described in Objective 2.2. Include local resources for hazard information such as fire stations and local radio call numbers.		✓			Newaygo Co. Em. Services – Newaygo County Emergency Services utilizes the Newaygo County Community Emergency Response Team and Medical Reserve Corps to distribute preparedness and safety information to the public during special events such as Newaygo County Kids Day, Gerber Babyfood Festival, Community Health and Safety Day, etc. Brooks Twp – Lack of resources.
#71. Assist local communities in participating in programs mentioned in Objectives 1.1, 1.4, and 2.3 (NFIP, CRS, Firewise Communities/USA, Tree City USA, BCEGS, Fortified...for safer living, Storm Ready, TADD, etc.) and assess and respond to concerns regarding program requirements and obstacles to participation.		✓			
#80. Coordinate with American Red Cross to ensure the countywide availability and public awareness of designated and accessible emergency shelters; with consideration given to the seasonal populations in homes, cabins and mobile homes without basements; and assure facilities are inspected, certified, and have back-up power.	✓				Newaygo Co. Em. Services – Identified within the Newaygo County Emergency Operations Plan. Brooks Twp – The township hall is a designated American Red Cross Shelter.

Revised Action Agenda

The action items highlighted in this section were selected from the list of potential hazard mitigation actions presented in the chapter entitled “Potential Hazard Mitigation Actions” and are presented below as the Action Agenda 2015-2019. The selection process was guided by criteria described in the chapter entitled “Evaluation Criteria to Select and Prioritize Action Items.” All items on this revised Action Agenda are considered to be of the highest priority. Implementation of these action items may be appropriate on the county level and / or the local level. The “List of Hazard Mitigation Actions Applicable to Governmental Units” at the end of the chapter assigns action items to appropriate jurisdictions within Newaygo County. Each action item includes the following information to help facilitate implementation:

Priority Level

All identified action items are considered priorities within this Hazard Mitigation Plan. In order to help structure implementation of the Plan, a further prioritization of high, medium, or low is assigned to each measure. This is intended to convey a sense of importance relative to the other action items from a countywide perspective.

Timeframe

Generally identifies when an action item might begin. Where appropriate, prerequisite activities are discussed.

Applicable Governmental Unit(s) / Responsible Person (s)

Identifies key players for initiating and implementing each action. Often the work will be shared by a number of individuals and agencies.

Potential Technical / Financial Assistance

Identifies common sources of technical and financial assistance. In many cases, identified parties will provide referrals to currently available or specialized assistance and / or guidance. Detail provided is not intended to be exhaustive because opportunities for assistance may come and go; such as following a disaster declaration. **Refer to the Michigan Hazard Mitigation Plan MSP/EMHSD Pub. 106 for a detailed listing of potential federal and state funding sources for hazard-specific measures.**

Comments

Additional details or helpful information about the action item. This feature was added for the revised edition of this plan.

ACTION AGENDA 2015-2019

Action Item 1. Regularly evaluate the effectiveness of the public warning system including the threat detection process, management system, communications links, and methods of dissemination. Evaluation should consider warning for slow onset as well as short onset hazards, new technologies, public views of the warning system and the effect this has on response to warnings, disseminating warnings to people with “special needs,” redundancies, and effective methods of risk communication.

Priority Level: High

Timeframe: Annually

Applicable Governmental Unit(s)/Responsible Person(s):

Newaygo County Emergency Services (NCES); Newaygo County 911 Central Dispatch.

Potential Technical/Financial Assistance Sources:

Local resources.

Comments:

Protecting public health and safety is one of the four main goals of this plan. Maintaining an effective and reliable public warning system is one of the best ways to accomplish that goal. This action item is new for the 2014 Action Agenda.

Action Item 10. Install back-up generators, as needed for short-term relief from power failures, at critical facilities such as sewage pump stations, municipal wells, municipal buildings, road commissions, hospitals and medical centers, nursing home facilities, schools, and shelters.

Priority Level: High

Timeframe: 2015; or as funding becomes available

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Critical facility managers.

Potential Technical/Financial Assistance Sources:

MI State Police-Emergency Management Homeland Security Division (MSP-EMHSD).

Comments:

Though many facilities in Newaygo County have generators, some remain in need of backup power. To help accomplish this action item, NCES might consider conducting an inventory of critical facilities that need a generator.

Action Item 14. Continue to refine state, county and local road, bridge and culvert maintenance / vegetation management programs to maintain visibilities, provide for living snow fences, reduce erosion, slow stormwater runoff, and maintain the structural integrity of transportation infrastructure.

Priority Level: Medium

Timeframe: Ongoing

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Newaygo County Road Commission.

Potential Technical/Financial Assistance Sources:

MDOT; Newaygo Conservation District.

Comments:

NCES should work through the Newaygo County LEPT to identify opportunities to incorporate hazard mitigation provisions into management programs to protect new and existing infrastructure and enhance public safety.

Action Item 19. Continue to maintain, and acquire as necessary, firefighting and rescue equipment; including dry fire hydrants in rural areas and specialized equipment for water and ice rescue, limited access areas (such as urban/forest intermix areas), and snow-blocked areas.

Priority Level: High

Timeframe: Annually

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Local fire departments.

Potential Technical/Financial Assistance Sources:

MSP-EMHSD; Homeland Security Grant Program (HSGP).

Comments:

Improving the capabilities of first responders will provide a way to lessen or perhaps shorten the duration of a disaster's impacts.

Action Item 20. Construct and/or designate storm shelters/tornado shelters in parks, campgrounds, mobile home parks, and developments that do not have shelters. Consider retrofitting existing or constructing public buildings, industrial sites and other large businesses or complexes (such as strip malls, fairgrounds, and other vulnerable public areas) to include shelters.

Priority Level: Low

Timeframe: 2015

Applicable Governmental Unit(s)/Responsible Person(s):

NCES.

Potential Technical/Financial Assistance Sources:

MSP-EMHSD; American Red Cross.

Comments:

Steps have been taken by NCES to make sure that public and private campgrounds have emergency plans in place (including designated shelters). This action item remains a priority for Newaygo County.

Action Item 31. Identify structural projects to channel water away from people and property (e.g. berms, dikes, levees, or floodwalls), or to improve drainage capabilities (e.g. culvert improvements, bridge modifications, spillways, relief drains, or floodgates).

Priority Level: Medium

Timeframe: 2016

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Newaygo County Road Commission; Newaygo County Drain Commission.

Potential Technical/Financial Assistance Sources:

MSP-EMHSD.

Comments:

This plan identifies Flooding as the #1 hazard in Newaygo County. Structural projects should be considered to protect existing structures and infrastructure from this hazard. This action item is new for the 2014 Action Agenda.

Action Item 35. Maintain the Newaygo County Community Wildfire Protection Plan (CWPP), and work to implement its recommendations.

Priority Level: Medium

Timeframe: Review CWPP annually; Implement CWPP Action Plan as funding allows

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Local fire departments; Townships located within the CWPP-identified wildland-urban interface (WUI): Big Prairie, Brooks, Croton, Everett, Lilley, and Merrill.

Potential Technical/Financial Assistance Sources:

USDA-Forest Service; Michigan DNR; MSU Extension.

Comments:

The Newaygo County CWPP is due for a 5-year update in 2015. This action item is new for the 2014 Action Agenda.

Action Item 36. Encourage property owners and public facility operators to increase their property's resilience and resistance to hazards.

Priority Level: Low

Timeframe: Following adoption of this plan

Applicable Governmental Unit(s)/Responsible Person(s):

County building inspectors; Local elected officials; Local zoning officials.

Potential Technical/Financial Assistance Sources:

MSP-EMHSD; NCES.

Comments:

Hazard mitigation concepts and strategies will be incorporated into the day-to-day activities of elected officials, zoning officials, and building inspectors; especially those activities that involve interaction with local land owners and facility operators. Local officials should refer to the Hazard Mitigation Alternatives chapter for information about potential mitigation strategies. Examples include the promotion of Firewise principles for property maintenance, and the proper anchoring of objects located within floodplain areas.

Action Item 42. Encourage and assist municipalities that are at risk to flooding, or that have been exposed to flooding in the past, to join the National Flood Insurance Program (NFIP) so that residents can obtain flood insurance.

Priority Level: Medium

Timeframe: 2015

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Municipalities that currently do not participate in the NFIP: City of Grant, and townships of Barton, Beaver, Big Prairie, Dayton, Denver, Everett, Goodwell, Grant, Home, Lilley, Merrill, Monroe, Norwich, Sheridan and Troy.

Potential Technical/Financial Assistance Sources:

MSP-EMHSD; MDEQ NFIP Coordinator.

Comments:

All municipalities are eligible to participate in the program, so long as the minimum requirements are met. NFIP flood insurance can only be acquired in communities that participate in the program.

Action Item 45. Utilize federal programs; such as but not limited to FEMA's Pre-Disaster Mitigation Program, Flood Mitigation Assistance Program, and Hazard Mitigation Program; to address community needs for hazard mitigation.

Priority Level: High

Timeframe: As funding becomes available, especially following a disaster declaration

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Local units of government that adopt this Hazard Mitigation Plan.

Potential Technical/Financial Assistance Sources:

Federal Emergency Management Agency (FEMA); MSP-EMHSD.

Comments:

HMGP funding opportunities are made available following a disaster declaration. Annual funding opportunities may be made available through the PDM and FMA programs, which are nationally competitive.

Action Item 51. Contact Insurance Services Office (ISO) to request a copy of the community's Building Code Effectiveness Grading Scale (BCEGS), and work to improve the BCEGS rating through improvements to building codes and enforcement.

Priority Level: Low

Timeframe: 2015-2016

Applicable Governmental Unit(s)/Responsible Person(s):

Newaygo County Building Inspector; cities of Newaygo and White Cloud; townships of Barton, Big Prairie, Dayton, Ensley, Everett, Garfield, Lilley, Lincoln, Sheridan, and Sherman.

Potential Technical/Financial Assistance Sources:

Local resources.

Comments:

A free copy of a community's BCEGS report is available upon the request of a community's chief elected official or building official. This information can be used to identify deficiencies in existing building codes and enforcement. Addressing those deficiencies can enhance the resiliency of new and rehabilitated structures.

Action Item 56. Incorporate mitigation provisions into comprehensive plans and land use plans; such as identification of acceptable land uses and densities based on consideration of flood-prone areas, soil types, topography, and etc.

Priority Level: Low

Timeframe: To be completed when land use plans are written or updated

Applicable Governmental Unit(s)/Responsible Person(s):
Local units of government.

Potential Technical/Financial Assistance Sources:
Local resources.

Comments:
Land use planning helps provide rationale for local rules and policies, so it is important to integrate principals of hazard mitigation into this process. Following adoption of this plan, local units of government and the county will be encouraged to consider the contents of this hazard mitigation plan when writing or updating local plans. State law in Michigan requires that master plans must be reviewed, and updated if necessary, every five years.

Action Item 58. Incorporate hazard mitigation provisions and recommendations into local zoning ordinances as they restrict or direct development; with consideration given to dams, flood plains, soil type and topography; and as they allow flexibility in lot sizes and locations, such as in Planned Unit Developments (PUD).

Priority Level: Medium

Timeframe: To be completed when zoning ordinances are written or updated

Applicable Governmental Unit(s)/Responsible Person(s):
Local units of government.

Potential Technical/Financial Assistance Sources:
Local resources.

Comments:
Following adoption of this plan, local units of government and the county will be encouraged to consider the contents of this plan when writing or updating local ordinances. Zoning is an effective tool for mitigating hazards because it can be used to direct new development away from known hazardous areas, such as floodplains. Resources such as the IBHS suite of FORTIFIED programs can provide additional guidance for increasing the resistance of new and existing structures to hazards.

Action Item 67. Obtain and distribute available information on hazards and cost-effective mitigation actions individuals can implement (for example, Firewise pamphlets), and post-disaster repair and cleanup guidance.

Priority Level: Low

Timeframe: Seasonally, as budget allows

Applicable Governmental Unit(s)/Responsible Person(s):
NCES; Local units of government.

Potential Technical/Financial Assistance Sources:
MSP-EMHSD; FEMA; MSUE; NFIP; American Red Cross; Salvation Army.

Comments:
Mitigation and disaster recovery information may be distributed via social media, public meetings, newsletters, etc. NCES will consider distributing such information in the days and weeks ahead of a given season; e.g. the distribution of fire safety information in the early spring.

Action Item 68. Produce and distribute local emergency preparedness and safety information to the general public and/or targeted groups (seasonal populations, floodplain residents, developers and builders, farm owners and operators, decision makers, Spanish speaking, etc.). Include local resources for information such as fire stations, local radio stations and utilities.

Priority Level: High

Timeframe: Ongoing

Applicable Governmental Unit(s)/Responsible Person(s):
NCES; Newaygo County Departments.

Potential Technical/Financial Assistance Sources:
HMGP; HSGP; MSP-EMHSD; Utilities.

Comments:

Many county departments are constantly implementing this action item. It is stated here to support efforts that are currently in effect, and to encourage NCES to distribute pertinent information through 211, social media, public meetings, etc.

Action Item 79. Notify communities of hazard mitigation funds, as they become available, and assist them in applying for funds.

Priority Level: Medium

Timeframe: As hazard mitigation funding becomes available

Applicable Governmental Unit(s)/Responsible Person(s):
NCES.

Potential Technical/Financial Assistance Sources:
MSP-EMHSD.

Comments:

NCES would be a resource to help facilitate awareness of state and federal funding opportunities for hazard mitigation. This action item is new for the 2014 Action Agenda.

Action Item 85. Coordinate with American Red Cross to ensure the countywide availability and public awareness of designated and accessible emergency shelters; with consideration given to the seasonal populations in homes, cabins and mobile homes without basements; and assure facilities are inspected, certified, and have back-up power.

Priority Level: Medium

Timeframe: 2015-2016

Applicable Governmental Unit(s)/Responsible Person(s):

NCES; Communities identified in this plan as not having a community shelter designated by the American Red Cross: City of Grant, and townships of Beaver, Big Prairie, Bridgeton, Dayton, Denver, Ensley, Everett, Garfield, Home, Lincoln, Monroe, Sherman, Troy, and Wilcox.

Potential Technical/Financial Assistance Sources:
American Red Cross.

Comments:

Determinations must be made as to which communities listed above are in need of a designated community shelter.

Action Agenda 2015-2019

List of Hazard Mitigation Actions Applicable to Governmental Units

ACTION AGENDA	Action Item	Warning System	Generators	Road Maintenance	Fire/Rescue Equipment	Storm Shelters	Structural Projects	CWPP	Owner Participation	NFIP Participation	Federal Programs	BCEGS	Comprehensive Planning	Zoning	Distribute Mitigation Info	Local Preparedness Info	Funding Notification	Community Shelters
	Action Item #	1	10	14	19	20	31	35	36	42	45	51	56	58	67	68	79	85
APPLICABLE LOCAL GOVERNMENT	Newaygo County	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Fremont City				•			•	•			•	•	•	•			
	Grant City				•			•	•	•			•	•	•			•
	Newaygo City				•			•	•				•	•	•			
	White Cloud City				•			•	•			•	•	•	•			
	Hesperia Village				•			•	•				•	•	•			
	Ashland Twp.								•		Plan		•	•	•			
	Barton Twp.								•	•	Management	•	•	•	•			
	Beaver Twp.								•	•			•	•	•			•
	Big Prairie Twp.				•			•	•	•	Hazard	•	•	•	•			•
	Bridgeton Twp.								•		that		•	•	•			•
	Brooks Twp.							•	•		adopts		•	•	•			
	Croton Twp.				•			•	•		this		•	•	•			
	Dayton Twp.								•	•	government	•	•	•	•			•
	Denver Twp.								•	•	that		•	•	•			•
	Ensley Twp.								•		local	•	•	•	•			•
	Everett Twp.							•	•	•	government	•	•	•	•			•
	Garfield Twp.								•		to	•	•	•	•			•
	Goodwell Twp.								•	•	any		•	•	•			
	Grant Twp.								•	•	Applicable		•	•	•			
	Home Twp.								•	•	to		•	•	•			•
	Lilley Twp.				•			•	•	•	local	•	•	•	•			
	Lincoln Twp.								•		government	•	•	•	•			•
	Merrill Twp.							•	•	•	that		•	•	•			
	Monroe Twp.								•	•	adopts		•	•	•			•
	Norwich Twp.								•	•	this		•	•	•			
	Sheridan Twp.								•	•	government	•	•	•	•			
	Sherman Twp.								•		to	•	•	•	•			•
	Troy Twp.								•	•	any		•	•	•			•
	Wilcox Twp.								•		Applicable		•	•	•			•

Annex A

Community Profiles

NEWAYGO COUNTY

1.	major geographic features:	<ul style="list-style-type: none"> - 57.5 people per square mile of land area - 29.8 housing units per square mile of land area - Muskegon River, White River - Manistee National Forest
2.	Population Concentrations	
a.	group homes:	<ul style="list-style-type: none"> - Clapp Foster Care, 12310 Tamarack, Sand Lake, MI (capacity 2) - Countryside, 6116 W. Pat St, Fremont, MI (capacity 6) - Dallas Darling Home, 7003 Baldwin Ave., Newaygo, MI (capacity 12) - Deerfield, 209 Meadow Hill LN., Fremont, MI (capacity 12) - Fishers AFC, 1032 E 88th, Newaygo, MI (capacity 3) - Fountainview Retirement Village, 102 Hillcrest, Fremont, MI (capacity 20) - Fountainview Retirement Village, 50 S. Maple St, Grant, MI (capacity 38) - Kilchermanns AFC, 7 Arthur St., Grant, MI (capacity 6) - Morgan St, 104 Morgan St., White Cloud, MI (capacity 6) - Oakview, 979 S. Oakview, White Cloud, MI (capacity 6) - Peaceful Acres AFC, 6135 112th St., Howard City, MI (capacity 12) - Pinewood Manor, 2358 W. Pinewood Blvd., Bitely, MI (capacity 6) - Purdy's AFC, 2930 1 Mile, White Cloud, MI (capacity 6) - Rex Street Home, 1034 Rex St., Fremont, MI (capacity 6) - The Masters Home, 240 N. Webster, White Cloud, MI (capacity 6) - Woodland Park Manor, 8835 N. 21st Ave., Bitely, MI (capacity 6)
b.	large apartment buildings:	<ul style="list-style-type: none"> - Apple Ridge, 228 DeWitt Ave, Fremont, MI (32 family units) - Autumn Grove, 620 W. Brooks St, Newaygo, MI (24 family units) - Deerfield Apartments, 209 Meadow Hills, Fremont, MI (12 elderly units) - Edgeview Apartments, 290 E 82nd St, Newaygo, MI (36 family units) - Fremont Townhouses, Fremont, MI (12 units) - Grant Senior Citizen Housing, 10 North Lake St, Grant, MI (24 elderly units) - Greenfield Manor Apartments, 228 DeWitt St, Fremont, MI (26 elderly units) - Meadow Hills North, 216 Meadow Hills Lane, Fremont, MI (48 family units) - Newaygo Apartments Co LP, 500 West Brooks St, Newaygo, MI (24 units) - Oak Creek Village, 1101 W. Main St, Fremont, MI (32 family units) - Peachtree Village Apartments, 1100 State St, Fremont, MI (20 family units) - Pine Lake Village Apartments, 123 W. Pine Lake Dr., Newaygo, MI - Sand Hill Apartments, 92 North Lester St, White Cloud, MI (24 elderly units) - Silverwood Manor Senior Apartments, 140 Town Place Court, Hesperia, MI (16 elderly units) - Town Place Apartments, Town Place Court, Hesperia, MI (16 family units) - White Cloud Meadows, 98 N. Lester St, White Cloud, MI (32 elderly units) - Wildwood North Apartments, 157 E. Barton, Newaygo, MI (18 elderly units) - Whispering Hill, 161 & 163 North Lake West, Grant, MI (24 family units) - Woodridge Apartments, 70 North Lester, White Cloud, MI (32 family units) - Wedgewood Apartments, 216 Meadow Lane, Fremont, MI (20 elderly units) - Woodview Apartments, 782 East Brooks St, Newaygo, MI (66 elderly units)
c.	schools:	<ul style="list-style-type: none"> - Baker College, 4747 W 48th St - Big Jackson Public School, 4020 East 13 Mile Rd (34 students, 9 staff) - Bitely Head Start Program, 10697 N Bingham - Fremont Center, 4575 W 48th St - Fremont Christian Academy, 208 Hillcrest Ave - Fremont Co-Operative Preschool Inc., 351 Butterfield St (capacity 26) - Fremont Education and Activity Center 4633 W 48th - Fremont Public Schools <ul style="list-style-type: none"> - Fremont High School, 5421 S Warner Ave (722 students, 55 employees) - Fremont Middle School, 500 Woodrow (473 students, 44 employees)

		<ul style="list-style-type: none"> - Daisy Brook Elem., 502 N Division Ave (313 students, 31 employees) - Pathfinder Elementary, 109 W 44th St (618 students, 54 employees) - Quest Alternative School, 350 W Cedar St (65 students, 6 employees) - Pine Street Childcare & Administration, 450 East Pine (19 children, 15 employees) - Grant Christian School, 12931 S Poplar Ave - Grant Public Schools <ul style="list-style-type: none"> - Grant High School, 331 E State St (573 students) - Grant Middle School, 96 E 120th (550 students) - Grant Elementary School, 160 E State St (400 students) - Grant Primary Center, 103 Elder Ave (317 students) - Special Education, 12192 S Elder - Community Education and Resource Center, 156 E State - Hesperia Community Schools <ul style="list-style-type: none"> - Hesperia High School, 96 S Division St (330 students, 23 staff) - Hesperia Middle School, 96 S Division St (443 students, 22staff) - Patricia St. Clair Elementary, 96 S Division St (443 students, 40 staff) - Hesperia Community Education, 232 S Cook St (34 students, 7 staff) - Newaygo County Career Technical, 4645 W 48th - Newaygo Public Schools <ul style="list-style-type: none"> - Newaygo High School, 200 East St (542 students, 35 teachers) - Newaygo Middle School, 850 E. 76th St (379 students, 25 teachers) - Velma Matson Upper Elementary School, 29 E. Post (351 students, 16 teachers) - Vera Wilsie Elementary School, 140 Main St (422 students, 30 teachers) - Newaygo Center, 585 W Fremont St. - Seventh Day Adventist School of Fremont, 5335 S Garden Ave - White Cloud Public Schools <ul style="list-style-type: none"> - White Cloud High School, 555 E Wilcox (303 students, 36 teachers) - White Cloud Junior High, 555 E Wilcox (266 students, 21 teachers) - Jack Jones Elementary, 640 Pine Hill Ave (190 students, 27 teachers) - White Cloud Upper Elementary, 585 Pine Hill (320 students, 34 teachers)
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	Refer to individual city, village or township profiles
f.	major employers:	<ul style="list-style-type: none"> - DURA Automotive Systems, 502 Connie Avenue (375 employees) - Fremont Public Schools, 222 W. Pine (275 employees) - Grant Public Schools (297 employees) - County of Newaygo (247 employees) - Newaygo Public Schools (200 employees) - Gerber Life Insurance, 206 W Main (200 employees) - Spectrum Health Gerber Memorial, 1323 W Main St (550 employees) - Gerber Products Company, 445 State St (1,200 employees) - Magna Mirrors, 700 S Park Drive (550 employees) - Family Health Care, (137 employees) - Hesperia Community Schools (127 employees) - North American Refractories Company, 1301 E 8th St (125 employees) - Pine Medical Group, 230 W Oak (110 employees) - Transitional Health Services of Fremont, 4554 W 48th (105 employees) - Wal-Mart Stores, Inc., 7083 W 48th, (195 employees)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 19,059 commute with an average commuting time of 28.9 minutes - 10,357 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 25,075 total housing units: 18,406 occupied/ 6,669 vacant - Of the vacant, 4,885 (73.2%) are seasonal, recreational, or occasional use

4.	Important or Critical Public and Private Facilities	
a.	police precincts:	<ul style="list-style-type: none"> - Fremont Police Department, 101 East Main Street - City of Grant Police Department, 280 S. Maple St - Newaygo County Sheriff's Department, 1035 East James St - City of Newaygo Police Department, 28 State Road - Village of Hesperia Police, 33 East Michigan Ave - City of White Cloud Police Department, 12 S Charles St
b.	fire stations:	<ul style="list-style-type: none"> - Ashland-Grant Fire District, 62 W State St (City of Grant) - Big Prairie Township Fire Department, 2815 S Elm Ave - Croton Township Fire Department, 6431 S Elm Ave - Fremont Fire Department, 101 E Main Street - Hesperia Fire Department, 8320 E M-20 (Oceana County) - Lilley Township Fire Department, 10730 Prospect Ave - Newaygo Fire Department, 177 Co-operative Center Dr - White Cloud Area Fire Department, 1020 Wilcox St
c.	public works yards:	<ul style="list-style-type: none"> - Hesperia Department of Public Works, 33 E Michigan Ave.
d.	pumping stations:	<ul style="list-style-type: none"> - Public Water Service (pumping stations used where gravity is insufficient): Cities of Fremont, Grant, Newaygo, White Cloud, and Village of Hesperia.
e.	community shelters:	<ul style="list-style-type: none"> - Amazing Grace Acres, 762 W. Woodland Park Dr., Brohman, MI - Ashland Township Hall, 2019 W. 120th St., Grant, MI - Barton Township Park Bldg., 786 17 Mile Rd., Reed City, MI - Bitely Community Church, 10981 Bingham Rd., Bitely, MI - Brooks Township Hall, 490 Quarterline Rd, Newaygo, MI - Croton Township Fire Department, 6431 S. Elm, Newaygo, MI - Fremont High School, 134 E. Main, Fremont, MI - Fremont Middle School, 500 Woodrow, Fremont, MI - Fremont Wesleyan Church, 918 Garden Ave., Fremont, MI - Goodwell Township Hall, 2465 N. Cypress Ave., White Cloud, MI - Grant Middle School, 96 E. 120th St., Grant, MI - Hesperia Community Schools, 96 S. Division, Hesperia, MI - Merrill Township Community Complex, 1585 W. 11 Mile Rd, Bitely - Newaygo County Sr. Resource Center, 93 S. Gibbs St., White Cloud - Newaygo High School, 200 East St., Newaygo, MI - Newaygo Middle School, 850 E. 76th St., Newaygo, MI - Norwich Township Hall, 7213 N. Cypress Ave, White Cloud, MI - Pathfinder Elementary School, 109 W. 44th St., Fremont, MI - Pine Grove Community Church, 8775 E. 88th St., Newaygo, MI - Pine Street Primary School, 450 E. Pine St., Fremont, MI - Resurrection Life Church, 302 E. 68th St., Newaygo, MI - St. Bartholomew Church, 599 W. Brooks St., Newaygo, MI - TrueNorth Community Services, 6308 S. Warner, Fremont, MI - White Cloud High School, 555 Wilcox, White Cloud, MI
f.	community medical facilities, hospitals:	<ul style="list-style-type: none"> - Grant Medical Center, 230 S Maple St - Grant Teen Health, 96 E 120th St - Family Health Care Grant Clinic, 11 N Maple - Family Health Care White Cloud Clinic, 1035 E Wilcox Ave - Newaygo Medical Center, 211 W Pine Lake Drive - Spectrum Health Gerber Memorial Hospital, 212 S Sullivan (49 beds) - Spectrum Health Rural Health Clinic, 70 N Division - Teen Health Center, 1035 E Wilcox Ave
g.	historic sites:	<ul style="list-style-type: none"> - Ensley Windmill Tower, 4634 S Luce Ave. - Gerber, Cornelius, Cottage, 6480 W. Cottage Grove - City of Grant Depot & Water Tower - Penoyer's Sawmill - Saint Mark's Episcopal Church, 30 Justice St

		<ul style="list-style-type: none"> - Woods, John F., Residence, 59 Bridge St - Birch Grove School, 3962 N Felch - Weaver, Daniel, House 84 S Cook St - Hardy Hydroelectric Plant, 6928 36th St - Croton Congregational Church, SE Corner of Croton-Hardy Drive and Division - Oak Grove District No. 3 Schoolhouse, 6382 E 80th - Big Prairie Grange No. 935 Hall, 1968 Elm Ave - Lilley District No. 5 School, NE Corner of Bingham and Main - Birch Grove School, 3962 N Felch - Ensley Windmill Tower, 4634 S Luce Ave
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	Refer to individual city, village or township profiles

5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-20, M-37, M-82, M-120 - B-31, B-35, B-96, - Michigan Shore Railroad (City of Fremont, Sheridan Twp) - Marquette Rail Railroad (Cities of Grant, Newaygo, White Cloud; Twps of Ashland, Brooks, Everett, Garfield, Lilley, Lincoln, Merrill, Wilcox) - Bridges: Marquette Rail Railroad over Muskegon River, Marquette Rail over White River, B-35 over Muskegon River, B-31 over Muskegon River, M-20 over White River, M-37 over Muskegon River, M-82 over Muskegon River
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	<ul style="list-style-type: none"> - Consumers Energy Power Line (Ashland Township, Beaver Township, Big Prairie Township, Bridgeton Township, Brooks Township, City of Newaygo, Croton Township, Dayton Township, Denver Township, Ensley Township, Everett Township, Garfield Township, Grant Township, Norwich Township, Sherman Township) - Hardy Dam, Rowe Dam No. 1, Rowe Dam No.2, Croton Dam, White Cloud Dam, Peace Creek Dam, Michigan Creek Dam, Tornbloom Dam, Henkin Pond Dam, Minnie Lake Dam - Hardy Hydroelectric Plant, 6928 East 36th St - Croton Hydroelectric Dam, Croton Dam Rd - Public Sewer Service: Cities of Fremont, Grant, Newaygo, and White Cloud, Village of Hesperia, and Townships of Brooks, Everett, Garfield, Sheridan, and Sherman
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	<ul style="list-style-type: none"> - MichCon Natural Gas Pipeline (Ashland Township, Bridgeton Township, Brooks Township, Croton Township, Ensley Township, Grant Township) - Fremont Municipal Airport, 7756 W 60th - Grant Airport, 11798 S Willow - Hardy Dam Marina, 6619 36th Street (37 slips) - White Cloud Airport, 25 N Charles

6.	Socio-Economic Profile of Sector	
a.	total population (night):	48,460
b.	peak population (seasonal):	61,161 (estimate)
c.	percent over 65:	15.5
d.	percent under 18:	25
e.	percent below poverty level:	13.1

f.	percent that are homeowners:	82.4
g.	percent with disability or mobility limitation:	20.3
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal: \$127,431,991 Agricultural: \$178,054,600 Commercial: \$107,074,700 Industrial: \$41,774,200 Residential: \$1,193,712,702 Total: \$1,648,048,193
i.	flood insurance coverage:	Total Losses since 01/01/78: 50 Total Payments since 01/01/78: \$782,356 Policies In-Force: 113 Total Insurance In-Force: 17,565,000
j.	location of floodplains:	Refer to individual city, village or township profiles
7.	Emergency Warning System Coverage	
a.	siren locations and/or description of warning system:	- Consumers Energy Siren/Speakers: 4 below Hardy Dam and 4 below Croton Dam - Tornado Sirens: Fremont, Newaygo & Hesperia - Fire and Tornado: Croton Twp, Big Prairie Twp, Lilley Twp, & White Cloud
b.	population covered by warning sirens or system:	- ¾ mile radius at a 70-decibel level and 1 ½ mile at a 60-decibel level for the Consumers Energy sirens - 11,349 people covered by tornado & fire warning sirens
(Note: Map showing warning siren and system coverage is included in Part D.)		

Newaygo County



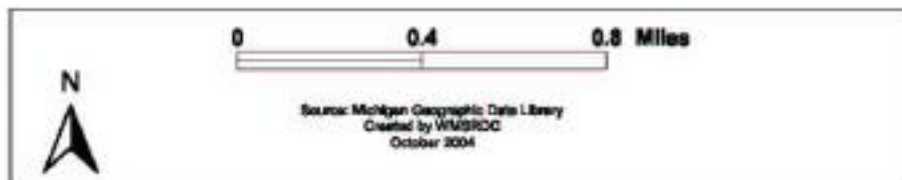
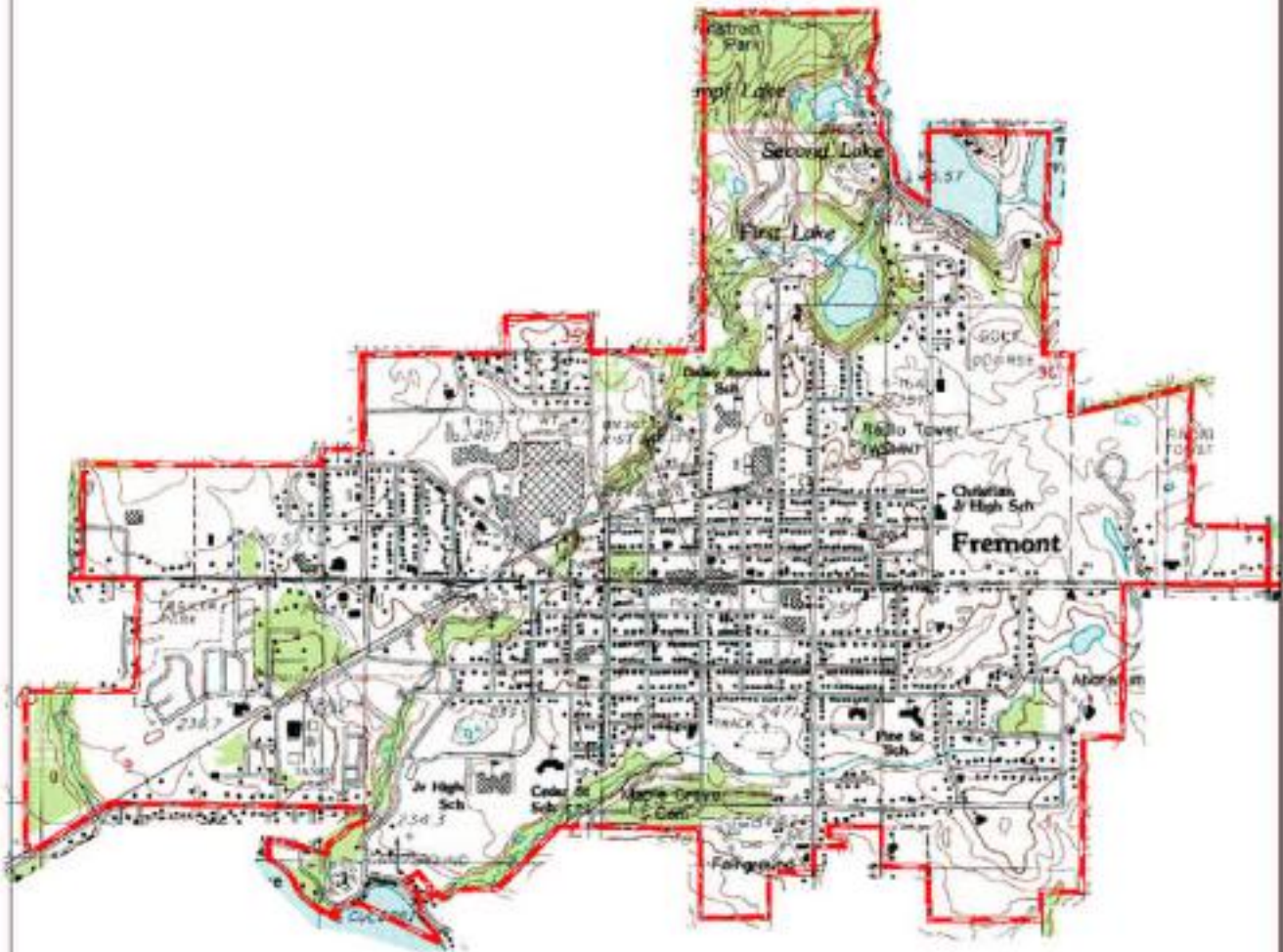
CITY OF FREMONT

1.	major geographic features:	<ul style="list-style-type: none"> - 1,193.3 people per square mile of land area - 575 housing units per square mile of land area - Dense residential, moderate commercial, and light industrial areas - Fremont Lake, First Lake, Second Lake, Third Lake, Kempf Lake - Darling Creek
2.	Population Concentrations	
a.	group homes:	<ul style="list-style-type: none"> - Deerfield, 209 Meadow Hill LN., Fremont, MI (capacity 12) - Fountainview Retirement Village, 102 Hillcrest (capacity 20) - Rex Street Home, 1034 Rex St., Fremont, MI (capacity 6)
b.	large apartment buildings:	<ul style="list-style-type: none"> - Apple Ridge, 228 DeWitt Ave (32 family units) - Deerfield Apartments, 209 Meadow Hills (12 elderly units) - Fremont Townhouses, 1220 State St. (12 units) - Greenfield Manor Apartments, 228 DeWitt St (26 elderly units) - Meadow Hills North, 216 Meadow Hills LN (48 family units) - Oak Creek Village, 1101 W. Main St. (32 family units) - Peachtree Village Apartments, 1100 State St (20 family units) - Wedgewood Apartments, 216 Meadow Hills (20 elderly units)
c.	schools:	<ul style="list-style-type: none"> - Fremont High School, 5421 S Warner Ave (722 students, 55 employees) - Fremont Middle School, 500 Woodrow (473 students, 44 employees) - Daisy Brook Elementary, 502 North Division Ave (313 students, 31 employees) - Pathfinder Elementary, 109 W 44th St (618 students, 54 employees) - Quest Alternative School (alternative education), 350 West Cedar St (65 Students, 6 employees) - Pine Street Childcare & Administration, 450 E. Pine St. (19 children, 15 employees) - Fremont Christian School, 208 Hillcrest Drive (140 Students, 24 employees) - Cornerstone Christian Academy, 405 W 44th - Fremont Co-Operative Preschool Inc, 351 E Butterfield (capacity 26)
d.	large office buildings:	<ul style="list-style-type: none"> - None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Bright Start Preschool Day Care, 453 E Main (capacity 33) - Fremont High School Stadium, at corner of M-82 and Pine St - Fremont Lake Park Campground, 933 Cottage Grove (66 sites) - Harrington Inn, 1117 W. Main (38 rooms, 45-person conference room) - National Baby Food Festival (latter half of July) - Newaygo County Fairgrounds, west side of M-82 at Stewart - Packers Pride Child Care Center, 350 W Cedar (capacity 24) - Pathfinder Elementary, 109 W 44th St (day care, capacity 50) - Ramshorn Country Club, 1100 Ramshorn Dr - The Ark Christian Child Care Center, 605 Hemlock (capacity 50) - The Holiday Fair, held at Fremont High School (November)

f.	major employers:	<ul style="list-style-type: none"> - Fremont Public Schools, 22 W Pine (275 employees) - Gerber Life Insurance, 206 W. Main (200 employees) - Gerber Products Company, 445 State St (1,200 employees) - Pine Medical Group, 230 W Oak (110 Employees) - Spectrum Health Gerber Memorial, 1323 W. Main St (550 employees) - Transitional Health Services of Fremont, 4554 W 48th (105 employees) - Wal-Mart Stores, Inc., 7083 W 48th (195 employees)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 1,591 commute to work with an average commuting time of 14 minutes - 844 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,968 total housing units: 1,781 occupied/ 187 vacant - Of the vacant, 31 (16.6%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- Fremont Police Department, 101 E Main Street
b.	fire stations:	- Fremont Fire Department, 101 E Main Street
c.	public works yards:	- None Identified
d.	pumping stations:	- Public Water Service (pumping stations used where gravity is insufficient)
e.	community shelters:	<ul style="list-style-type: none"> - Fremont High School, 134 E. Main St - Fremont Middle School, 500 Woodrow - Fremont Wesleyan Church, 918 Garden Ave - Pathfinder Elementary School, 109 W 44th St - Pine Street Primary School, 450 East Pine St
f.	community medical facilities, hospitals:	- Spectrum Health Gerber Memorial Hospital, 212 S. Sullivan (49 beds)
g.	historic sites:	<ul style="list-style-type: none"> - Ensley Windmill Tower, 4634 S. Luce Ave. - Gerber, Cornelius, Cottage, 6480 W. Cottage Grove
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	<ul style="list-style-type: none"> - City of Fremont, 101 E Main St - Fremont Area District Library, 104 East Main St - United States Post Office, Fremont, 19 S Division - Fremont Industrial Park, located on M-82 east of M-120 (148.04 total acres)
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-82 - Michigan Shore Railroad
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Public Sewer Service
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified
6.	Socio-Economic Profile of Sector	
a.	total population (night):	4,081
b.	peak population (seasonal):	4,151 (estimate)
c.	percent over 65:	19.4
d.	percent under 18:	25.1

e.	percent below poverty level:	14.8														
f.	percent that are homeowners:	61.2														
g.	percent with disability or mobility limitation:	21.6														
h.	estimated property insurance coverage (Real Equalized Valuations): <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Personal Property:</td> <td>\$25,029,500</td> </tr> <tr> <td>Agricultural:</td> <td>\$136,400</td> </tr> <tr> <td>Commercial:</td> <td>\$38,092,500</td> </tr> <tr> <td>Industrial:</td> <td>\$13,909,900</td> </tr> <tr> <td>Residential:</td> <td>\$56,732,300</td> </tr> <tr> <td>Developmental:</td> <td>\$0</td> </tr> <tr> <td>Total:</td> <td>\$133,900,600</td> </tr> </table>	Personal Property:	\$25,029,500	Agricultural:	\$136,400	Commercial:	\$38,092,500	Industrial:	\$13,909,900	Residential:	\$56,732,300	Developmental:	\$0	Total:	\$133,900,600	
Personal Property:	\$25,029,500															
Agricultural:	\$136,400															
Commercial:	\$38,092,500															
Industrial:	\$13,909,900															
Residential:	\$56,732,300															
Developmental:	\$0															
Total:	\$133,900,600															
i.	flood insurance coverage: <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Total Losses since 01/01/78:</td> <td>N/A</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>N/A</td> </tr> <tr> <td>Policies In-Force:</td> <td>1</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$350,000</td> </tr> </table>	Total Losses since 01/01/78:	N/A	Total Payments since 01/01/78:	N/A	Policies In-Force:	1	Total Insurance In-Force:	\$350,000							
Total Losses since 01/01/78:	N/A															
Total Payments since 01/01/78:	N/A															
Policies In-Force:	1															
Total Insurance In-Force:	\$350,000															
j.	location of floodplains:	- flood plain around Second and Third lakes														
7.	Emergency Warning System Coverage															
a.	siren locations and/or description of warning system:	- Tornado Siren at Fremont DPW, 805 Oak St														
b.	population covered by warning sirens or system:	- 4,224														
(Note: Map showing warning siren and system coverage is included in Part D.)																

City of Fremont

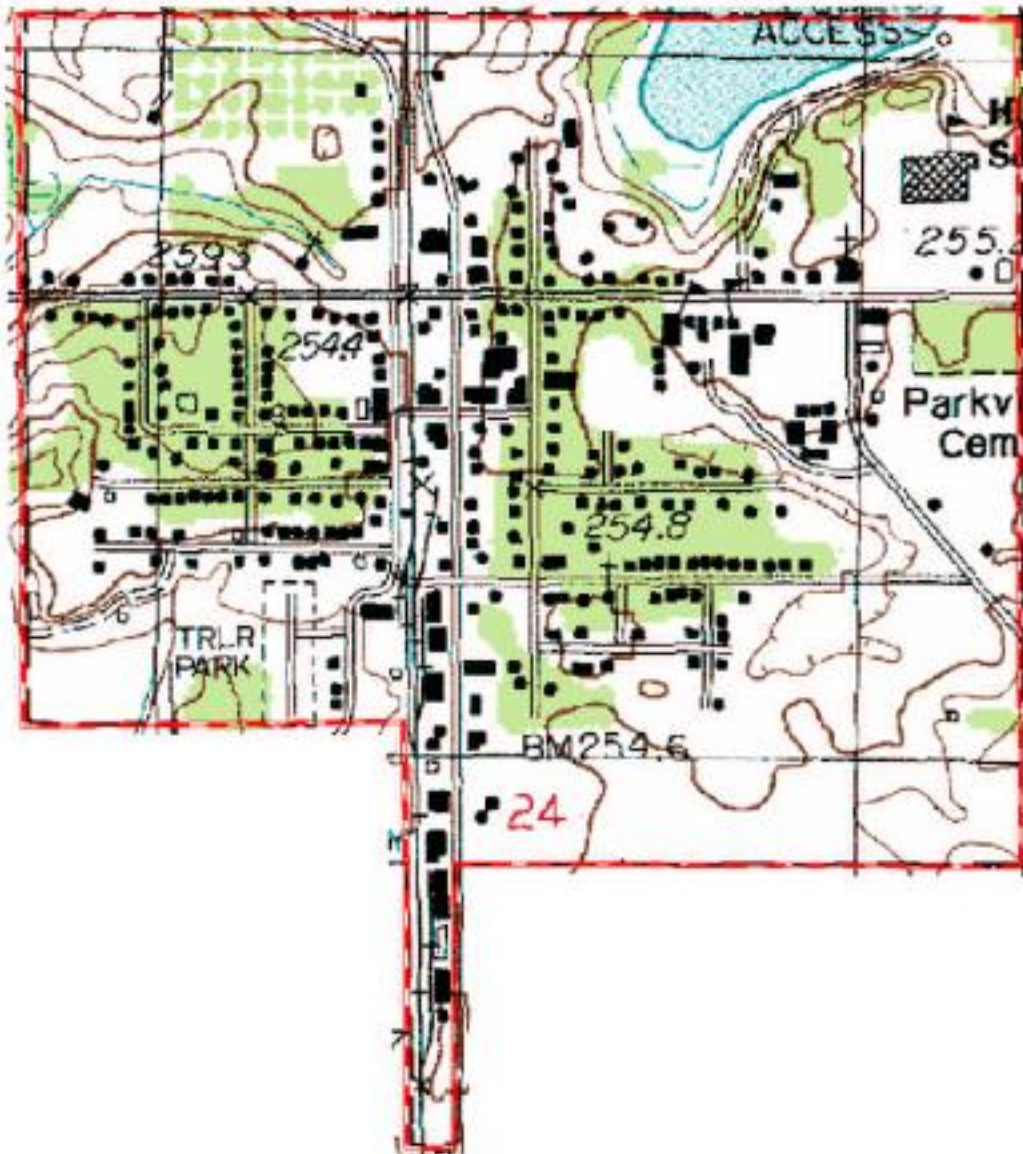


CITY OF GRANT

1.	major geographic features:	<ul style="list-style-type: none"> - 1,375.1 people per square mile of land area - 640 housing units per square mile of land area - Light urban residential and commercial areas - Blanche Lake
2.	Population Concentrations	
a.	group homes:	- Fountainview Retirement Village, 50 S. Maple St
b.	large apartment buildings:	<ul style="list-style-type: none"> - Grant Senior Citizen Housing, 10 North Lake St (24 elderly units) - Whispering Hill, 161 & 163 North Lake West (24 family units)
c.	schools:	<ul style="list-style-type: none"> - Grant High School, 331 E State St (573 students) - Grant Middle School, 96 E. 120th (550 students) - Grant Elementary School, 160 E State St (400 students) - Grant Primary Center, 103 Elder Ave (317 students) - Special Education, 12192 S Elder - Community Education and Resource Center (adult education), 156 E State
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Blanche Lake Township Park - Small Impressions Child Care, 86 N Maple (capacity 58) - Fountainview Retirement Village (nursing home), 50 S Maple - Grant Learning Center Child Care, 156 E State (capacity 20) - Building Bridges Grant, 156 E State (day care, capacity 48) - Emerald Estates Mobile Home Community, 238 Jones Street
f.	major employers:	- Grant Public Schools, 148 S Elder (297)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 281 commute to work with an average commuting time of 23.7 minutes - 190 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 416 total housing units: 361 occupied/ 55 vacant - Of the vacant, 2 (3.6%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- City of Grant Police Department, 280 S. Maple
b.	fire stations:	- Ashland-Grant Fire District, 62 W. State St
c.	public works yards:	- None Identified
d.	pumping stations:	- Public Water Service (pumping stations used where gravity is insufficient)
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	<ul style="list-style-type: none"> - Grant Medical Center, 230 S Maple St - Family Health Care Grant Clinic, 11 N Maple - Grant Teen Health, 96 E. 120th St

g.	historic sites:	- City of Grant Depot and Water Tower												
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Grant Community Building, 105 S Front St - Grant Area District Library, 51 Front St												
5.	Vital or Critical Infrastructure													
a.	roads, railroads, and bridges:	- M-37 - Marquette Rail Railroad												
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Public Sewer Service												
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	894												
b.	peak population (seasonal):	899 (estimate)												
c.	percent over 65:	15.7												
d.	percent under 18:	29.5												
e.	percent below poverty level:	22.8												
f.	percent that are homeowners:	49												
g.	percent with disability or mobility limitation:	20.6												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="0"> <tr> <td>Personal Property:</td> <td>\$1,309,600</td> </tr> <tr> <td>Agricultural:</td> <td>\$43,000</td> </tr> <tr> <td>Commercial:</td> <td>\$6,607,800</td> </tr> <tr> <td>Industrial:</td> <td>\$0</td> </tr> <tr> <td>Residential:</td> <td>\$9,070,000</td> </tr> <tr> <td>Total:</td> <td>\$17,030,400</td> </tr> </table>	Personal Property:	\$1,309,600	Agricultural:	\$43,000	Commercial:	\$6,607,800	Industrial:	\$0	Residential:	\$9,070,000	Total:	\$17,030,400
Personal Property:	\$1,309,600													
Agricultural:	\$43,000													
Commercial:	\$6,607,800													
Industrial:	\$0													
Residential:	\$9,070,000													
Total:	\$17,030,400													
i.	flood insurance coverage:	<table border="0"> <tr> <td>Total Losses since 01/01/78:</td> <td rowspan="4"><i>Not participating in the NFIP</i></td> </tr> <tr> <td>Total Payments since 01/01/78:</td> </tr> <tr> <td>Policies In-Force:</td> </tr> <tr> <td>Total Insurance In-Force:</td> </tr> </table>	Total Losses since 01/01/78:	<i>Not participating in the NFIP</i>	Total Payments since 01/01/78:	Policies In-Force:	Total Insurance In-Force:							
Total Losses since 01/01/78:	<i>Not participating in the NFIP</i>													
Total Payments since 01/01/78:														
Policies In-Force:														
Total Insurance In-Force:														
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- Fire & Tornado Siren at Ashland-Grant Fire District (on-site activation and remote activation possible by Central Dispatch from 7:00 am to 2:00 pm)												
b.	population covered by warning sirens or system:	- 881												
(Note: Map showing warning siren and system coverage is included in Part D.)														

City of Grant



CITY OF NEWAYGO

1.	major geographic features:	<ul style="list-style-type: none"> - 528.3 people per square mile of land area - 238.5 housing units per square mile of land area - Muskegon River, Brooks Creek, Penoyer Creek - June Lake, 3 small lakes - Moderately dense residential and commercial areas
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	<ul style="list-style-type: none"> - Woodview Apartments, 782 East Brooks (66 elderly units) - Autumn Grove, 620 West Brooks St (24 family units) - Wildwood North Apartments, 157 East Barton St (18 elderly units) - Newaygo Apartments Co LP, 500 West Brooks St (24 units) - Edgeview Apartments, 290 E. 82nd St (36 family units) - Pine Lake Village Apartments, 123 W. Pine Lake Dr.
c.	schools:	<ul style="list-style-type: none"> - Newaygo High School, 200 East St (542 students, 35 teachers) - Newaygo Middle School, 850 E. 76th St (379 students, 25 teachers) - Velma Matson Upper Elementary School, 29 E Post (351 students, 16 teachers) - Vera Wilsie Elementary School, 140 Main St (422 students, 30 teachers) - Newaygo Center (special education), 585 W. Fremont St.
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Newaygo High School Stadium, 200 East St - Winterfest (end of January) - Memorial Weekend Arts & Craft Show (Brooks Park) - 4th of July Celebration - Logging Festival (Labor Day weekend) - Annual Holiday Arts & Crafts Fair, held at Newaygo High School (end of October) - Henning County Park, 500 E Croton Dr (64 campsites) - Newaygo Center Preschool, 585 Fremont (day care, capacity 95) - Brook Haven Estates Mobile Home Community, 622 S Division - Hills Mobile Home Park, 927 Lake Drive
f.	major employers:	<ul style="list-style-type: none"> - Newaygo Public Schools, 360 S Mill (200 employees) - Magna Mirrors, 700 S Park Drive (550 employees)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 828 commute to work with an average commuting time of 22.4 minutes - 453 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 892 total housing units: 786 occupied/ 106 vacant - Of the vacant, 18 (17.0%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	<ul style="list-style-type: none"> - Newaygo Police Department, 28 North State Rd - Michigan State Police Post #65, 360 Adams

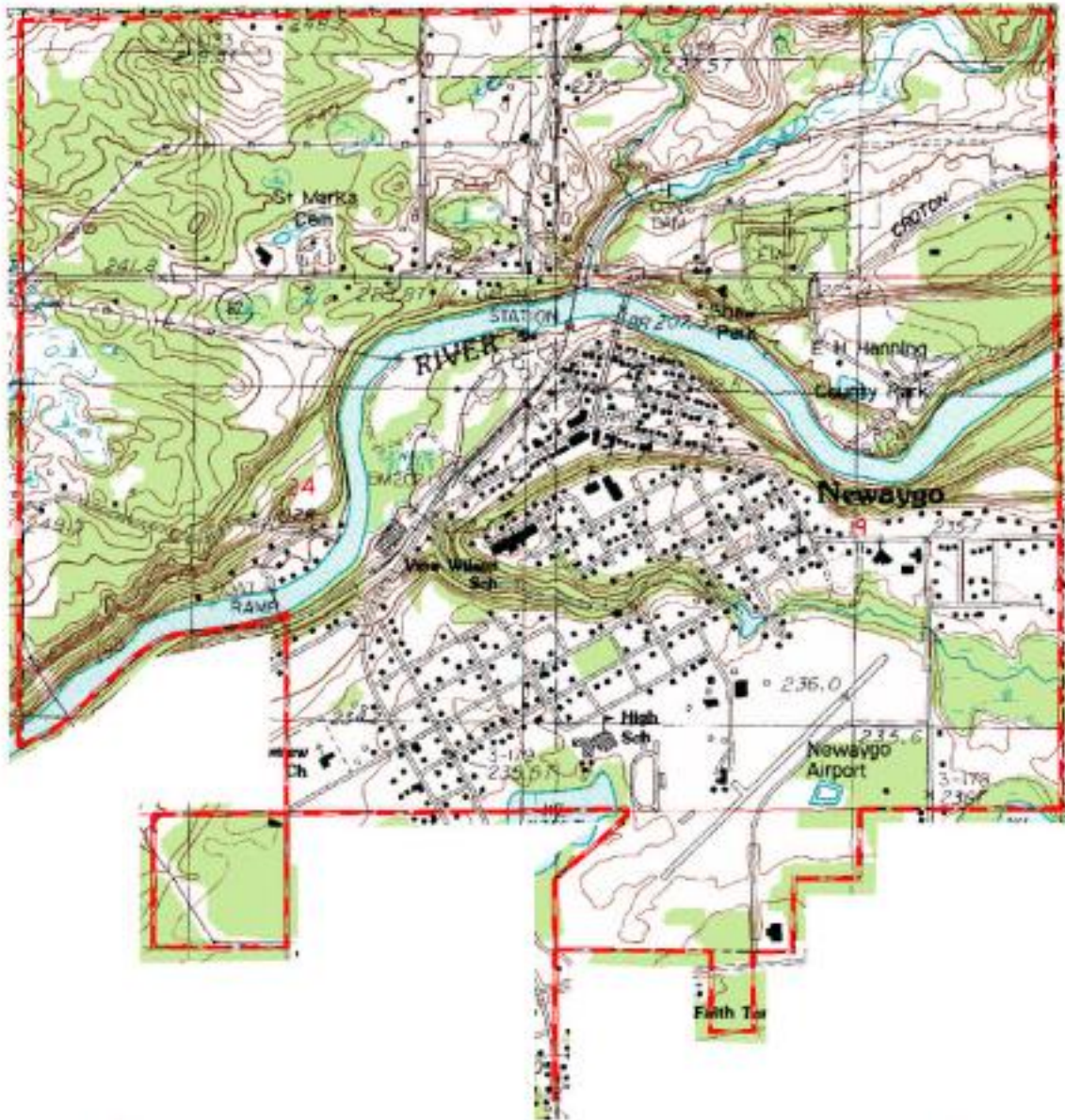
b.	fire stations:	- Newaygo Fire District, 177 Cooperative Dr
c.	public works yards:	- None Identified
d.	pumping stations:	- Public Water Service (pumping stations used where gravity is insufficient)
e.	community shelters:	- Newaygo High School, 200 East St - Resurrection Life Church, 302 E 68 th St - St. Bartholomew Church, 599 W. Brooks St
f.	community medical facilities, hospitals:	- Newaygo Medical Center, 211 W Pine Lake Drive
g.	historic sites:	- Penoyer's Sawmill - Saint Mark's Episcopal Church, 30 Justice St - Woods, John F., Residence, 59 Bridge St
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- City of Newaygo, 28 State Road - Newaygo Carnegie Library, 44 North State Rd - Timber Trails Industrial Park, located on M-82 east of M-37 (80 acres)

5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- M-37, M-82 - M-37/M-82 bridge over Muskegon River - Marquette Rail Railroad - Marquette Rail Railroad over Muskegon River
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line - Rowe Dam No. 1 - Rowe Dam No.2 - Public Sewer Service
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector		
a.	total population (night):		1,976
b.	peak population (seasonal):		2,021 (estimate)
c.	percent over 65:		14.2
d.	percent under 18:		29.3
e.	percent below poverty level:		17.3
f.	percent that are homeowners:		53.3
g.	percent with disability or mobility limitation:		21.6
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$14,592,000 Agricultural: \$0 Commercial: \$19,280,400 Industrial: \$6,881,400 Residential: \$18,095,100 Total: \$58,848,900	
i.	flood insurance coverage:	Total Losses since 01/01/78: 9 Total Payments since 01/01/78: \$216,833 Policies In-Force: 5 Total Insurance In-Force: \$935,100	
j.	location of floodplains:	- flood plain along Muskegon River	

7.	Emergency Warning System Coverage	
a.	siren locations and/or description of warning system:	- Tornado Sirens at: 40 Centerline Rd, and 355 Clay Rd
b.	population covered by warning sirens or system:	- 1,670
(Note: Map showing warning siren and system coverage is included in Part D.)		

City of Newaygo

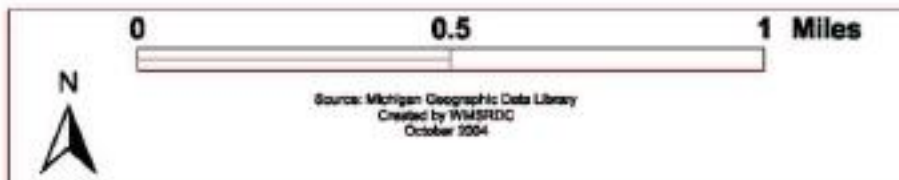
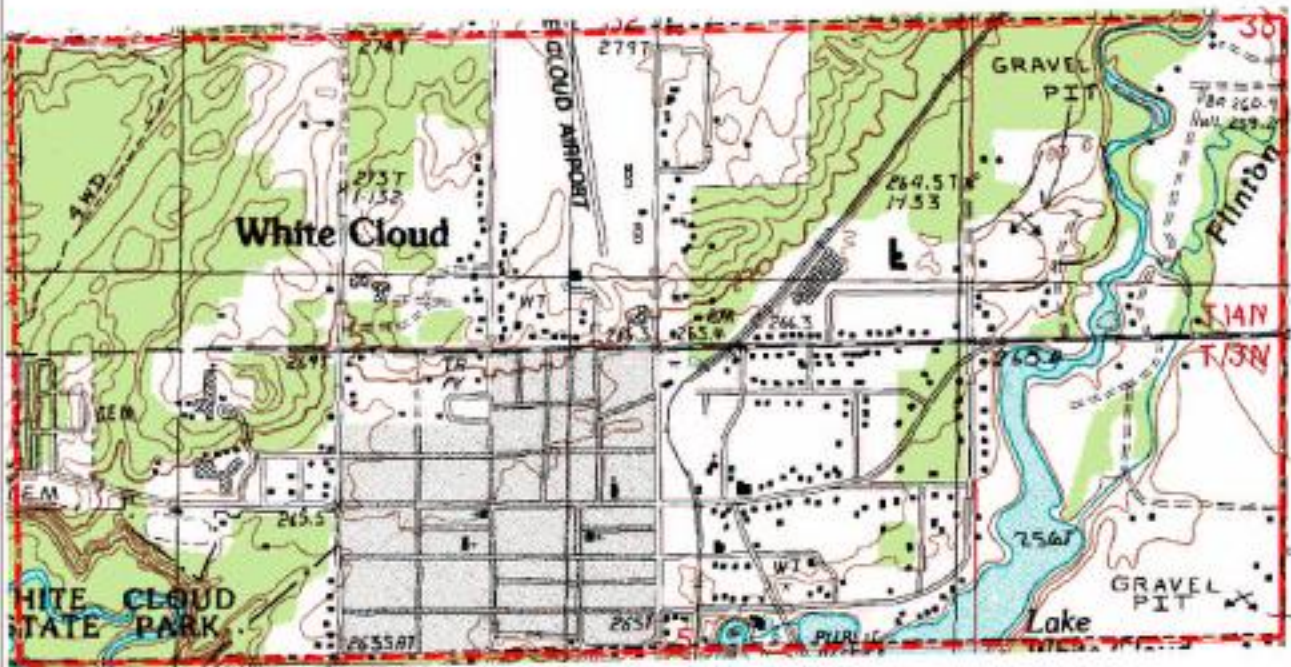


CITY OF WHITE CLOUD

1.	major geographic features:	<ul style="list-style-type: none"> - 735.4 people per square mile of land area - 275.4 housing units per square mile of land area - Moderately dense residential and light commercial - White River, 2 small creeks - Mill Pond
2.	Population Concentrations	
a.	group homes:	<ul style="list-style-type: none"> - Morgan St, 104 Morgan St., White Cloud, MI (6 capacity) - The Masters Home, 240 N. Webster, White Cloud, MI (6 capacity)
b.	large apartment buildings:	<ul style="list-style-type: none"> - Sand Hill Apartments, 92 North Lester St. (24 elderly units) - White Cloud Meadows, 98 North Lester St. (32 elderly units) - Woodridge Apartments, 70 North Lester St. (32 family units)
c.	schools:	<ul style="list-style-type: none"> - White Cloud High School, 555 E Wilcox (303 students, 36 teachers) - White Cloud Junior High, 555 E Wilcox (266 students, 21 teachers) - Jack Jones Elementary, 640 Pine Hill Ave (190 students, 27 teachers) - White Cloud Upper Elementary, 585 Pine Hill Ave (320 students, 34 teachers)
d.	large office buildings:	<ul style="list-style-type: none"> - None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Indian Pow-Wow & Homecoming, held near Mill Pond (end of July) - Newaygo County Jail, 300 Williams St (capacity 48) - Newaygo County Historical Museum, 85 West Water St - White Cloud Campground, 680 Wilcox Ave (98 campsites) - White Cloud Center (pre-school/ day care), 116 Adda St - Building Bridges White Cloud, 717 Adda (day care, capacity 48) - Maple Lane Mobile Home Community, 65 North Street - Sportman Mobile Home Community, 2500 Sportmans lot 38
f.	major employers	<ul style="list-style-type: none"> - County of Newaygo (247 employees) - Family Health Care (137 employees)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 338 commute to work with an average commuting time of 22.5 minutes - 305 school-aged children
c.	seasonal:	<ul style="list-style-type: none"> - 537 total housing units: 467 occupied/ 70 vacant - Of the vacant, 10 (14.3%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	<ul style="list-style-type: none"> - White Cloud Police Department, 12 N Charles - Newaygo County Sheriff's Department, 1035 East James St
b.	fire stations:	<ul style="list-style-type: none"> - White Cloud Fire Department, 1020 East Wilcox
c.	public works yards:	<ul style="list-style-type: none"> - None Identified
d.	pumping stations:	<ul style="list-style-type: none"> - Public Water Service (pumping stations used where gravity is insufficient)
e.	community shelters:	<ul style="list-style-type: none"> - White Cloud High/ Middle School, 555 Wilcox Ave - Newaygo County Senior Resources and Center, 93 S. Gibbs
f.	community medical facilities, hospitals:	<ul style="list-style-type: none"> - Family Health Care White Cloud Clinic, 1035 E Wilcox Ave - Teen Health Center, 1035 E Wilcox Ave
g.	historic places:	<ul style="list-style-type: none"> - Birch Grove School, 3962 N Felch

h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- City of White Cloud, 12 N Charles St - White Cloud Community Library, 1038 Wilcox - Newaygo County Administration Building, 1087 Newell St - Newaygo County Central Dispatch, 1018 Newell St - Newaygo County Courthouse, 1092 Newell St - Newaygo Health Department Building, 1049 Newell St - Newaygo County Animal Control, 78 North Webster Street - White Cloud Department of Public Works, 181 Benson St - United States Post Office, White Cloud, 1097 Wilcox Ave - Newaygo County Family Independence Agency, 1018 Newell												
5.	Vital or Critical Infrastructure													
a.	roads, railroads, and bridges:	- M-37, M-20 - Marquette Rail Railroad - M-20 bridge over White River												
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Public Sewer Service												
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- White Cloud Airport, 25 N Charles												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	1,408												
b.	peak population (seasonal):	1,434 (estimate)												
c.	percent over 65:	11.6												
d.	percent under 18:	25.9												
e.	percent below poverty level:	36.1												
f.	percent that are homeowners:	60.6												
g.	percent with disability or mobility limitation:	27												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="0"> <tr> <td>Personal Property:</td> <td>\$1,682,900</td> </tr> <tr> <td>Agricultural:</td> <td>\$0</td> </tr> <tr> <td>Commercial:</td> <td>\$5,529,100</td> </tr> <tr> <td>Industrial:</td> <td>\$863,900</td> </tr> <tr> <td>Residential:</td> <td>\$11,077,500</td> </tr> <tr> <td>Total:</td> <td>\$19,153,400</td> </tr> </table>	Personal Property:	\$1,682,900	Agricultural:	\$0	Commercial:	\$5,529,100	Industrial:	\$863,900	Residential:	\$11,077,500	Total:	\$19,153,400
Personal Property:	\$1,682,900													
Agricultural:	\$0													
Commercial:	\$5,529,100													
Industrial:	\$863,900													
Residential:	\$11,077,500													
Total:	\$19,153,400													
i.	flood insurance coverage:	<table border="0"> <tr> <td>Total Losses since 01/01/78:</td> <td>N/A</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>N/A</td> </tr> <tr> <td>Policies In-Force:</td> <td>2</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$387,000</td> </tr> </table>	Total Losses since 01/01/78:	N/A	Total Payments since 01/01/78:	N/A	Policies In-Force:	2	Total Insurance In-Force:	\$387,000				
Total Losses since 01/01/78:	N/A													
Total Payments since 01/01/78:	N/A													
Policies In-Force:	2													
Total Insurance In-Force:	\$387,000													
j.	location of floodplains:	- flood plain along White River, and around Mill Pond												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- Fire & Tornado Siren at White Cloud Fire Department, 1020 Wilcox Ave. (remote activation by Central Dispatch or on-site activation)												
b.	population covered by warning sirens or system:	- 1,420												
(Note: Map showing warning siren and system coverage is included in Part D.)														

City of White Cloud



VILLAGE OF HESPERIA

1.	major geographic features:	<ul style="list-style-type: none"> - 1,208 people per square mile of land area - 545.6 housing units per square mile of land area - Moderately dense residential and light commercial areas - White River - Hesperia Pond
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	<ul style="list-style-type: none"> - Silverwood Manor Senior Apartments, 140 Town Place Court (16 elderly units) - Town Place Apartments, Town Place Court (16 family units) - White Cloud Meadows, 98 N. Lester St (32 elderly units) - Woodridge Apartments, 70 N Lester St (32 family units)
c.	schools:	<ul style="list-style-type: none"> - Hesperia High School, 96 S Division (330 students, 23 staff) - Hesperia Middle School, 96 S Division (323 students, 22 staff) - Patricia St. Clair Elementary, 96 S Division (443 students, 40 staff) - Hesperia Community Education (adult education), 232 S Cook (34 students, 7 staff)
d.	large office buildings:	- See 4.g.
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Building Bridges Hesperia MSRP, 96 S Division (day care, capacity 32) - Hesperia High School Football Stadium, 96 S Division St - All Seasons Inn, 287 S. Division (Oceana County) - Rivers Edge Lodging, 31 S South, M-20
f.	major employers	- Hesperia Community Schools, 96 S Division (127 employees)
3.	Population Shifts <i>(also included in Newfield Township [Oceana] and Denver Township [Newaygo])</i>	
a.	daily:	<ul style="list-style-type: none"> - 387 commute to work with an average commuting time of 26 minutes - 227 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 431 total housing units: 382 occupied/ 49 vacant - Of the vacant, 6 (12.2%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- Village of Hesperia Police, 33 East Michigan Ave
b.	fire stations:	- Hesperia Fire Department, 8320 East M-20 (Oceana County)
c.	public works yards:	- Hesperia Department of Public Works, 33 East Michigan Ave
d.	pumping stations:	- Village of Hesperia Water System (pumping stations used where gravity is insufficient)
e.	community shelters:	- Hesperia High/ Middle School, 96 S Division St
f.	community medical facilities, hospitals:	- Spectrum Health Rural Health Clinic, 78 N Division
g.	historic places:	- Weaver, Daniel, House, 84 S. Cook St

h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Village of Hesperia, 33 E Michigan Ave - Hesperia Community Library & Civic Center, 80 S Division - United States Post Office, Hesperia, 205 N Division St (Oceana County)										
5.	Vital or Critical Infrastructure											
a.	roads, railroads, and bridges:	- M-120, M-20										
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Pond Dam, Mill St. (Oceana County) - Hesperia Water Department - Public Sewer Service										
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified										
6.	Socio-Economic Profile of Sector											
a.	total population (night):	<i>(also included in Newfield Township [Oceana] and Denver Township [Newaygo])</i> <div>954</div>										
b.	peak population (seasonal):	<i>(also included in Newfield Township [Oceana] and Denver Township [Newaygo])</i> <div>969 (estimate)</div>										
c.	percent over 65:	16.1										
d.	percent under 18:	27										
e.	percent below poverty level:	20.3										
f.	percent that are homeowners:	67.8										
g.	percent with disability or mobility limitation:	26										
h.	estimated property insurance coverage (Real Equalized Valuations):	<table> <tr> <td>Agricultural:</td> <td>N/A</td> </tr> <tr> <td>Commercial:</td> <td>N/A</td> </tr> <tr> <td>Industrial:</td> <td>N/A</td> </tr> <tr> <td>Residential:</td> <td>N/A</td> </tr> <tr> <td>Total:</td> <td>N/A</td> </tr> </table>	Agricultural:	N/A	Commercial:	N/A	Industrial:	N/A	Residential:	N/A	Total:	N/A
Agricultural:	N/A											
Commercial:	N/A											
Industrial:	N/A											
Residential:	N/A											
Total:	N/A											
i.	flood insurance coverage:	<table> <tr> <td>Total Losses since 01/01/78:</td> <td>2</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>\$12,904</td> </tr> <tr> <td>Policies In-Force:</td> <td>3</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$327,700</td> </tr> </table>	Total Losses since 01/01/78:	2	Total Payments since 01/01/78:	\$12,904	Policies In-Force:	3	Total Insurance In-Force:	\$327,700		
Total Losses since 01/01/78:	2											
Total Payments since 01/01/78:	\$12,904											
Policies In-Force:	3											
Total Insurance In-Force:	\$327,700											
j.	location of floodplains:	- floodplain along White River										
7.	Emergency Warning System Coverage											
a.	siren locations and/or description of warning system:	- Tornado Siren at Hesperia Village Hall, 33 E. Michigan St.										
b.	population covered by warning sirens or system:	- 954										
(Note: Map showing warning siren and system coverage is included in Part D.)												

Village of Hesperia



ASHLAND TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 79.5 people per square mile of land area - 31.5 housing units per square mile of land area - Muskegon River, 4-6 small creeks - 3 small lakes - Widespread agriculture, widely scattered forest, and sparse urban development
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Brigadoon Golf Club, 12559 Bagley Ave (27 holes) - Christ Lutheran Preschool, 701 S Evergreen (day care, capacity 20)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 1,169 commute with and average commuting time of 32 minutes - 669 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,098 total housing units: 942 occupied/ 156 vacant - Of the vacant, 89 (57.1%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- Ashland Township Hall, 2019 W 120 th St.
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Ashland, 2019 W 120 th St
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-37, B-35 - Marquette Rail Railroad
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line
c.	other: (airports, pipelines, bus	- MichCon Natural Gas Pipeline

	terminals, train stations, military bases, marine passenger ferry services, etc.)													
6.	Socio-Economic Profile of Sector													
a.	total population (night):	2,773												
b.	peak population (seasonal):	3,034 (estimate)												
c.	percent over 65:	10.5												
d.	percent under 18:	28.5												
e.	percent below poverty level:	10.8												
f.	percent that are homeowners:	86.1												
g.	percent with disability or mobility limitation:	20.1												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="1"> <tr> <td>Personal:</td> <td>\$3,675,300</td> </tr> <tr> <td>Agricultural:</td> <td>\$19,043,600</td> </tr> <tr> <td>Commercial:</td> <td>\$3,732,400</td> </tr> <tr> <td>Industrial:</td> <td>\$215,500</td> </tr> <tr> <td>Residential:</td> <td>\$55,569,300</td> </tr> <tr> <td>Total:</td> <td>\$82,236,100</td> </tr> </table>	Personal:	\$3,675,300	Agricultural:	\$19,043,600	Commercial:	\$3,732,400	Industrial:	\$215,500	Residential:	\$55,569,300	Total:	\$82,236,100
Personal:	\$3,675,300													
Agricultural:	\$19,043,600													
Commercial:	\$3,732,400													
Industrial:	\$215,500													
Residential:	\$55,569,300													
Total:	\$82,236,100													
i.	flood insurance coverage:	<table border="1"> <tr> <td>Total Losses since 01/01/78:</td> <td>25</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>\$672,336</td> </tr> <tr> <td>Policies In-Force:</td> <td>13</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$1,675,000</td> </tr> </table>	Total Losses since 01/01/78:	25	Total Payments since 01/01/78:	\$672,336	Policies In-Force:	13	Total Insurance In-Force:	\$1,675,000				
Total Losses since 01/01/78:	25													
Total Payments since 01/01/78:	\$672,336													
Policies In-Force:	13													
Total Insurance In-Force:	\$1,675,000													
j.	location of floodplains:	- floodplain along Muskegon River, Greenwood Creek and Sand Creek												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Ashland Township



BARTON TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 20 people per square mile of land area - 11.9 housing units per square mile of land area - 2 small lakes, 3 creeks - Scattered forest (Manistee National Forest), and scattered agriculture
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- None Identified
f.	major employers	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 251 commute with an average commuting time of 21.7 minutes - 132 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 429 total housing units: 298 occupied/ 131 vacant - Of the vacant, 91 (69.5%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- Barton Township Park Bldg., 786 17 Mile Rd
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Barton, 12110 N Beech Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- B-96
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- None Identified
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector		
a.	total population (night):	717	
b.	peak population (seasonal):	945 (estimate)	
c.	percent over 65:	15.3	
d.	percent under 18:	21.2	
e.	percent below poverty level:	13.5	
f.	percent that are homeowners:	91.3	
g.	percent with disability or mobility limitation:	17.3	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$752,500 Agricultural: \$8,657,600 Commercial: \$330,000 Industrial: \$0 Residential: \$19,190,100 Total: \$28,930,200	
i.	flood insurance coverage:	Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	Not participating in the NFIP
j.	location of floodplains	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- None Identified	
b.	population covered by warning sirens or system:	- N/A	

Barton Township

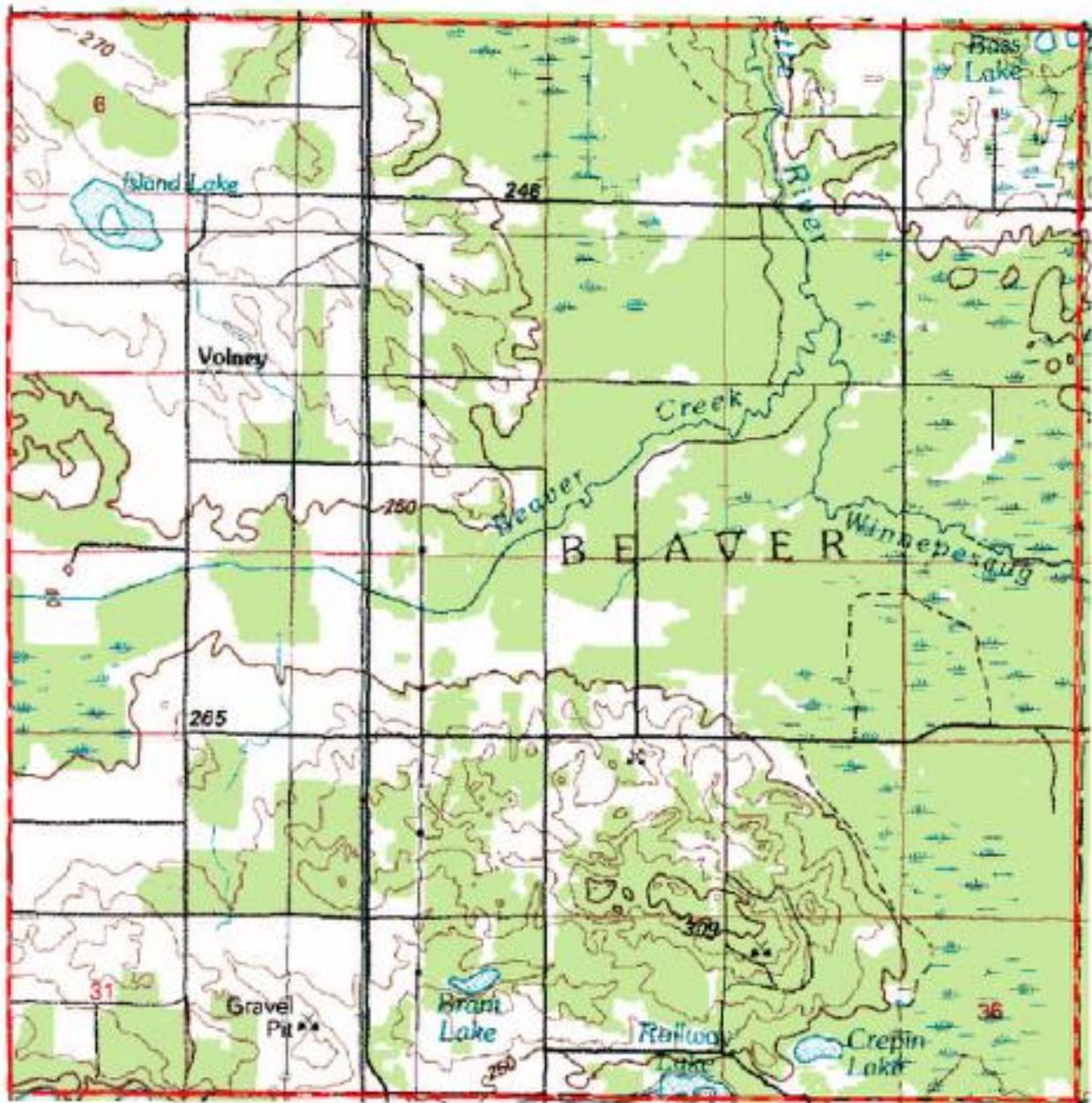


BEAVER TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 14.3 people per square mile of land area - 8.9 housing units per square mile of land area - Marquette River (south branch), Beaver Creek, 2 small creeks - Island Lake, 7 small lakes - Dense forest (Manistee National Forest), sparse agriculture
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Four Seasons Trailer Park, 36th Street, R #2 - Cindy Lou's Hide-A-Way, 6245 N. Comstock Rd (22 campsites)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 227 commute to work with an average commuting time of 30.2 minutes - 112 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 317 total housing units: 192 occupied/ 125 vacant - Of the vacant, 100 (80%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Beaver, 7991 N Dickinson Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- None Identified
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector		
a.	total population (night):	509	
b.	peak population (seasonal):	774 (estimate)	
c.	percent over 65:	12.2	
d.	percent under 18:	25.9	
e.	percent below poverty level:	18.2	
f.	percent that are homeowners:	86.5	
g.	percent with disability or mobility limitation:	22.9	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$617,100 Agricultural: \$8,176,700 Commercial: \$175,200 Industrial: \$247,000 Residential: \$15,021,900 Total: \$24,237,900	
i.	flood insurance coverage:	Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	<i>Not participating in the NFIP</i>
j.	location of floodplains:	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- None Identified	
b.	population covered by warning sirens or system:	- N/A	

Beaver Township



BIG PRAIRIE TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Muskegon River - Hardy Dam Pond, 2 small lakes - Dense forest (Manistee National Forest), widely scattered agriculture, and isolated urban development around Hardy Dam Pond - 81.7 people per square mile of land area - 50.7 housing units per square mile of land area
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2. Population Concentrations

a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Hardy Dam Ramp County Park - Oxbow Township Park, 2973 Cottonwood (197 sites) - Big Bend Township Park, 2000 South Beach (230 sites) - Newaygo State Park, 2793 Beech Ave (99 sites) - The Trout Club, 1695 East 40th St (campground) - Sandy Beach Campground, 6926 30th St (200 sites) - Sportsman Park Campground & Boat Slips, 2500 Sportsman Dr (86 sites) - Wolverine Service Club Recreation Area, Whitney Bridge Rd (10 sites)
f.	major employers:	- None Identified

3. Population Shifts

a.	daily:	<ul style="list-style-type: none"> - 805 commute to work with an average commuting time of 37.8 minutes - 494 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,598 total housing units: 1,016 occupied/ 582 vacant - Of the vacant, 455 (78.2%) are seasonal, recreational, or occasional use

4. Important or Critical Public and Private Facilities

a.	police precincts:	- None Identified
b.	fire stations:	- Big Prairie Township Fire Department, 2815 S Elm Ave
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities:	- None Identified
g.	historic places:	- Hardy Hydroelectric Plant, 6928 36 th St
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Big Prairie, 2815 S Elm Ave

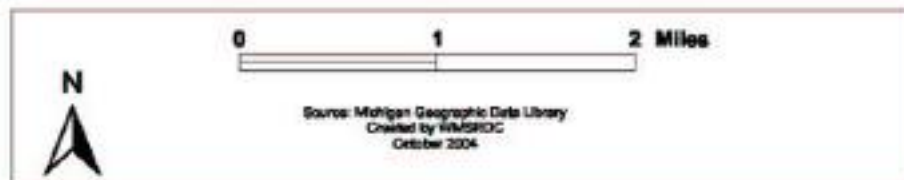
5. Vital or Critical Infrastructure

a.	roads, railroads, and bridges:	- M-20
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b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Hardy Dam - Hardy Hydroelectric Plant, 6928 East 36 th St - Consumers Energy Power Line	
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- Hardy Dam Marina, 6619 36 th Street (37 slips)	
6.	Socio-Economic Profile of Sector		
a.	total population (night):	2,573	
b.	peak population (seasonal):	3,724 (estimate)	
c.	percent over 65:	17.3	
d.	percent under 18:	22.2	
e.	percent below poverty level:	14.9	
f.	percent that are homeowners:	81.1	
g.	percent with disability or mobility limitation:	29.1	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal: Agricultural: Commercial: Industrial: Residential: Total:	\$2,145,400 \$0 \$1,158,100 \$10,598,400 \$46,759,500 \$60,661,400
i.	flood insurance coverage:	Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	<i>Not participating in the NFIP</i>
j.	Location of flood plains:	<i>Flood Hazard Areas – Not in Flood Insurance Program:</i> - floodplain along Muskegon River - floodplain around Hardy Dam Pond and adjacent creeks	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- Consumers Energy siren/speaker locations: 36 th St. at Hardy Dam Parking Lot (Consumers Energy property); near intersection of 44 th St. and River St. - Fire and Tornado Siren at Big Prairie Township Fire Department, 2815 S. Elm St	
b.	population covered by warning sirens or system:	- One mile radius for warning sirens - 600	
(Note: Map showing warning siren and system coverage is included in Part D.)			

Land Use and Natural Features Map (USGS Quad.)

Big Prairie Township

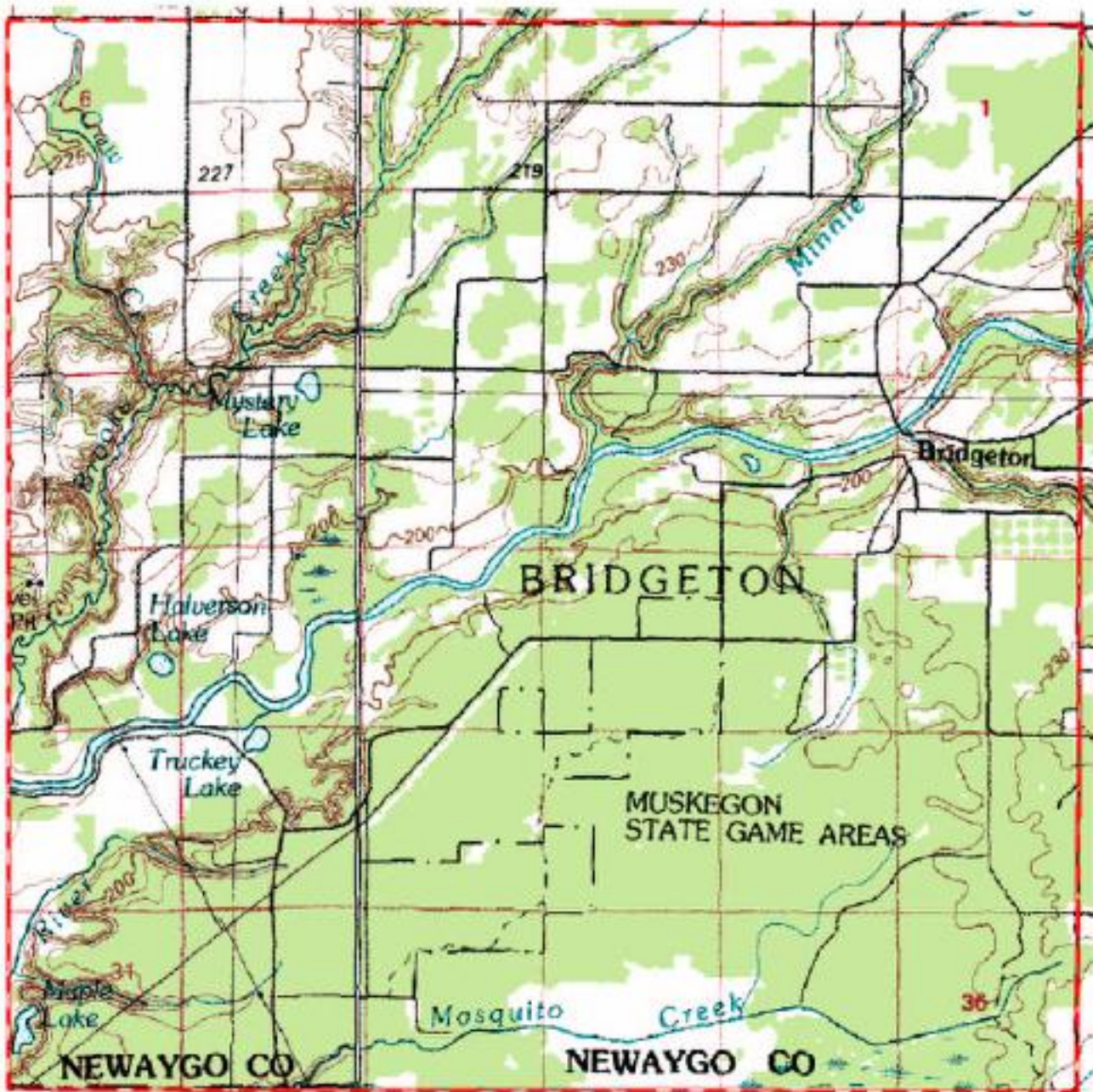


BRIDGETON TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Muskegon River, Maple River, 4 creeks - 6 small lakes - Dense forest, widely scattered agriculture - Muskegon State Game Area - 60.3 people per square mile of land area - 26.1 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Chinook Camping, 5471 W 112th St, 5471 W 112th St. (168 campsites) - Dan Raymond Park, 6971 W. 112th St, Grant, MI (164 campsites)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 890 commute to work with an average commuting time of 36.6 minutes - 464 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 926 total housing units: 776 occupied/ 150 vacant - Of the vacant, 82 (54.7%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Bridgeton, 11830 S. Warner Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - B-35, B-31 - B-35 bridge over Muskegon River - B-31 bridge over Muskegon River
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line

c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- MichCon Natural Gas Pipeline												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	2,141												
b.	peak population (seasonal):	2,367 (estimate)												
c.	percent over 65:	11.1												
d.	percent under 18:	25.6												
e.	percent below poverty level:	16.5												
f.	percent that are homeowners:	87.5												
g.	percent with disability or mobility limitation:	24.7												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="1"> <tr> <td>Personal Property:</td> <td>\$4,313,800</td> </tr> <tr> <td>Agricultural:</td> <td>\$2,737,800</td> </tr> <tr> <td>Commercial:</td> <td>\$636,400</td> </tr> <tr> <td>Industrial:</td> <td>\$169,500</td> </tr> <tr> <td>Residential:</td> <td>\$46,290,700</td> </tr> <tr> <td>Total:</td> <td>\$54,148,200</td> </tr> </table>	Personal Property:	\$4,313,800	Agricultural:	\$2,737,800	Commercial:	\$636,400	Industrial:	\$169,500	Residential:	\$46,290,700	Total:	\$54,148,200
Personal Property:	\$4,313,800													
Agricultural:	\$2,737,800													
Commercial:	\$636,400													
Industrial:	\$169,500													
Residential:	\$46,290,700													
Total:	\$54,148,200													
i.	flood insurance coverage:	<table border="1"> <tr> <td>Total Losses since 01/01/78:</td> <td>41</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>\$769,130</td> </tr> <tr> <td>Policies In-Force:</td> <td>25</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$3,544,300</td> </tr> </table>	Total Losses since 01/01/78:	41	Total Payments since 01/01/78:	\$769,130	Policies In-Force:	25	Total Insurance In-Force:	\$3,544,300				
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Total Payments since 01/01/78:	\$769,130													
Policies In-Force:	25													
Total Insurance In-Force:	\$3,544,300													
j.	location of floodplains:	- floodplain along Muskegon River, Minnie Creek and around Truckery Lake												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Bridgeton Township

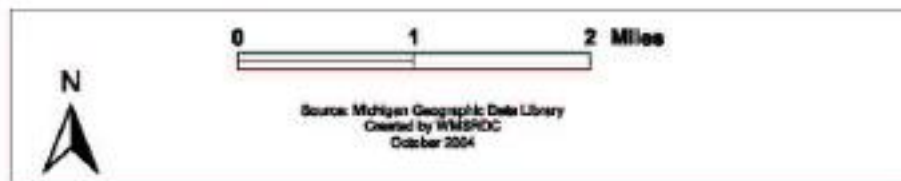
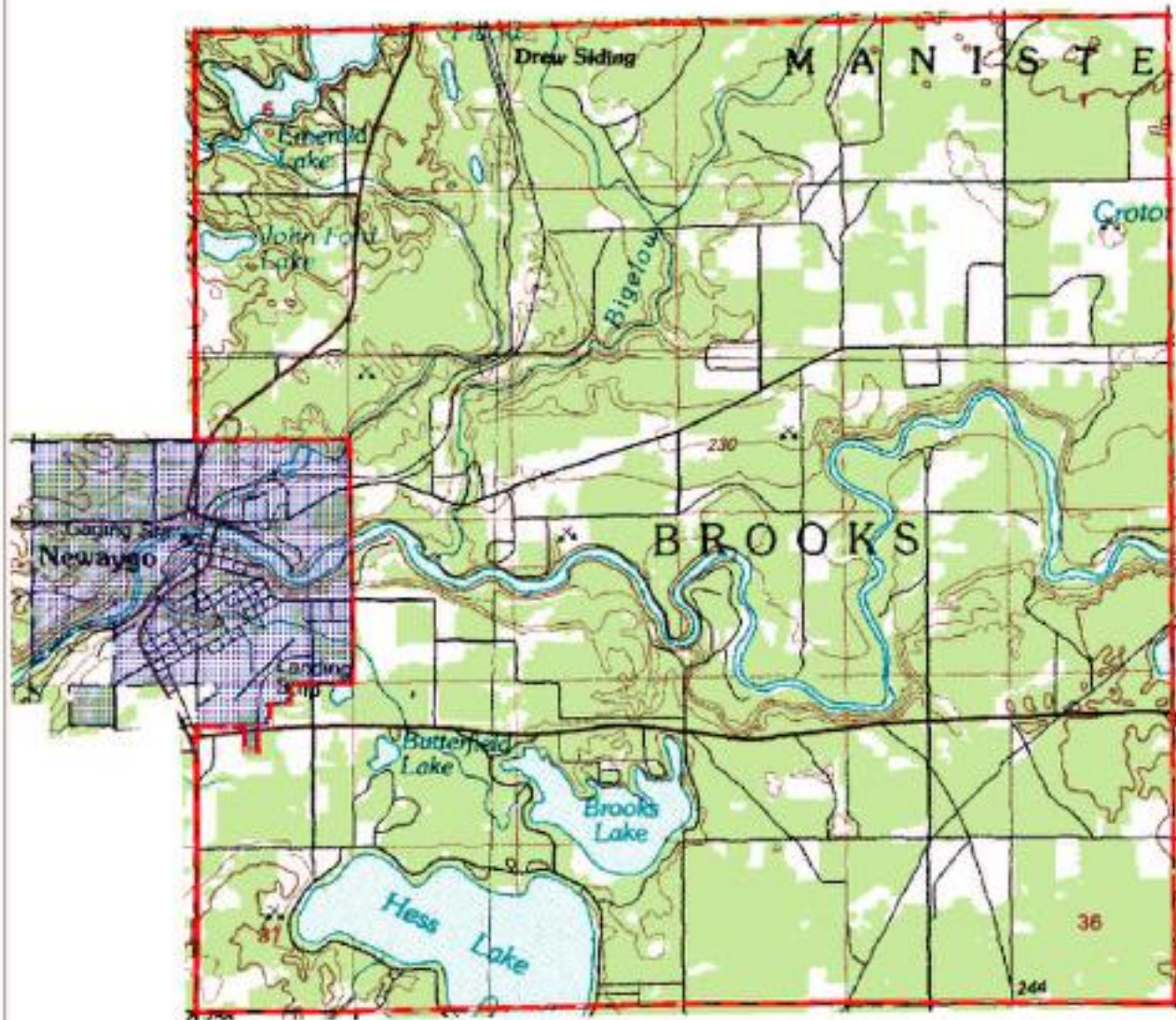


BROOKS TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Muskegon River, 4 creeks - Hess Lake, Brooks Lake, 6-8 small lakes - Dense forest (Manistee National Forest) and urban development around Hess Lake and Brooks Lake - 110.4 people per square mile of land area - 65.1 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- Fishers AFC, 1032 E 88 th (capacity 3)
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Ed H Henning County Park, 500 E Croton Drive (60 Sites) - M-37 Motel, 8372 Mason (5 units) - Camp Calvary, 7500 Pettit Drive (capacity 96) - Brooks Lake Mobile Home Park, 2263 Spruell (15 sites) - Lake Forest Park Mobile Home Community, 9502 S. Second - Wieranga's Hess Lake Trailer Park, 825 East 88th Street (34 sites)
f.	major employers	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 1,422 commute to work with an average commuting time of 33.3 minutes - 751 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 2,069 total housing units: 1,393 occupied/ 676 vacant - Of the vacant, 573 (84.8%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	<ul style="list-style-type: none"> - Brooks Township Hall, 490 Quarterline Rd. - Newaygo Middle School, 850 E. 76th St.
f.	community medical facilities, hospitals:	- None Identified
g.	historic sites:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Brooks, 490 Quarterline Rd
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- M-37, M-82

		- Marquette Rail Railroad												
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.	- Consumers Energy Power Line - Public Sewer Service												
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- MichCon Natural Gas Pipeline												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	3,510												
b.	peak population (seasonal):	4,954 (estimate)												
c.	percent over 65:	16.4												
d.	percent under 18:	24.1												
e.	percent below poverty level:	11.6												
f.	percent that are homeowners:	87.5												
g.	percent with disability or mobility limitation:	17.6												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="1"> <tr> <td>Personal Property:</td> <td>\$5,356,500</td> </tr> <tr> <td>Agricultural:</td> <td>\$357,000</td> </tr> <tr> <td>Commercial:</td> <td>\$3,516,300</td> </tr> <tr> <td>Industrial:</td> <td>\$0</td> </tr> <tr> <td>Residential:</td> <td>\$135,473,500</td> </tr> <tr> <td>Total:</td> <td>\$138,989,800</td> </tr> </table>	Personal Property:	\$5,356,500	Agricultural:	\$357,000	Commercial:	\$3,516,300	Industrial:	\$0	Residential:	\$135,473,500	Total:	\$138,989,800
Personal Property:	\$5,356,500													
Agricultural:	\$357,000													
Commercial:	\$3,516,300													
Industrial:	\$0													
Residential:	\$135,473,500													
Total:	\$138,989,800													
i.	flood insurance coverage:	<table border="1"> <tr> <td>Total Losses since 01/01/78:</td> <td>17</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>\$473,148</td> </tr> <tr> <td>Policies In-Force:</td> <td>33</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$5,660,300</td> </tr> </table>	Total Losses since 01/01/78:	17	Total Payments since 01/01/78:	\$473,148	Policies In-Force:	33	Total Insurance In-Force:	\$5,660,300				
Total Losses since 01/01/78:	17													
Total Payments since 01/01/78:	\$473,148													
Policies In-Force:	33													
Total Insurance In-Force:	\$5,660,300													
j.	location of floodplains:	- floodplain along Muskegon River												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- Consumers Energy siren/speaker locations: intersection of Pettit Lake Dr. and Tanglewood St. (private property); Thornapple Ave. (county right-of-way); Spruce Ave. (county right-of-way)												
b.	population covered by warning sirens or system:	- ¾ mile radius at a 70-decibel level and 1 ½ mile radius at a 60-decibel level												
(Note: Map showing warning siren and system coverage is included in Part D.)														

Brooks Township



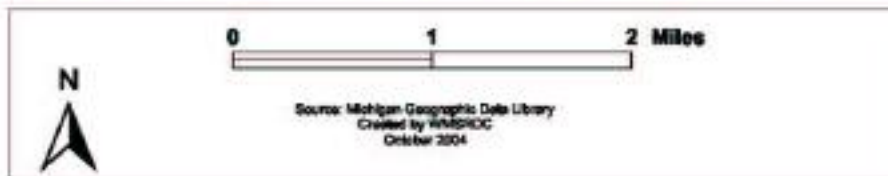
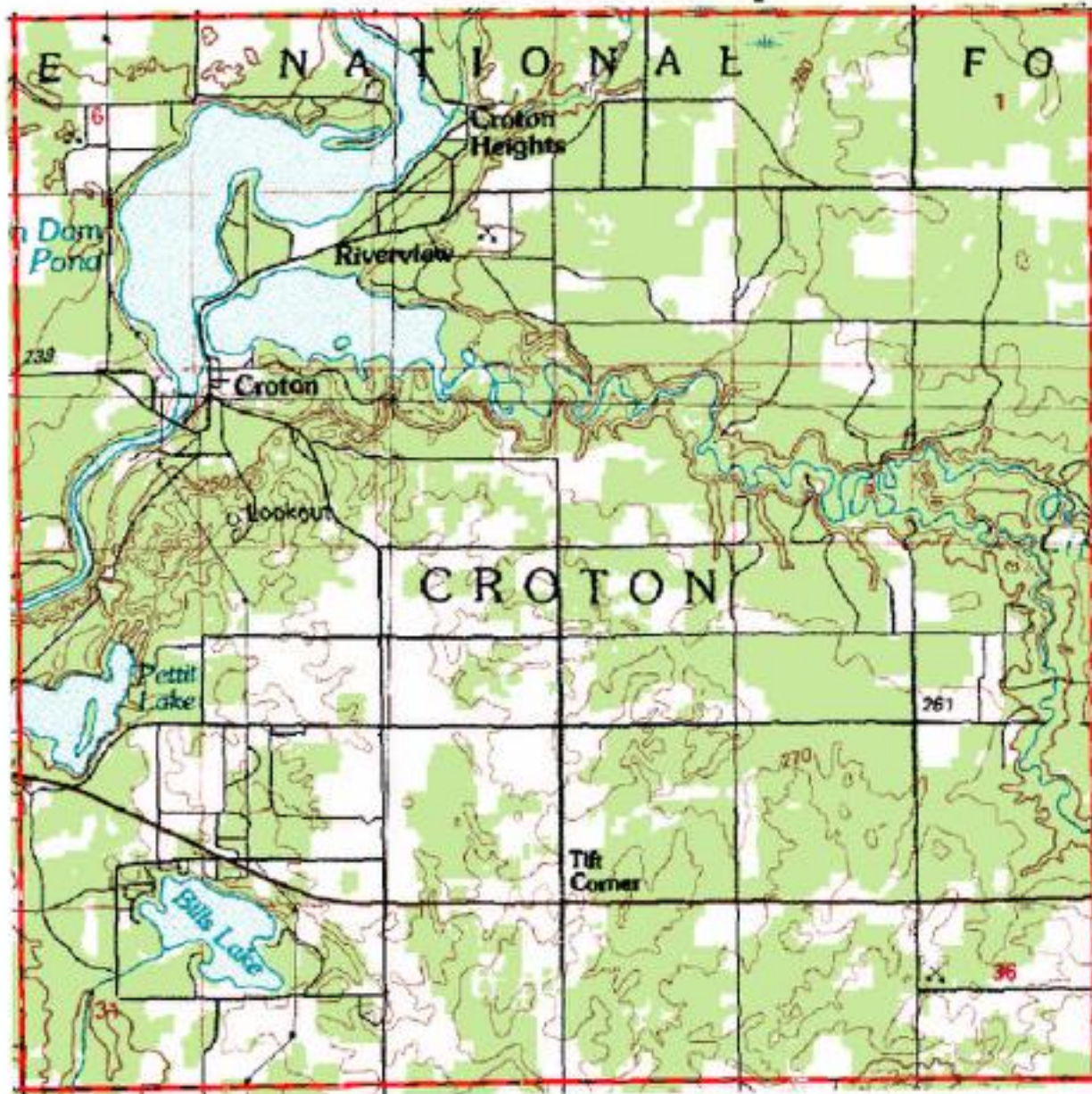
CROTON TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Croton Dam Pond, Little Muskegon River Pond, Bill's Lake, Pettit Lake - Muskegon River, Little Muskegon River, 2 creeks - Dense forest (Manistee National Forest), small area of agriculture, and urban development around Bill's Lake and Croton Dam Pond - 94.9 people per square mile of land area - 56.7 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Croton Township Campground, 5725 Croton Hardy Drive (157 campsites) - Camp Calvary, 7500 Pettit Dr (22 campsites) - Riverside Resort, 5757 Division (10 units) - Frank's Alpine Resort, 5724 Croton Hardy Drive - VFW Children's Camp, 5566 East 86th (capacity 88) - Croton Day Care Center, 5764 Division (capacity 139)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 1,474 commute to work with an average commuting time of 35.9 minutes - 626 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,927 total housing units: 1,319 occupied/ 608 vacant - Of the vacant, 473 (77.8%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- Croton Township Fire Department, 6464 S Croton Hardy Dr
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	<ul style="list-style-type: none"> - Pine Grove Community Church, 8775 E. 88th St. - Croton Township Fire Department, 6431 S. Elm St.
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	<ul style="list-style-type: none"> - Croton Congregational Church, SE Corner of Croton-Hardy Drive and Division - Oak Grove District No. 3 Schoolhouse, 6382 E. 80th
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	<ul style="list-style-type: none"> - Township of Croton, 5833 E Division St - Croton Public Library, 6464 Croton Hardy Drive

5.	Vital or Critical Infrastructure		
a.	roads, railroads, and bridges:	- M-82	
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Croton Dam - Croton Hydroelectric Dam, Croton Dam Rd - Consumers Energy Power Line	
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- MichCon Natural Gas Pipeline	
6.	Socio-Economic Profile of Sector		
a.	total population (night):	3,228	
b.	peak population (seasonal):	4,387 (estimate)	
c.	percent over 65:	16.9	
d.	percent under 18:	22	
e.	percent below poverty level:	10.6	
f.	percent that are homeowners:	88.2	
g.	percent with disability or mobility limitation:	17.1	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$6,812,600 Agricultural: \$0 Commercial: \$2,700,400 Industrial: \$3,939,200 Residential: \$122,959,100 Total: \$136,411,300	
i.	flood insurance coverage	Total Losses since 01/01/78: 1 Total Payments since 01/01/78: N/A Policies In-Force: 21 Total Insurance In-Force: \$4,337,200	
j.	location of floodplains:	- floodplain along Muskegon River, Little Muskegon River, Tamarack Creek, and around Bills Lake, Croton Dam Pond and Pettit Lake	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- Consumers Energy siren/speaker locations: 52 nd St. (private property); Marclay St. behind Independent Bank (county right-of-way); 68 th St. (Consumers Energy property) - Fire & Tornado Siren, 6464 S Croton-Hardy Drive	
b.	population covered by warning sirens or system:	- One mile radius for the fire department siren - 1,200	
(Note: Map showing warning siren and system coverage is included in Part D.)			

Land Use and Natural Features Map (USGS Quad.)

Croton Township



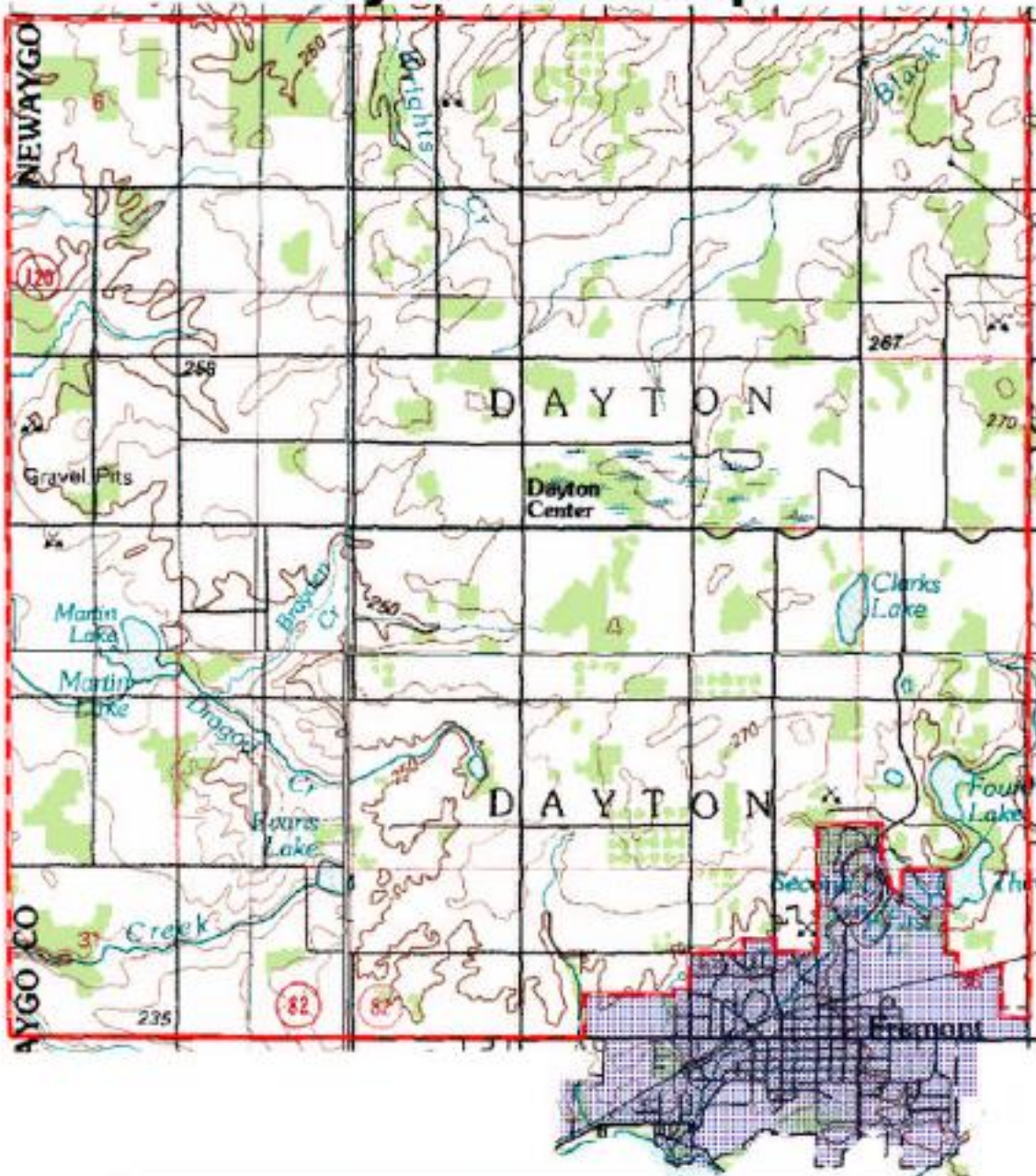
DAYTON TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 10 lakes - 5 creeks - Sparse forests, widespread agriculture, and isolated urban development around lakes - 57.7 people per square mile of land area - 22.7 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- Countryside, 6116 W. Pat St, Fremont, MI (capacity 6)
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Northwood Golf Course, 2888 South Comstock Ave (18 holes) - Country View Estates Mobile Home Community, 401 Market Street
f.	major employers:	- Wal-Mart Supercenter, 7083 W 48 th (approx 195 employees)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 997 commute to work with an average commuting time of 19.2 minutes - 431 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 767 total housing units: 694 occupied/ 73 vacant - Of the vacant, 35 (47.9%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Dayton, 3215 S Stone Rd
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- M-82, M-120
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector		
a.	total population (night):	1,949	
b.	peak population (seasonal):	2,047 (estimate)	
c.	percent over 65:	15.7	
d.	percent under 18:	25.4	
e.	percent below poverty level:	4.3	
f.	percent that are homeowners:	91.1	
g.	percent with disability or mobility limitation:	13.3	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$1,818,000 Agricultural: \$29,358,400 Commercial: \$2,802,000 Industrial: \$232,900 Residential: \$42,647,900 Total: \$76,859,200	
i.	flood insurance coverage:	Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	<i>Not participating in the NFIP</i>
j.	location of floodplains:	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- None Identified	
b.	population covered by warning sirens or system:	- N/A	

Land Use and Natural Features Map (USGS Quad.)

Dayton Township

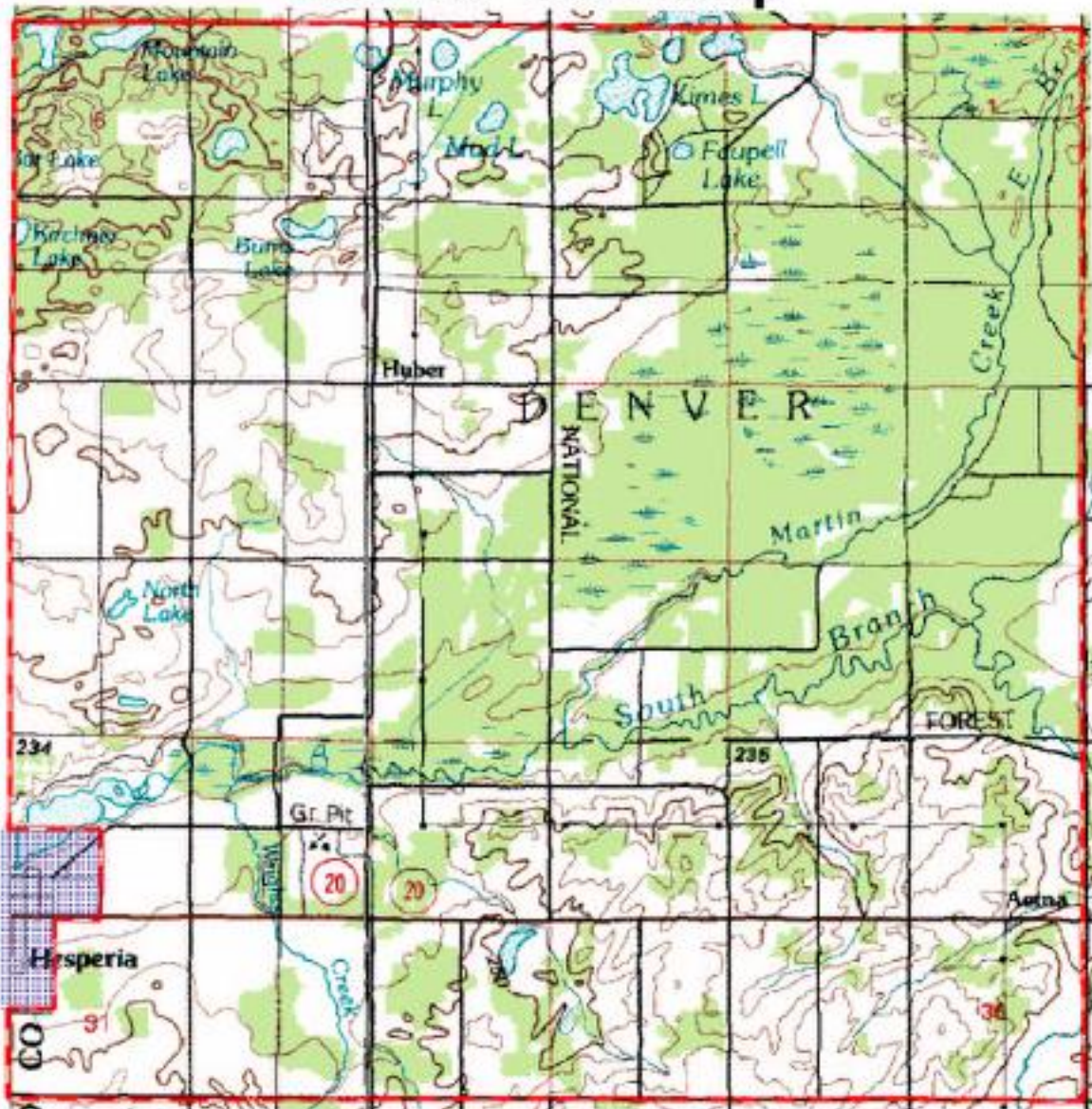


DENVER TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - White River, 4-6 creeks - Hesperia Pond, 14 small lakes - Dense forests (Manistee National Forest), scattered agriculture, wetlands around Hesperia Pond and Lakes - 54.5 people per square mile of land area - 26 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Hesperia Area Child Development Center, 5210 One Mile Rd (capacity 58) - Timbers Edge Campground, 4345 N Warner (50 campsites)
f.	major employers	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 689 commute to work with an average commuting time of 28.1 minutes - 420 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 920 total housing units: 756 occupied/ 164 vacant - Of the vacant, 100 (61.0%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- Weaver, Daniel, House, 84 S. Cook Street
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Denver, 33 E Michigan Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- M-120, M-20
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector	
a.	total population (night):	(numbers include Village of Hesperia) 1,928
b.	peak population (seasonal):	(numbers include Village of Hesperia) 2,183 (estimate)
c.	percent over 65:	16.4
d.	percent under 18:	25
e.	percent below poverty level:	17.6
f.	percent that are homeowners:	84.9
g.	percent with disability or mobility limitation:	23
h.	estimated property insurance coverage (Real Equalized Valuations): <div> Personal Property: \$1,606,200 Agricultural: \$5,115,200 Commercial: \$2,642,500 Industrial: \$155,300 Residential: \$35,921,900 Total: \$45,441,100 </div>	
i.	flood insurance coverage: <div> Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force: </div>	<i>Not participating in the NFIP</i>
j.	location of floodplains:	- None Identified
7.	Emergency Warning System Coverage	
a.	siren locations and/or description of warning system:	- None Identified
b.	population covered by warning sirens or system:	- N/A

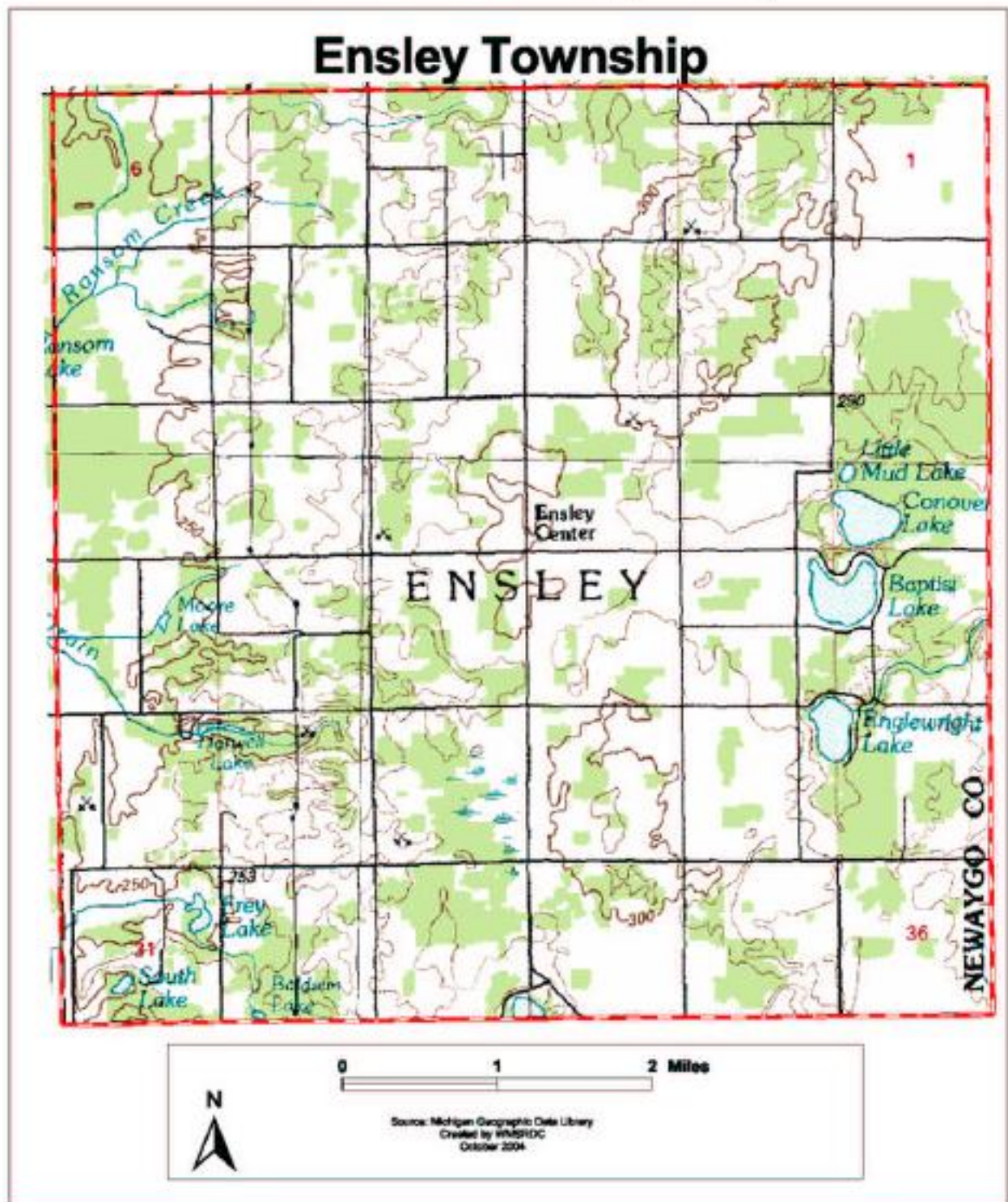
Denver Township



ENSLEY TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 10 small lakes - 2 creeks - Scattered forests and widespread agriculture - 73.8 people per square mile of land area - 30.6 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	<ul style="list-style-type: none"> - Clapp Foster Care, 12310 Tamarack (capacity 2) - Peaceful Acres AFC, 6135 112th St. (capacity 12)
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- None Identified
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 1,147 commute to work with an average commuting time of 41.3 minutes - 619 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,091 total housing units: 919 occupied/ 172 vacant - Of the 172 vacant, 110 (64.0%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Ensley, 7163 E 120 th St
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- None Identified
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- MichCon Natural Gas Pipeline

6.	Socio-Economic Profile of Sector		
a.	total population (night):	2,635	
b.	peak population (seasonal):	2,949 (estimate)	
c.	percent over 65:	9.6	
d.	percent under 18:	26.8	
e.	percent below poverty level:	10.3	
f.	percent that are homeowners:	89.9	
g.	percent with disability or mobility limitation:	16	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$3,709,500 Agricultural: \$18,794,900 Commercial: \$1,898,800 Industrial: \$295,300 Residential: \$56,291,900 Total: \$80,990,400	
i.	flood insurance coverage:	Total Losses since 01/01/78: \$0 Total Payments since 01/01/78: \$0 Policies In-Force: 0 Total Insurance In-Force: \$0	
j.	location of floodplains:	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- None Identified	
b.	population covered by warning sirens or system:	- N/A	

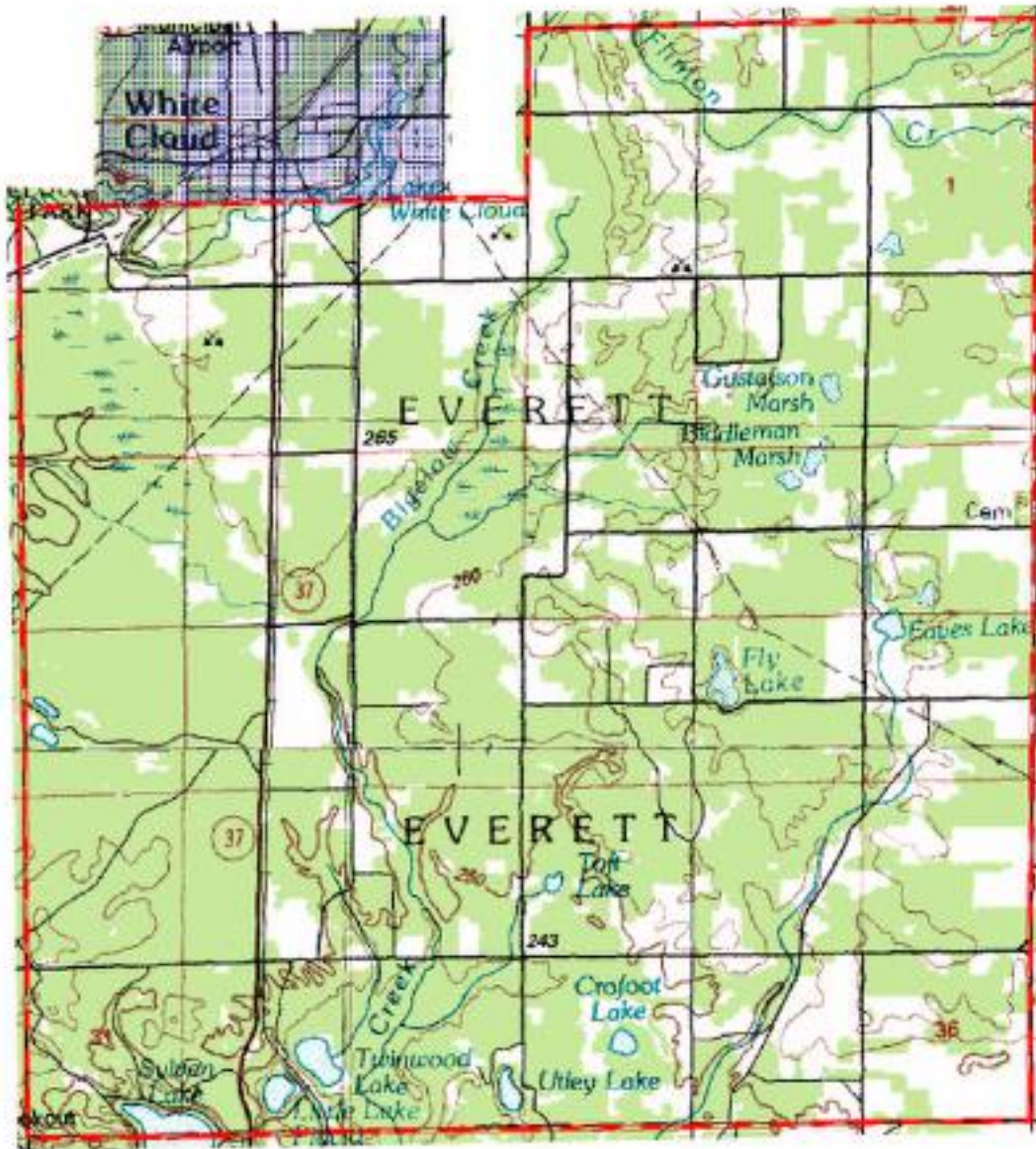


EVERETT TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 13-16 lakes - White River, 4 creeks - Dense forest (Manistee National Forest) and isolated agriculture - 52.3 people per square mile of land area - 25.1 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- Oakview, 979 S. Oakview (capacity 6)
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Sports County Park - Leisure Time RV Park, 4799 South Spruce (94 campsites) - Woodlands on the Lake RV Resort, 4495 South Spruce (334 campsites) - Blue Sky Resort & Ranch, 4470 E. 28th - Johnny's Motel, 644 South Evergreen (8 rooms) - Bob's Villa Mar Motel, 3993 S Evergreen
f.	major employers:	- North American Refractories Company, 1301 E 8 th (125 employees)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 697 commute to work with an average commuting time of 32.6 minutes - 298 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 893 total housing units: 714 occupied/ 179 vacant - Of the vacant, 111 (62.0%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Everett, 1516 E 8 th St
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-37, M-20 - M-37 bridge over White River - Marquette Rail Railroad - Marquette Rail Railroad bridge over White River

b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line - White Cloud Dam - Public Sewer Service	
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified	
6.	Socio-Economic Profile of Sector		
a.	total population (night):	1,862	
b.	peak population (seasonal):	2,423 (estimate)	
c.	percent over 65:	15.8	
d.	percent under 18:	25	
e.	percent below poverty level:	8.3	
f.	percent that are homeowners:	84.6	
g.	percent with disability or mobility limitation:	21.3	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$2,892,000 Agricultural: \$0 Commercial: \$2,455,200 Industrial: \$1,369,200 Residential: \$43,154,500 Total: \$49,870,900	
i.	flood insurance coverage:	Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	<i>Not participating in the NFIP</i>
j.	location of floodplains:	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- None Identified	
b.	population covered by warning sirens or system:	- N/A	

Everett Township

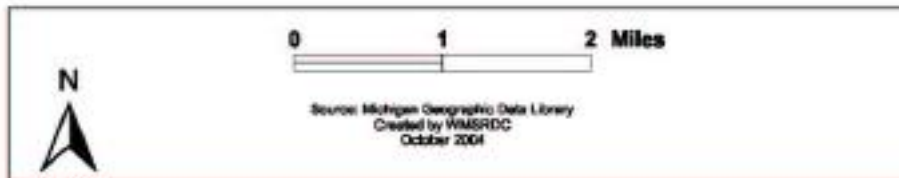
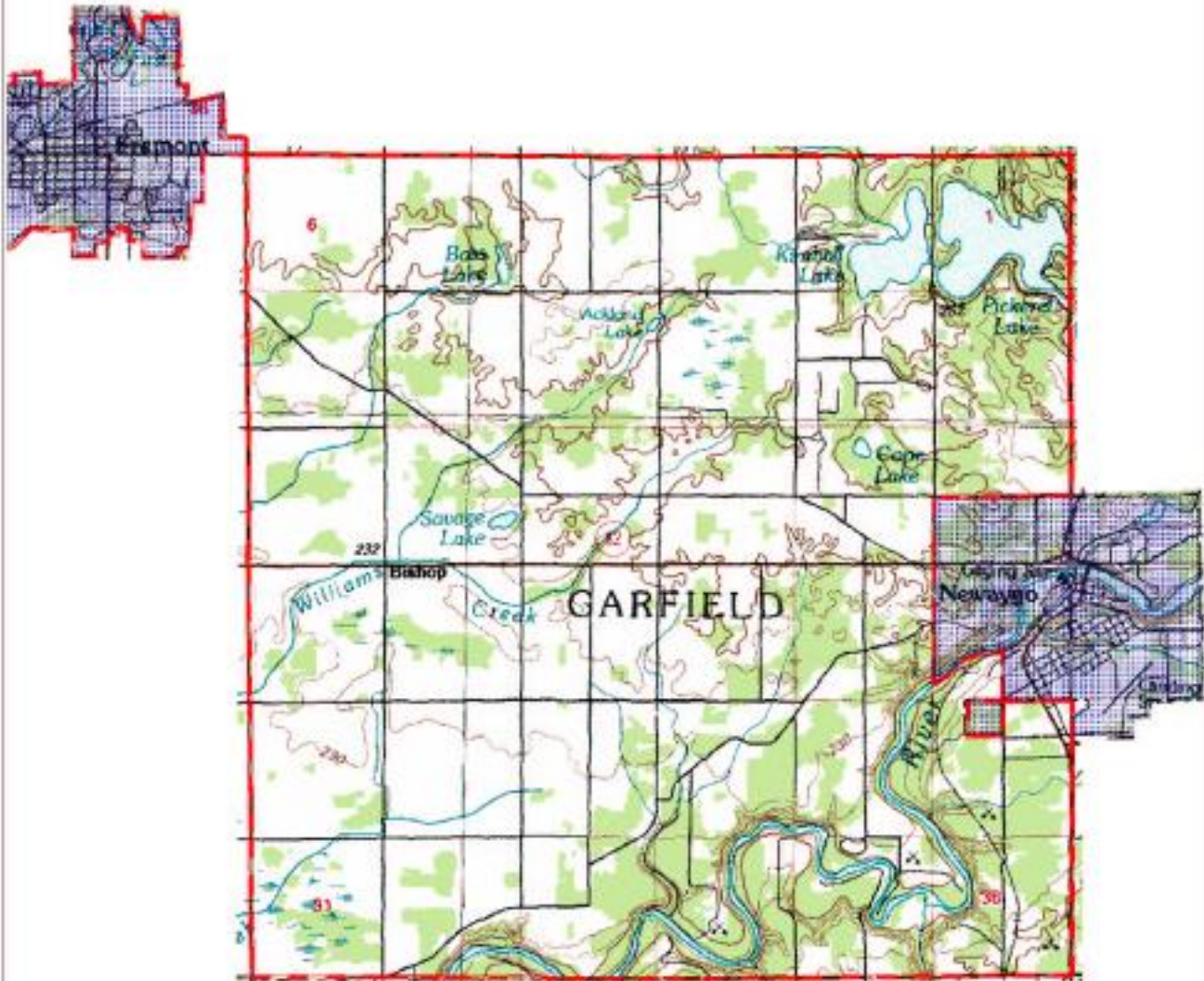


GARFIELD TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Muskegon River, 2 small creeks - Pickerel Lake, Kimball Lake, 4 small lakes - Scattered forests, widespread agriculture, urban development around Muskegon River and lakes - 76 people per square mile of land area - 32.6 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- Dallas Darling Home, 7003 Baldwin Ave (capacity 12)
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - VFW Post # 4249, 9074 Mason (assembly hall) - Transitional Health Services of Fremont, 4554 W 48th St (nursing home, capacity 129) - Cronk's Oakridge Motel, 9145 Mason (33 rooms) - Camp Newaygo, 5333 South Centerline Rd (capacity 140) - Camp Henry, 5755 South Gordon Ave (lodge and cabin capacity of 322 and additional camping sites) - Little Switzerland (campground), 254 Pickerel Lake Drive (80 sites) - Mystery Creek Campground, 9379 Wisner (85 campsites) - Salmon Run Campground Canoes & Tubes, 8845 Felch (80 sites) - Village Green Golf Club, 8130 Bingham (18 holes)
f.	major employers:	- Transitional Health Services of Fremont, 4554 W 48 th (105 employees)
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 930 commute to work with an average commuting time of 23.4 minutes - 598 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,089 total housing units: 826 occupied/ 263 vacant - Of the vacant, 212 (80.6%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	Police precincts:	- None Identified
b.	fire stations:	- covered by Newaygo Fire District
c.	Public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	Community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Garfield, 7190 S Bingham Ave

5.	Vital or Critical Infrastructure													
a.	roads, railroads, and bridges:	- M-37, M-82 - Marquette Rail Railroad												
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line - Public Sewer Service												
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	2,537												
b.	peak population (seasonal):	2,752 (estimate)												
c.	percent over 65:	19												
d.	percent under 18:	26.7												
e.	percent below poverty level:	15.1												
f.	percent that are homeowners:	86.4												
g.	percent with disability or mobility limitation:	20.1												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="0"> <tr> <td>Personal Property:</td> <td>\$7,298,500</td> </tr> <tr> <td>Agricultural:</td> <td>\$19,824,400</td> </tr> <tr> <td>Commercial:</td> <td>\$5,539,500</td> </tr> <tr> <td>Industrial:</td> <td>\$0</td> </tr> <tr> <td>Residential:</td> <td>\$66,198,800</td> </tr> <tr> <td>Total:</td> <td>\$98,861,200</td> </tr> </table>	Personal Property:	\$7,298,500	Agricultural:	\$19,824,400	Commercial:	\$5,539,500	Industrial:	\$0	Residential:	\$66,198,800	Total:	\$98,861,200
Personal Property:	\$7,298,500													
Agricultural:	\$19,824,400													
Commercial:	\$5,539,500													
Industrial:	\$0													
Residential:	\$66,198,800													
Total:	\$98,861,200													
i.	flood insurance coverage	<table border="0"> <tr> <td>Total Losses since 01/01/78:</td> <td>23</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>\$393,839</td> </tr> <tr> <td>Policies In-Force:</td> <td>7</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$823,100</td> </tr> </table>	Total Losses since 01/01/78:	23	Total Payments since 01/01/78:	\$393,839	Policies In-Force:	7	Total Insurance In-Force:	\$823,100				
Total Losses since 01/01/78:	23													
Total Payments since 01/01/78:	\$393,839													
Policies In-Force:	7													
Total Insurance In-Force:	\$823,100													
j.	location of floodplains:	- floodplain along Muskegon River and Four Mile Creek												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Garfield Township

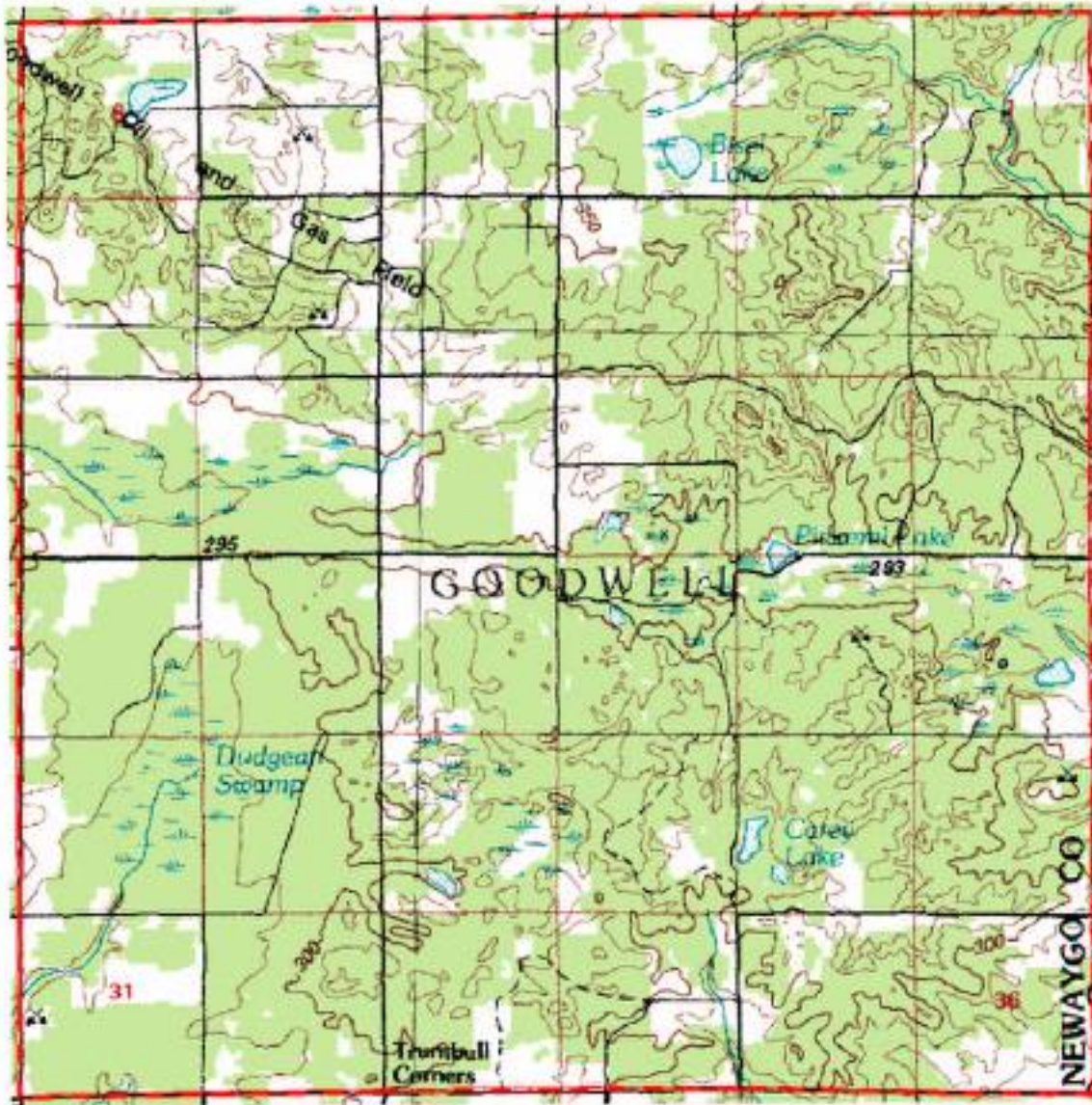


GOODWELL TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 11 small lakes - 2 small creeks - Dense forests (Manistee National Forest), scattered agriculture, and wetlands around lakes - 15.4 people per square mile of land area - 9 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- None Identified
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 229 commute to work with an average commuting time of 29.1 minutes - 112 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 322 total housing units: 207 occupied/ 115 vacant - Of the vacant, 94 (81.7%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- Goodwell Township Hall, 2465 N Cypress Ave
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- Big Prairie Grange No. 935 Hall, 1968 Elm Ave
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Goodwell, 2465 N Cypress Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- M-20
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- None Identified
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector	
a.	total population (night):	547
b.	peak population (seasonal):	795 (estimate)
c.	percent over 65:	17.4
d.	percent under 18:	21.2
e.	percent below poverty level:	16.1
f.	percent that are homeowners:	89.9
g.	percent with disability or mobility limitation:	17.2
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$9,673,200 Agricultural: \$0 Commercial: \$0 Industrial: \$1,721,900 Residential: \$24,668,900 Total: \$36,064,000
i.	flood insurance coverage Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	<i>Not participating in the NFIP</i>
j.	location of floodplains:	- None Identified
7.	Emergency Warning System Coverage	
a.	siren locations and/or description of warning system:	- None Identified
b.	population covered by warning sirens or system:	- N/A

Goodwell Township



GRANT TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Hess Lake - Rogue River, 4-6 small creeks - Scattered forests, widespread agriculture and scattered urban development concentrated around lakes - 91.8 people per square mile of land area - 35.4 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	<ul style="list-style-type: none"> - Grant Christian School, 12931 S Poplar Ave - Grant Middle School, 96 E 120th
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Grant Christian Preschool (daycare, capacity 12) - Grant Middle School Stadium, 96 E 120th
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 1,332 commute to work with an average commuting time of 31.4 minutes - 767 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,270 total housing units: 1,118 occupied/ 152 vacant - Of the vacant, 69 (45.4%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- Covered by Ashland-Grant Fire District (City of Grant)
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- Grant Middle School, 96 E 120 th St
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Grant, 1617 E 120 th St
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- M-37
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	<ul style="list-style-type: none"> - Kosten Drain - Consumers Energy Power Line
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	<ul style="list-style-type: none"> - Grant Airport, 11798 S Willow - MichCon Natural Gas Pipeline

6.	Socio-Economic Profile of Sector													
a.	total population (night):	3,294												
b.	peak population (seasonal):	3,496 (estimate)												
c.	percent over 65:	11												
d.	percent under 18:	27.9												
e.	percent below poverty level:	10.9												
f.	percent that are homeowners:	88.6												
g.	percent with disability or mobility limitation:	15.2												
h.	estimated property insurance coverage (Real Equalized Valuations): <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Personal Property:</td> <td>\$2,095,309</td> </tr> <tr> <td>Agricultural:</td> <td>\$18,724,100</td> </tr> <tr> <td>Commercial:</td> <td>\$657,600</td> </tr> <tr> <td>Industrial:</td> <td>\$297,800</td> </tr> <tr> <td>Residential:</td> <td>\$63,448,100</td> </tr> <tr> <td>Total:</td> <td>\$85,222,909</td> </tr> </table>	Personal Property:	\$2,095,309	Agricultural:	\$18,724,100	Commercial:	\$657,600	Industrial:	\$297,800	Residential:	\$63,448,100	Total:	\$85,222,909	
Personal Property:	\$2,095,309													
Agricultural:	\$18,724,100													
Commercial:	\$657,600													
Industrial:	\$297,800													
Residential:	\$63,448,100													
Total:	\$85,222,909													
i.	flood insurance coverage: <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Total Losses since 01/01/78:</td> <td></td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td></td> </tr> <tr> <td>Policies In-Force:</td> <td></td> </tr> <tr> <td>Total Insurance In-Force:</td> <td></td> </tr> </table>	Total Losses since 01/01/78:		Total Payments since 01/01/78:		Policies In-Force:		Total Insurance In-Force:		<i>Not participating in the NFIP</i>				
Total Losses since 01/01/78:														
Total Payments since 01/01/78:														
Policies In-Force:														
Total Insurance In-Force:														
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	- population covered by warning sirens or system:	- N/A												

Grant Township

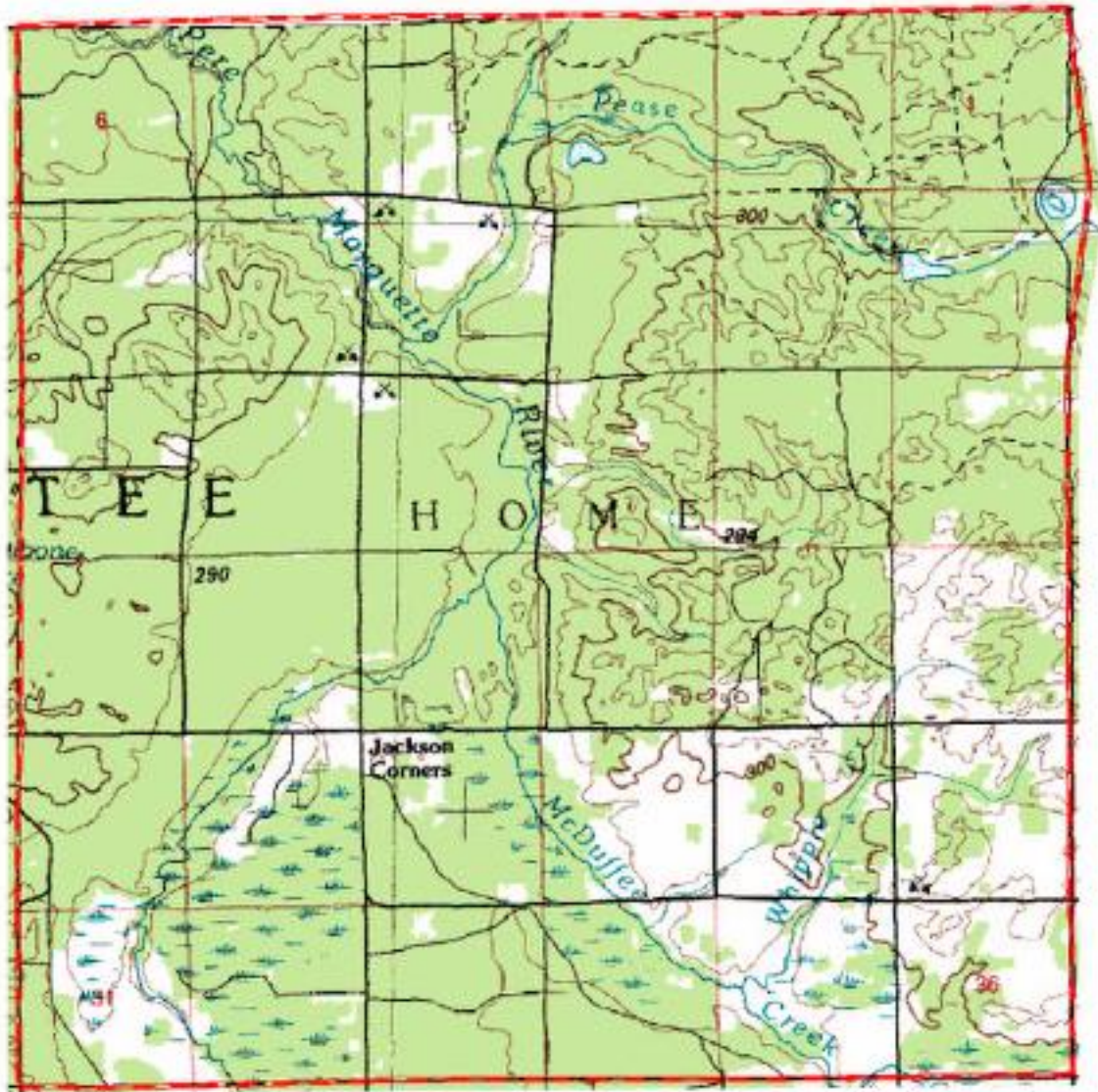


HOME TOWNSHIP

1.	major geographic features:	- Little South Branch Pere Marquette River, 3 creeks - Dense forest (Manistee National Forest) and isolated agriculture - 6.5 people per square mile of land area - 7 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- Big Jackson Public School (elementary), 4020 East 13 Mile Rd (34 students, 9 total staff)
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- None Identified
f.	major employers	- None Identified
3.	Population Shifts	
a.	daily:	- 61 commute to work with an average commuting time of 27.2 minutes - 33 school-aged children
b.	seasonal:	- 249 total housing units: 103 occupied/ 146 vacant - Of the vacant, 138 (94.5%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Home, 11253 N Walnut Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- B-96
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.	- Pease Creek Dam
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector													
a.	total population (night):	232												
b.	Peak population (seasonal):	543 (estimate)												
c.	percent over 65:	24.6												
d.	percent under 18:	15.5												
e.	percent below poverty level:	25.8												
f.	percent that are homeowners:	85.4												
g.	percent with disability or mobility limitation:	18												
h.	estimated property insurance coverage (Real Equalized Valuations): <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Personal Property:</td> <td>\$382,200</td> </tr> <tr> <td>Agricultural:</td> <td>\$2,144,500</td> </tr> <tr> <td>Commercial:</td> <td>\$0</td> </tr> <tr> <td>Industrial:</td> <td>\$0</td> </tr> <tr> <td>Residential:</td> <td>\$17,906,800</td> </tr> <tr> <td>Total:</td> <td>\$20,433,500</td> </tr> </table>	Personal Property:	\$382,200	Agricultural:	\$2,144,500	Commercial:	\$0	Industrial:	\$0	Residential:	\$17,906,800	Total:	\$20,433,500	
Personal Property:	\$382,200													
Agricultural:	\$2,144,500													
Commercial:	\$0													
Industrial:	\$0													
Residential:	\$17,906,800													
Total:	\$20,433,500													
i.	flood insurance coverage: <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Total Losses since 01/01/78:</td> <td></td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td></td> </tr> <tr> <td>Policies In-Force:</td> <td></td> </tr> <tr> <td>Total Insurance In-Force:</td> <td></td> </tr> </table>	Total Losses since 01/01/78:		Total Payments since 01/01/78:		Policies In-Force:		Total Insurance In-Force:		<i>Not participating in the NFIP</i>				
Total Losses since 01/01/78:														
Total Payments since 01/01/78:														
Policies In-Force:														
Total Insurance In-Force:														
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Home Township

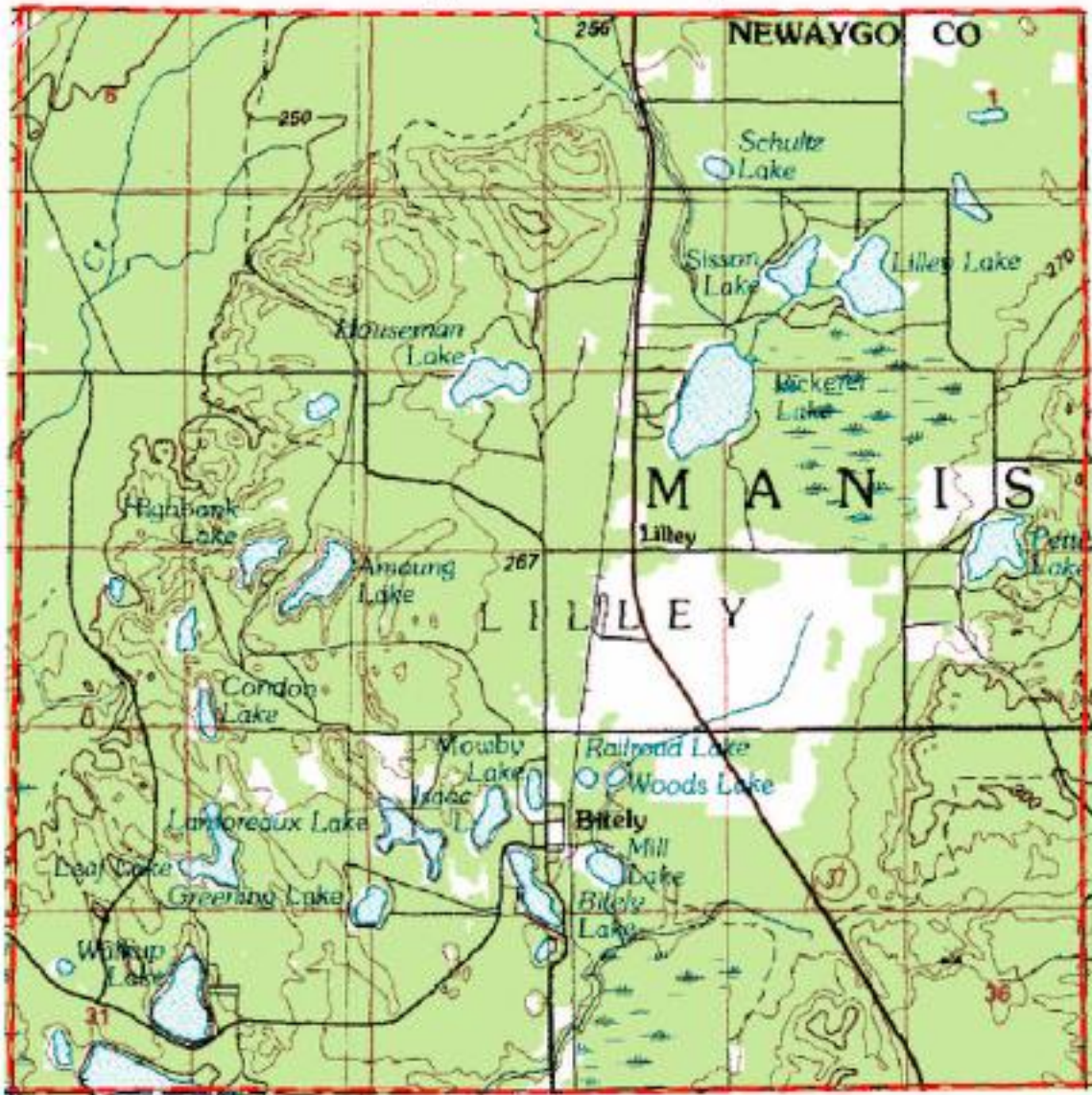


LILLEY TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - 26-29 small lakes and ponds - 3 creeks - Dense forest (Manistee National Forest), isolated open field and urban development around lakes - 23.1 people per square mile of land area - 30.8 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- Bitely Head Start Program, 10697 N Bingham
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Championship Snowmobile Water Race in Bitely (August) - Pettibone Lake County Park - High Banks Federal Park - Pettibone Lake Campground, 490 W Pettibone Lake Drive (16 campsites) - Pickerel Lake Lakeside Campground, 12666 N. Woodbridge (46 campsites) - Lonesome Lake Campground, 318 W. 18 Mile Rd (50 campsites)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 244 commute to work with an average commuting time of 44.9 minutes - 119 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,063 total housing units: 373 occupied/ 690 vacant - Of the vacant, 629 (91.2%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- Lilley Township Fire Department, 11664 N. Gordon Ave.
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- Bitely Community Church, 10981 Bingham Rd
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- Lilley District No. 5 School, NE Corner of Bingham and Main
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	<ul style="list-style-type: none"> - Township of Lilley, 10722 N Bingham Ave - United States Post Office, Bitely 10647 N Bingham
5.	Vital or Critical Infrastructure	

a.	roads, railroads, and bridges:	- M-37, B-96 - Marquette Rail Railroad	
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- None Identified	
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified	
6.	Socio-Economic Profile of Sector		
a.	total population (night):	797	
b.	peak population (seasonal):	2,137 (estimate)	
c.	percent over 65:	19.2	
d.	percent under 18:	22.2	
e.	percent below poverty level:	17	
f.	percent that are homeowners:	86.6	
g.	percent with disability or mobility limitation:	29.3	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: Agricultural: Commercial: Industrial: Residential: Total:	\$731,900 \$1,776,800 \$728,600 \$0 \$37,531,000 \$40,768,300
i.	flood insurance coverage	Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	<i>Not participating in the NFIP</i>
j.	location of floodplains:	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- Fire Siren at Lilley Township Fire Department, 10730 N Prospect (remote activation by Central Dispatch and on-site activation)	
b.	population covered by warning sirens or system:	- 400	
(Note: Map showing warning siren and system coverage is included in Part D.)			

Lilley Township

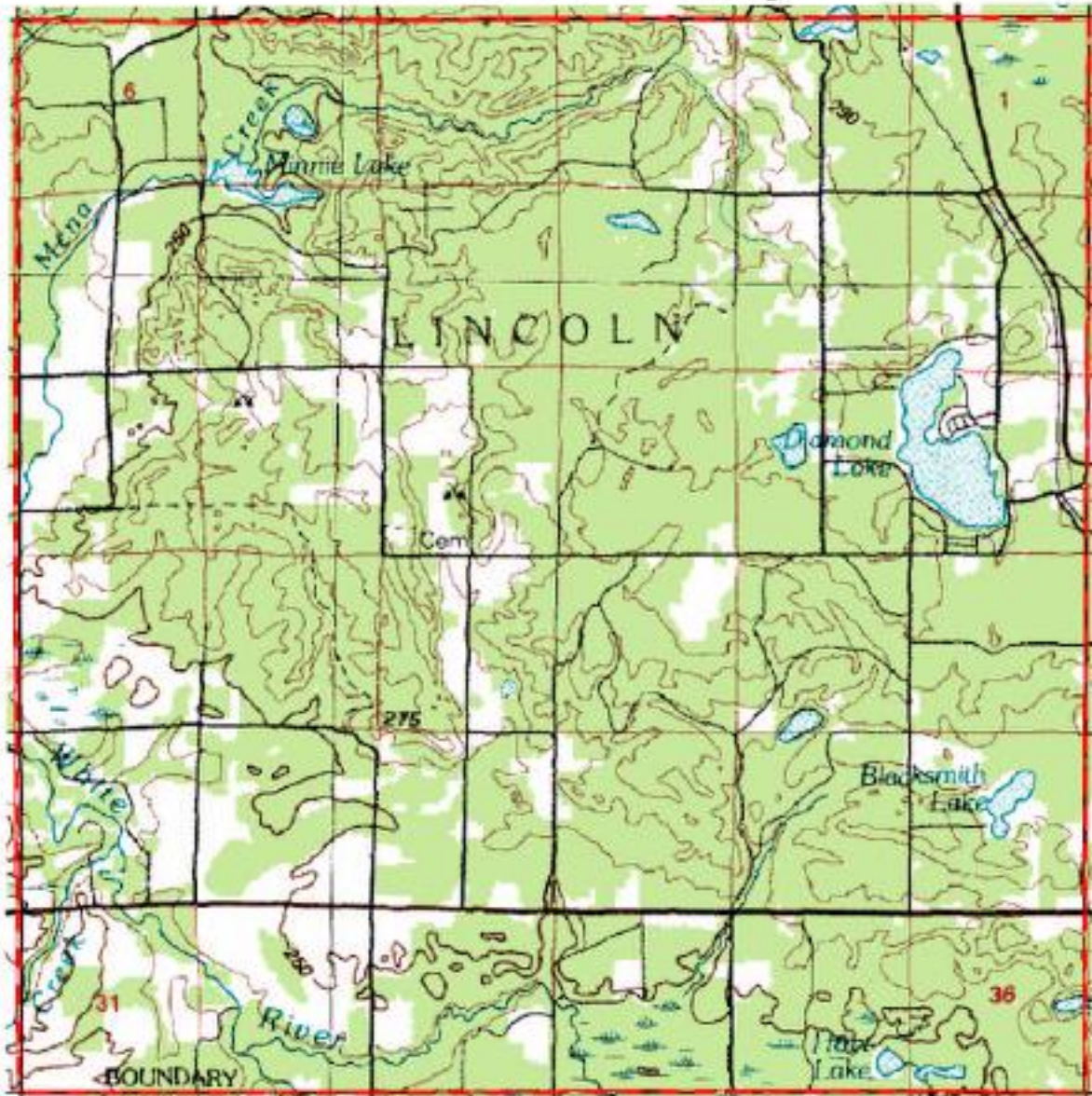


LINCOLN TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Diamond Lake, 8 small lakes - White River, 2 creeks - Dense forest (Manistee National Forest), isolated wetlands, scattered agriculture and urban development around lakes - 38.1 people per square mile of land area - 24.7 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- Purdy's AFC, 2930 1 Mile Rd.
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- Love's Family Resort, 2795 Mundy Ave (8 units)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 536 commute to work with an average commuting time of 24.4 minutes - 245 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 868 total housing units: 497 occupied/ 371 vacant - Of the vacant, 314 (84.6) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	-None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- Birch Grove School, 3962 N Felch
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	<ul style="list-style-type: none"> - Township of Lincoln, 1988 N Wisner Ave - Newaygo County Road Commission, 935 One Mile Rd
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-20, M-37 - M-20 bridge over White River - Marquette Rail Railroad
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Minnie Lake Dam

c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	1,275												
b.	peak population (seasonal):	2,076 (estimate)												
c.	percent over 65:	15.5												
d.	percent under 18:	22												
e.	percent below poverty level:	8.5												
f.	percent that are homeowners:	88.3												
g.	percent with disability or mobility limitation:	23.9												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="1"> <tr> <td>Personal Property:</td> <td>\$502,000</td> </tr> <tr> <td>Agricultural:</td> <td>\$82,500</td> </tr> <tr> <td>Commercial:</td> <td>\$595,500</td> </tr> <tr> <td>Industrial:</td> <td>\$0</td> </tr> <tr> <td>Residential:</td> <td>\$37,717,200</td> </tr> <tr> <td>Total:</td> <td>\$38,897,200</td> </tr> </table>	Personal Property:	\$502,000	Agricultural:	\$82,500	Commercial:	\$595,500	Industrial:	\$0	Residential:	\$37,717,200	Total:	\$38,897,200
Personal Property:	\$502,000													
Agricultural:	\$82,500													
Commercial:	\$595,500													
Industrial:	\$0													
Residential:	\$37,717,200													
Total:	\$38,897,200													
i.	flood insurance coverage:	<table border="1"> <tr> <td>Total Losses since 01/01/78:</td> <td>N/A</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>N/A</td> </tr> <tr> <td>Policies In-Force:</td> <td>15</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$1,584,000</td> </tr> </table>	Total Losses since 01/01/78:	N/A	Total Payments since 01/01/78:	N/A	Policies In-Force:	15	Total Insurance In-Force:	\$1,584,000				
Total Losses since 01/01/78:	N/A													
Total Payments since 01/01/78:	N/A													
Policies In-Force:	15													
Total Insurance In-Force:	\$1,584,000													
j.	location of floodplains:	- floodplain along White River, Second Cole Creek, Mena Creek and around Diamond Lake												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Lincoln Township

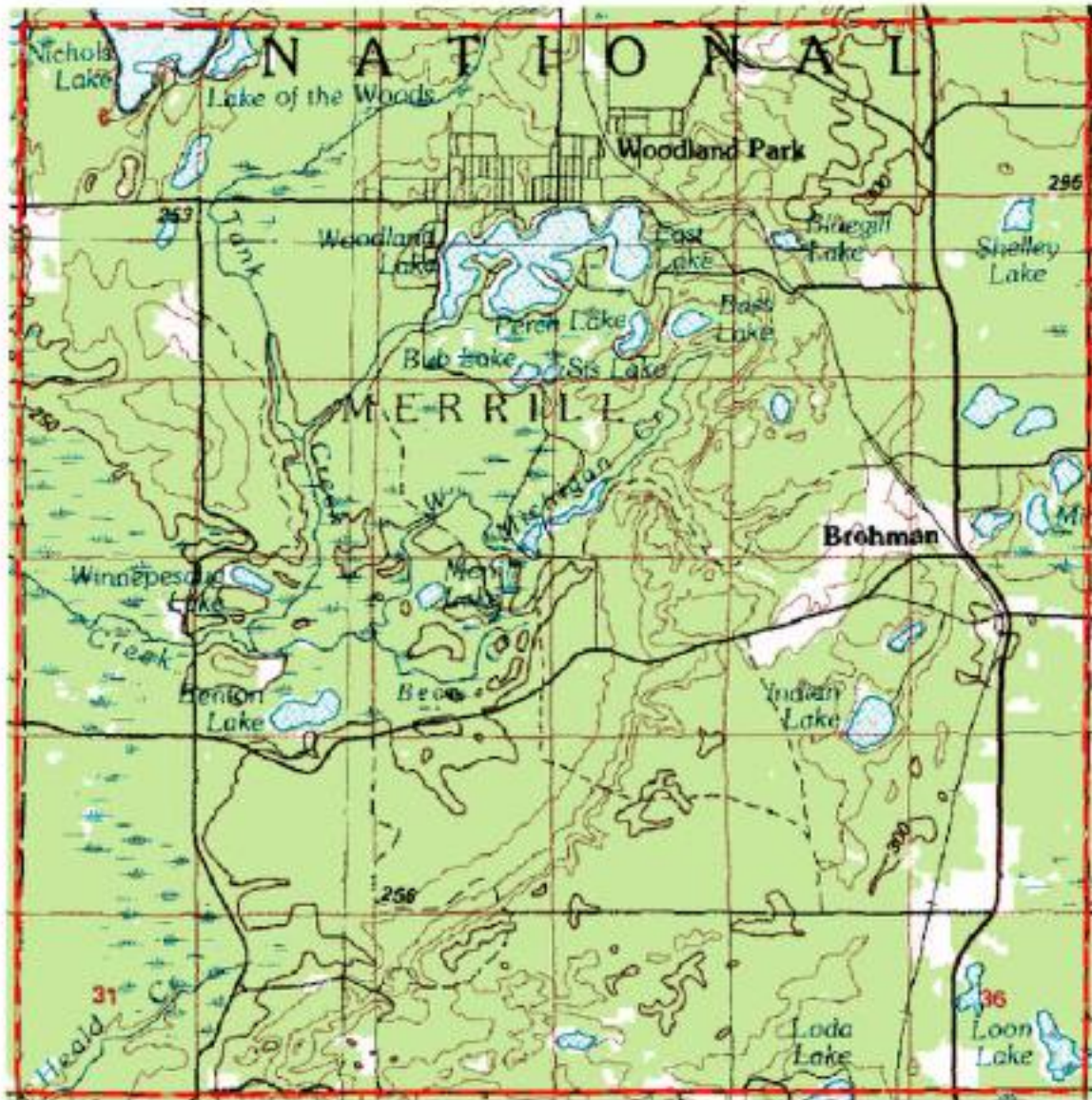


MERRILL TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - South Branch Pere Marquette River, 3 creeks - 21-24 small lakes and ponds - Dense forests (Manistee National Forest) and isolated wetlands - 19.1 people per square mile of land area - 24.6 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	<ul style="list-style-type: none"> - Pinewood Manor, 2358 W. Pinewood Blvd. - Woodland Park Manor, 8835 N. 21st Ave.
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Benton Lake Federal Park - Nichols Lake South Federal Park
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 152 commute to work with an average commuting time of 41.3 minutes - 99 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 857 total housing units: 310 occupied/ 547 vacant - Of the vacant, 450 (82.3%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- Covered by Lilley Township Fire Department
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	<ul style="list-style-type: none"> - Amazing Grace Acres, 762 W. Woodland Park Dr - Merrill Township Community Complex, 1585 W. 11 Mile Rd
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	<ul style="list-style-type: none"> - Township of Merrill, 1585 W 11 Mile Rd - United States Post Office, Brohman, 7261 Woodbridge Rd
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-37 - Marquette Rail Railroad
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Michigan Creek Dam

c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	667												
b.	peak population (seasonal):	1,626 (estimate)												
c.	percent over 65:	22.2												
d.	percent under 18:	16.5												
e.	percent below poverty level:	12.5												
f.	percent that are homeowners:	85.1												
g.	percent with disability or mobility limitation:	31.7												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="1"> <tr> <td>Personal Property:</td> <td>\$322,800</td> </tr> <tr> <td>Agricultural:</td> <td>\$124,600</td> </tr> <tr> <td>Commercial:</td> <td>\$724,700</td> </tr> <tr> <td>Industrial:</td> <td>\$0</td> </tr> <tr> <td>Residential:</td> <td>\$24,884,000</td> </tr> <tr> <td>Total:</td> <td>\$26,056,100</td> </tr> </table>	Personal Property:	\$322,800	Agricultural:	\$124,600	Commercial:	\$724,700	Industrial:	\$0	Residential:	\$24,884,000	Total:	\$26,056,100
Personal Property:	\$322,800													
Agricultural:	\$124,600													
Commercial:	\$724,700													
Industrial:	\$0													
Residential:	\$24,884,000													
Total:	\$26,056,100													
i.	flood insurance coverage: <table border="1"> <tr> <td>Total Losses since 01/01/78:</td> <td></td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td></td> </tr> <tr> <td>Policies In-Force:</td> <td></td> </tr> <tr> <td>Total Insurance In-Force:</td> <td></td> </tr> </table>	Total Losses since 01/01/78:		Total Payments since 01/01/78:		Policies In-Force:		Total Insurance In-Force:		<i>Not participating in the NFIP</i>				
Total Losses since 01/01/78:														
Total Payments since 01/01/78:														
Policies In-Force:														
Total Insurance In-Force:														
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Merrill Township

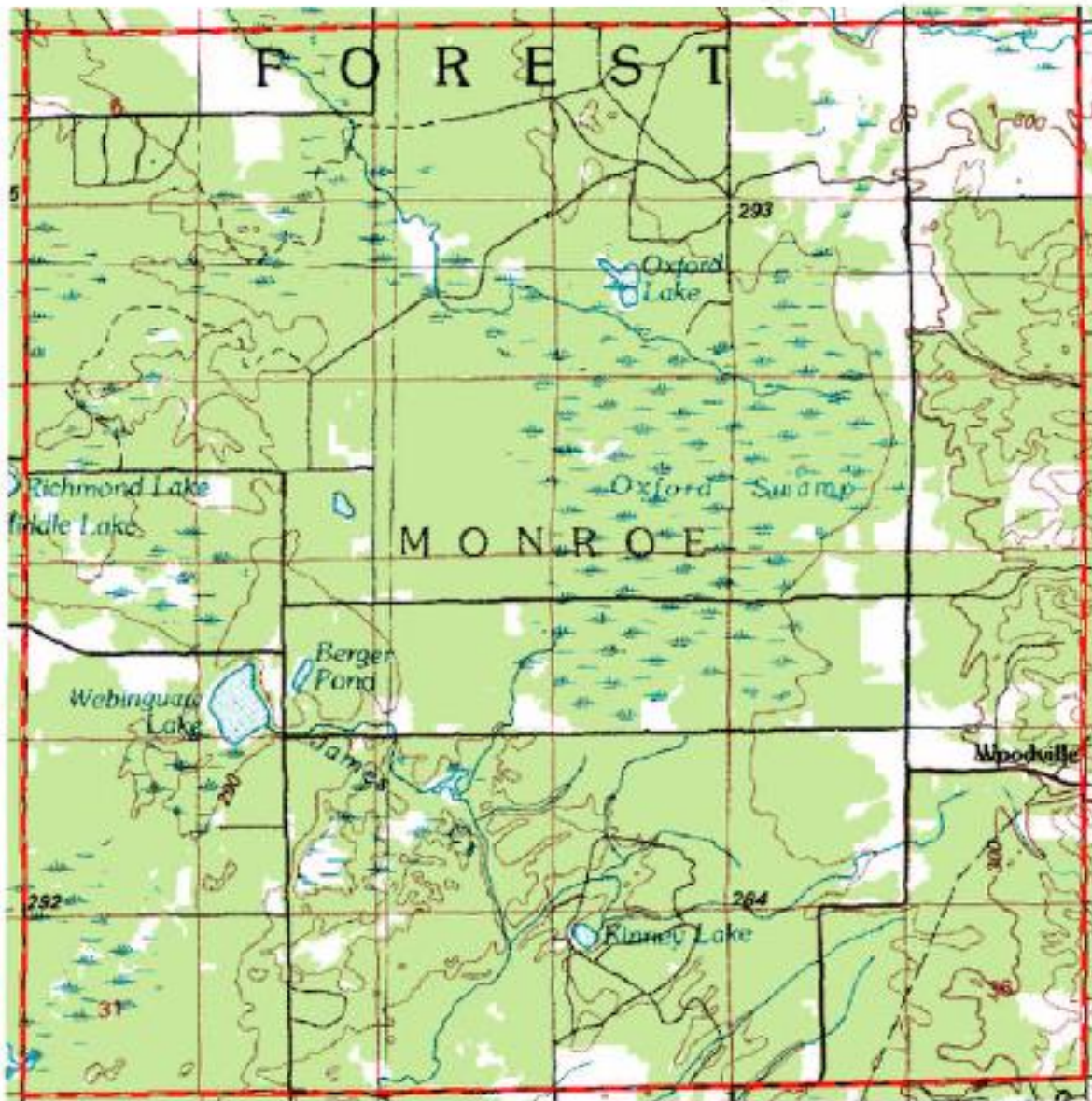


MONROE TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - White River, Little South Branch Pere Marquette River, 2 creeks - 7 lakes - Dense forest (Manistee National Forest) and scattered wetlands - 8.9 people per square mile of land area - 9.1 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- None Identified
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 103 commute to work with an average commuting time of 31.1 minutes - 46 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 325 total housing units: 137 occupied/ 188 vacant - Of the vacant, 170 (90.4%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Monroe, 4141 Fillmore St E
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- None Identified
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- None Identified
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector		
a.	total population (night):	320	
b.	peak population (seasonal):	718 (estimate)	
c.	percent over 65:	20	
d.	percent under 18:	20	
e.	percent below poverty level:	19.7	
f.	percent that are homeowners:	88.3	
g.	percent with disability or mobility limitation:	24.4	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$498,400 Agricultural: \$950,600 Commercial: \$0 Industrial: \$7,900 Residential: \$17,354,300 Total: \$18,811,200	
i.	flood insurance coverage:	Total Losses since 01/01/78: Total Payments since 01/01/78: Policies In-Force: Total Insurance In-Force:	<i>Not participating in the NFIP</i>
j.	location of floodplains:	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- None Identified	
b.	population covered by warning sirens or system:	- N/A	

Monroe Township

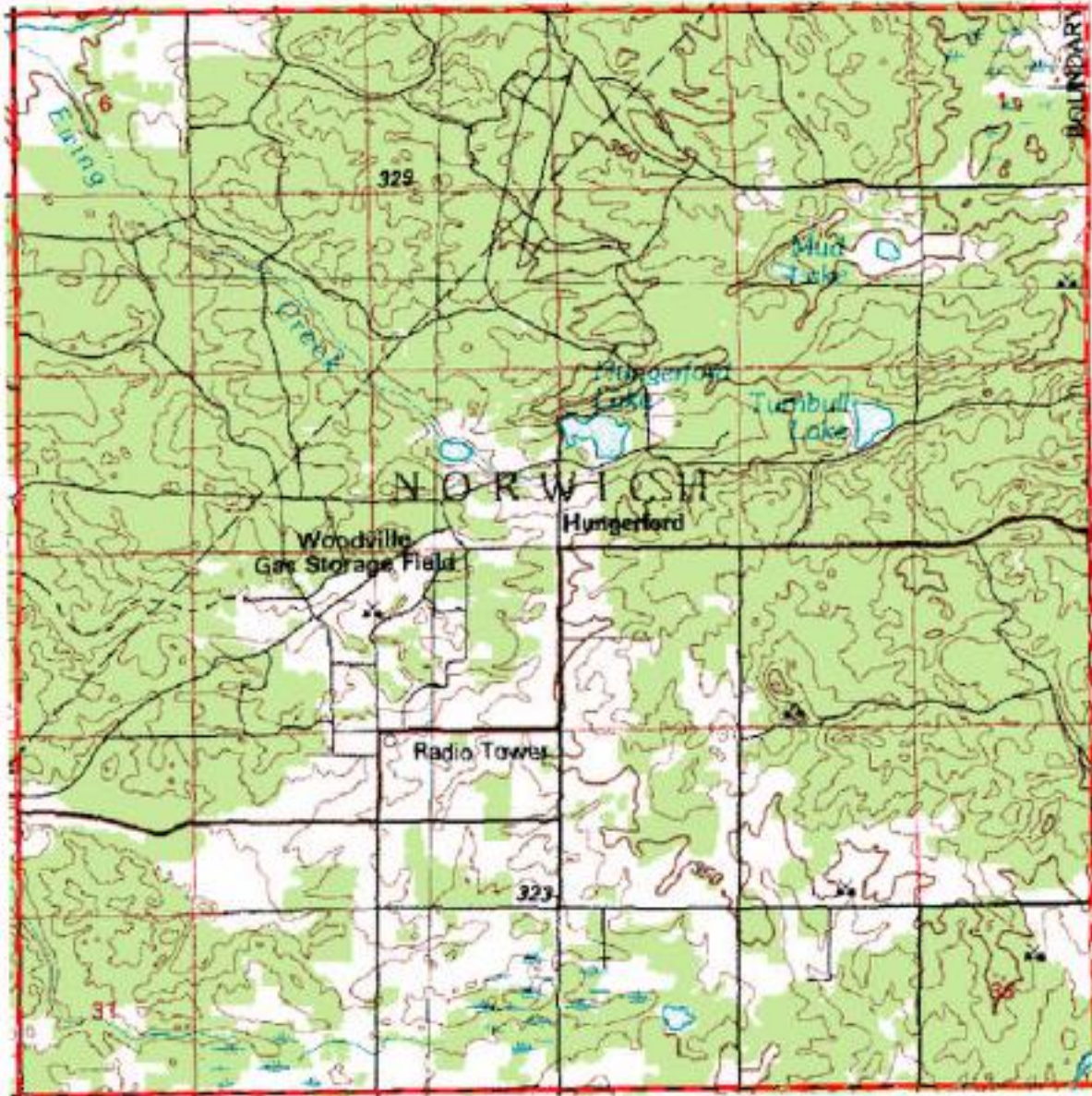


NORWICH TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - White River, Ewing Creek - 7 small lakes and ponds - Dense forest (Manistee National Forest) and scattered agriculture - 17.2 people per square mile of land area - 7.1 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- None Identified
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 236 commute to work with an average commuting time of 32.7 minutes - 145 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 251 total housing units: 208 occupied/ 43 vacant - Of the vacant, 25 (58.1%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- Norwich Township Hall, 7213 N Cypress Ave
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Norwich, 7213 N Cypress Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- None Identified
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	<ul style="list-style-type: none"> - Consumers Energy Power Line - Tornbloom Dam
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector													
a.	total population (night):	607												
b.	peak population (seasonal):	680 (estimate)												
c.	percent over 65:	15												
d.	percent under 18:	27.3												
e.	percent below poverty level:	10.8												
f.	percent that are homeowners:	88.9												
g.	percent with disability or mobility limitation:	14.8												
h.	estimated property insurance coverage (Real Equalized Valuations): <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Personal Property:</td> <td>\$721,300</td> </tr> <tr> <td>Agricultural:</td> <td>\$2,766,600</td> </tr> <tr> <td>Commercial:</td> <td>\$98,700</td> </tr> <tr> <td>Industrial:</td> <td>\$127,300</td> </tr> <tr> <td>Residential:</td> <td>\$19,342,200</td> </tr> <tr> <td>Total:</td> <td>\$23,056,100</td> </tr> </table>	Personal Property:	\$721,300	Agricultural:	\$2,766,600	Commercial:	\$98,700	Industrial:	\$127,300	Residential:	\$19,342,200	Total:	\$23,056,100	
Personal Property:	\$721,300													
Agricultural:	\$2,766,600													
Commercial:	\$98,700													
Industrial:	\$127,300													
Residential:	\$19,342,200													
Total:	\$23,056,100													
i.	flood insurance coverage: <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Total Losses since 01/01/78:</td> <td></td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td></td> </tr> <tr> <td>Policies In-Force:</td> <td></td> </tr> <tr> <td>Total Insurance In-Force:</td> <td></td> </tr> </table>	Total Losses since 01/01/78:		Total Payments since 01/01/78:		Policies In-Force:		Total Insurance In-Force:		<i>Not participating in the NFIP</i>				
Total Losses since 01/01/78:														
Total Payments since 01/01/78:														
Policies In-Force:														
Total Insurance In-Force:														
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Norwich Township

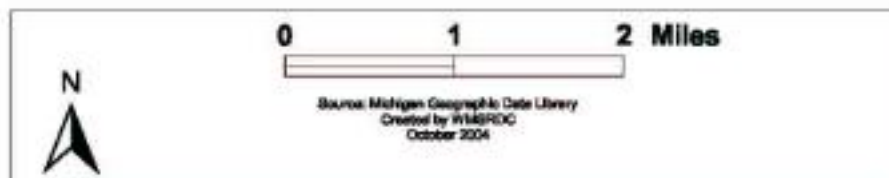
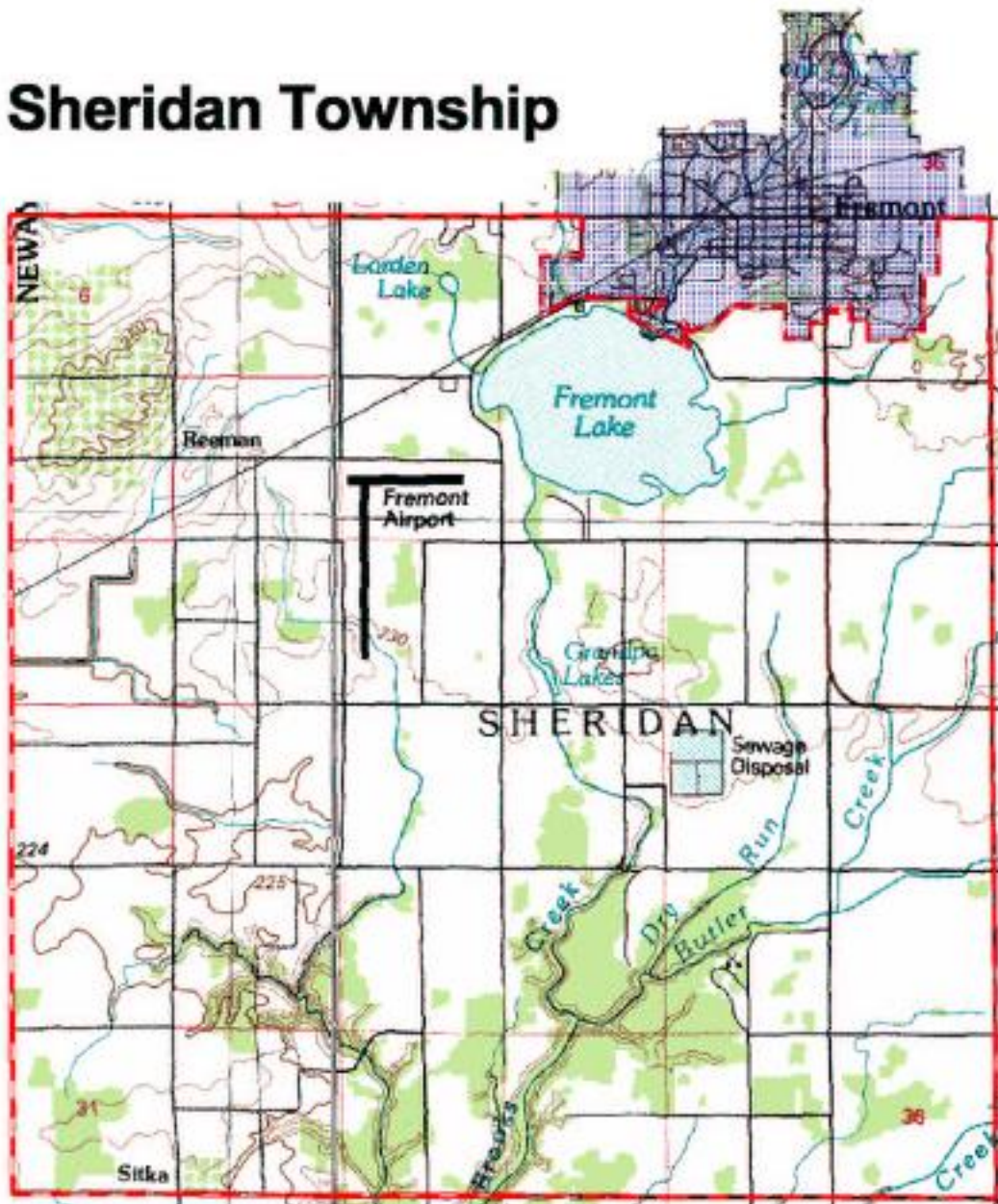


SHERIDAN CHARTER TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Fremont Lake, 2 small lakes - 5 creeks - Isolated forests, widespread agriculture, and scattered urban development - 75.6 people per square mile of land area - 31.5 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- Seventh Day Adventist School of Fremont, 5335 S Garden Ave
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Sheridan Township Park - Dunn Inn Resort, 7312 W. Lake Drive - St. Michael School Day Care, 6368 S Maple Island Rd (capacity 12) - Summer Breeze Par 3, 5883 South Warner Ave (golf course, 9 holes)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 1,109 commute to work with an average commuting time of 19 minutes - 575 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,047 total housing units: 911 occupied/ 136 vacant - Of the vacant, 57 (41.9%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- TrueNorth Community Services, 6038 S Warner Ave
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	<ul style="list-style-type: none"> - Township of Sheridan, 6525 W 64th St - Newaygo County Community Services, 6038 S Warner Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-82, M-120, B-31, B-35 - Michigan Shore Railroad
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Public Sewer Service
c.	other: (airports, pipelines, bus	- Fremont Municipal Airport, 7756 W 60th

	terminals, train stations, military bases, marine passenger ferry services, etc.)													
6.	Socio-Economic Profile of Sector													
a.	total population (night):	2,510												
b.	peak population (seasonal):	2,667 (estimate)												
c.	percent over 65:	14.5												
d.	percent under 18:	25.9												
e.	percent below poverty level:	10.3												
f.	percent that are homeowners:	88.3												
g.	percent with disability or mobility limitation:	14.6												
h.	estimated property insurance coverage (Real Equalized Valuations): <table border="0" style="float: right; margin-top: 10px;"> <tr> <td>Personal Property:</td> <td>\$2,952,882</td> </tr> <tr> <td>Agricultural:</td> <td>\$23,707,300</td> </tr> <tr> <td>Commercial:</td> <td>\$4,072,300</td> </tr> <tr> <td>Industrial:</td> <td>\$18,300</td> </tr> <tr> <td>Residential:</td> <td>\$62,445,200</td> </tr> <tr> <td>Total:</td> <td>\$93,195,982</td> </tr> </table>	Personal Property:	\$2,952,882	Agricultural:	\$23,707,300	Commercial:	\$4,072,300	Industrial:	\$18,300	Residential:	\$62,445,200	Total:	\$93,195,982	
Personal Property:	\$2,952,882													
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Total:	\$93,195,982													
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Total Losses since 01/01/78:														
Total Payments since 01/01/78:														
Policies In-Force:														
Total Insurance In-Force:														
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Sheridan Township

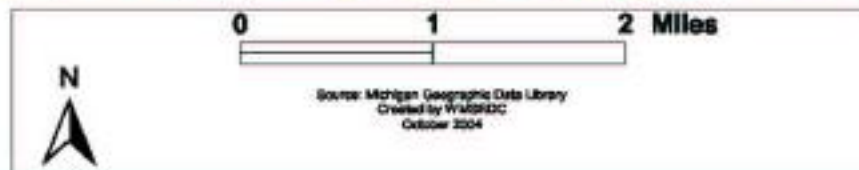
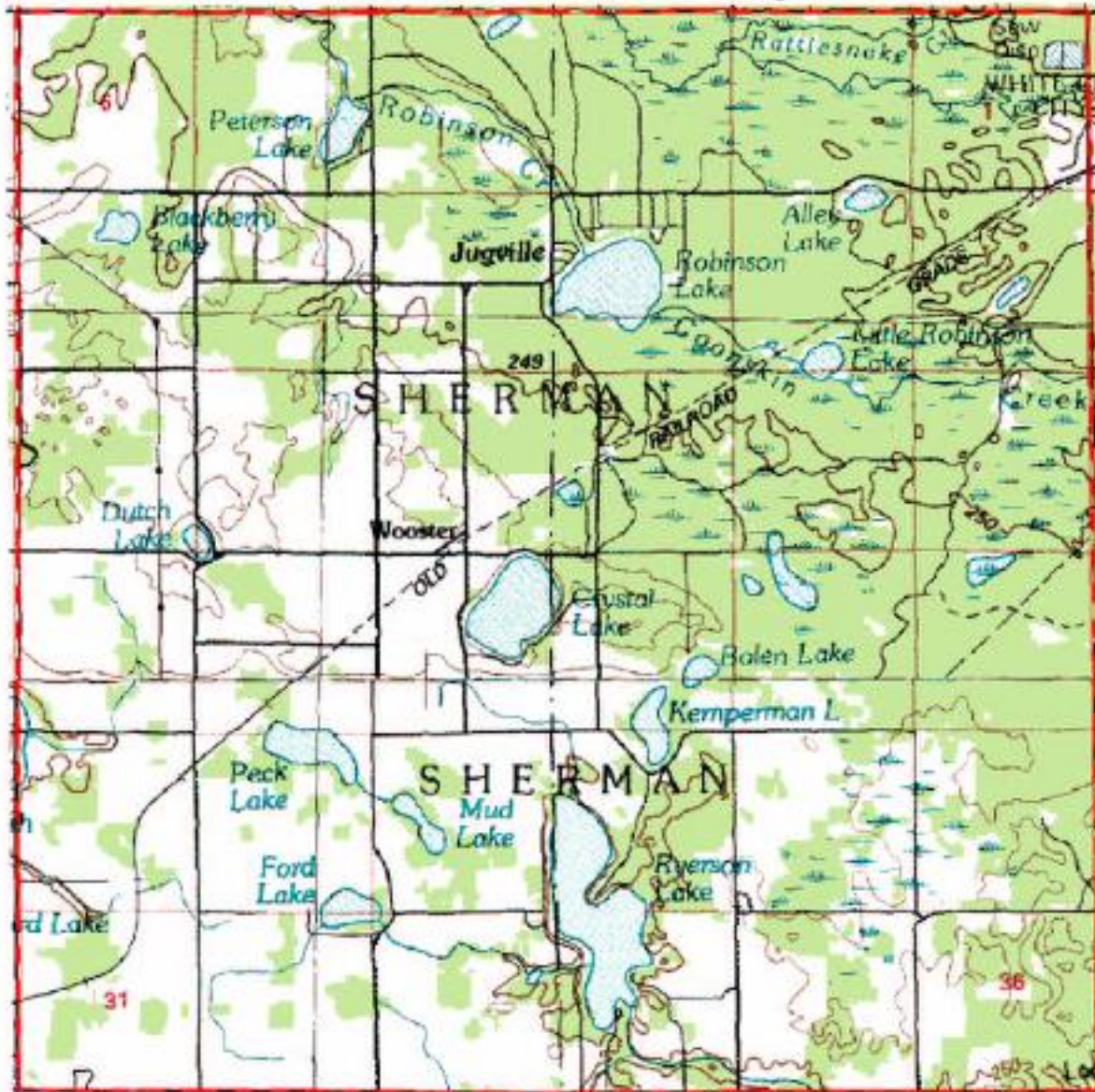


SHERMAN TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Long Lake, Robinson Lake, Crystal Lake, and 16 small lakes - White River, 3 creeks - Dense forest (Manistee National Forest), widespread agriculture, urban development around lakes, and isolated wetlands - 61 people per square mile of land area - 31 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	<ul style="list-style-type: none"> - Baker College, 4747 W 48th St - Fremont Center (special education), 4575 West 48th St - Fremont Education and Activity Center (special education), 4633 West 48th St - Newaygo County Career Technical (vocational education center), 4645 West 48th St
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Dogwood Center for the Performing Arts, 4734 South Campus Ct (420 seats) - Newaygo Medical Care Facility, 4465 W 48th St (nursing home, 116 beds) - Leisure Time RV Park, 4799 South Spruce - Miller's Resort, 1932 W. Park Lane (4-2 bedroom units) - The Shack Bed and Breakfast, 2263 W. 14th Street (73 rooms) - Bob's Villa Mar Motel, 3993 South Evergreen - Snuggle Inn Resort, 1970 Park Lane - Green Jug Resort, 1190 Bingham (15 campsites/ 2 cottage units) - Heights Hide A Way, 4424 Parson Rd (13 campsites) - Newaygo State Park, 2793 Beech St (99 campsites) - Fremont MSRP Building Bridges, W 48th St (day care, capacity 32) - Briar Hill Golf Course, 950 West 40th (18 holes)
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 807 commute to work with an average commuting time of 25 minutes - 436 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 1,064 total housing units: 772 occupied/ 292 vacant - Of the vacant, 228 (78.1%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified

g.	historic places:	- Ensley Windmill Tower, 4634 S. Luce Ave												
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Sherman, 2410 S Wisner Ave												
5.	Vital or Critical Infrastructure													
a.	roads, railroads, and bridges:	- None Identified												
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Consumers Energy Power Line - Public Sewer Service												
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified												
6.	Socio-Economic Profile of Sector													
a.	total population (night):	2,109												
b.	peak population (seasonal):	2,697 (estimate)												
c.	percent over 65:	21												
d.	percent under 18:	23												
e.	percent below poverty level:	5.9												
f.	percent that are homeowners:	87.2												
g.	percent with disability or mobility limitation:	18.5												
h.	estimated property insurance coverage (Real Equalized Valuations):	<table border="0"> <tr> <td>Personal Property:</td> <td>\$1,623,300</td> </tr> <tr> <td>Agricultural:</td> <td>\$12,556,100</td> </tr> <tr> <td>Commercial:</td> <td>\$1,734,600</td> </tr> <tr> <td>Industrial:</td> <td>\$381,700</td> </tr> <tr> <td>Residential:</td> <td>\$64,798,600</td> </tr> <tr> <td>Total:</td> <td>\$81,094,300</td> </tr> </table>	Personal Property:	\$1,623,300	Agricultural:	\$12,556,100	Commercial:	\$1,734,600	Industrial:	\$381,700	Residential:	\$64,798,600	Total:	\$81,094,300
Personal Property:	\$1,623,300													
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Total:	\$81,094,300													
i.	flood insurance coverage:	<table border="0"> <tr> <td>Total Losses since 01/01/78:</td> <td>\$0</td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td>\$0</td> </tr> <tr> <td>Policies In-Force:</td> <td>0</td> </tr> <tr> <td>Total Insurance In-Force:</td> <td>\$0</td> </tr> </table>	Total Losses since 01/01/78:	\$0	Total Payments since 01/01/78:	\$0	Policies In-Force:	0	Total Insurance In-Force:	\$0				
Total Losses since 01/01/78:	\$0													
Total Payments since 01/01/78:	\$0													
Policies In-Force:	0													
Total Insurance In-Force:	\$0													
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Sherman Township



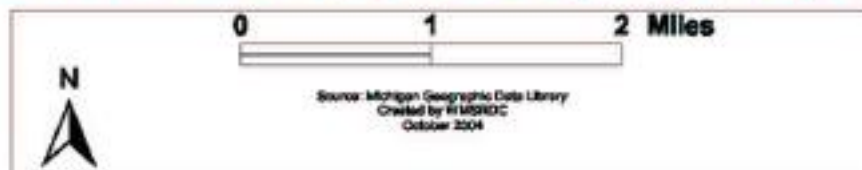
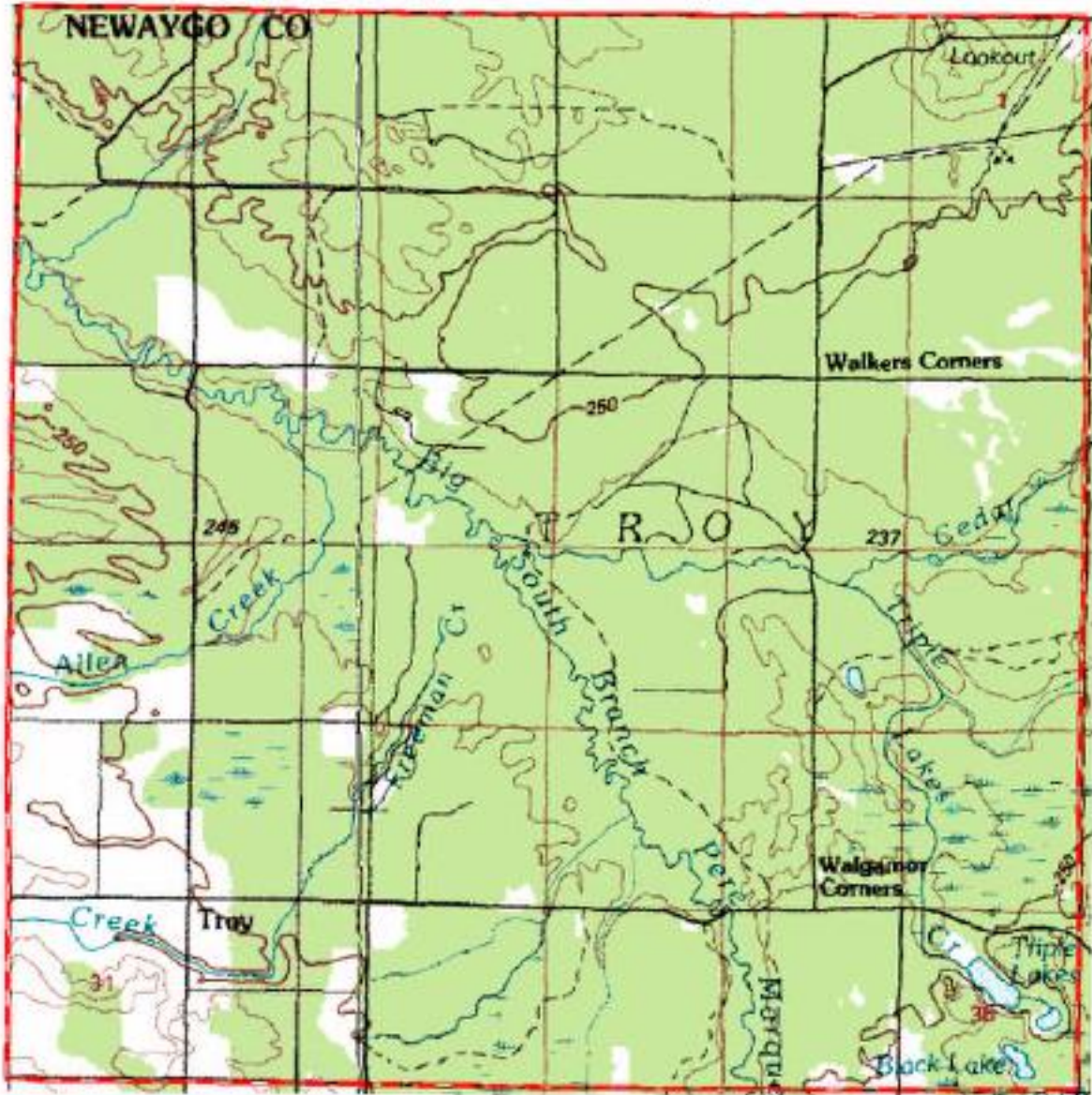
TROY TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - Big South Branch Pere Marquette River, 5 creeks - 6 small lakes - Dense forest (Manistee National Forest) and isolated agriculture - 7.8 people per square mile of land area - 6 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	- None Identified
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 93 commute to work with an average commuting time of 30.5 minutes - 60 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 218 total housing units: 107 occupied/ 111 vacant - Of the vacant, 94 (84.7%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Troy, 10350 N Dickinson Ave
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	- None Identified
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- Henkin Pond Dam
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector													
a.	total population (night):	283												
b.	peak population (seasonal):	531 (estimate)												
c.	percent over 65:	14.1												
d.	percent under 18:	23.7												
e.	percent below poverty level:	16.9												
f.	percent that are homeowners:	86.9												
g.	percent with disability or mobility limitation:	25.9												
h.	estimated property insurance coverage (Real Equalized Valuations): <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Personal Property:</td> <td>\$242,300</td> </tr> <tr> <td>Agricultural:</td> <td>\$1,252,800</td> </tr> <tr> <td>Commercial:</td> <td>\$61,400</td> </tr> <tr> <td>Industrial:</td> <td>\$0</td> </tr> <tr> <td>Residential:</td> <td>\$11,728,300</td> </tr> <tr> <td>Total:</td> <td>\$13,284,800</td> </tr> </table>	Personal Property:	\$242,300	Agricultural:	\$1,252,800	Commercial:	\$61,400	Industrial:	\$0	Residential:	\$11,728,300	Total:	\$13,284,800	
Personal Property:	\$242,300													
Agricultural:	\$1,252,800													
Commercial:	\$61,400													
Industrial:	\$0													
Residential:	\$11,728,300													
Total:	\$13,284,800													
i.	flood insurance coverage: <table border="0" style="float: right; margin-left: 20px;"> <tr> <td>Total Losses since 01/01/78:</td> <td></td> </tr> <tr> <td>Total Payments since 01/01/78:</td> <td></td> </tr> <tr> <td>Policies In-Force:</td> <td></td> </tr> <tr> <td>Total Insurance In-Force:</td> <td></td> </tr> </table>	Total Losses since 01/01/78:		Total Payments since 01/01/78:		Policies In-Force:		Total Insurance In-Force:		<i>Not participating in the NFIP</i>				
Total Losses since 01/01/78:														
Total Payments since 01/01/78:														
Policies In-Force:														
Total Insurance In-Force:														
j.	location of floodplains:	- None Identified												
7.	Emergency Warning System Coverage													
a.	siren locations and/or description of warning system:	- None Identified												
b.	population covered by warning sirens or system:	- N/A												

Land Use and Natural Features Map (USGS Quad.)

Troy Township

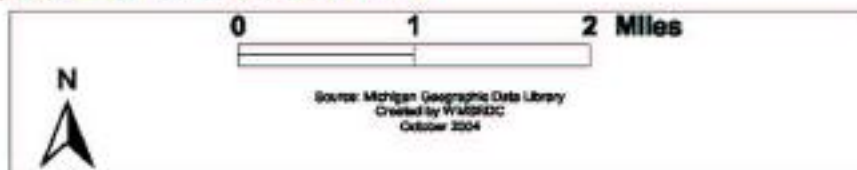
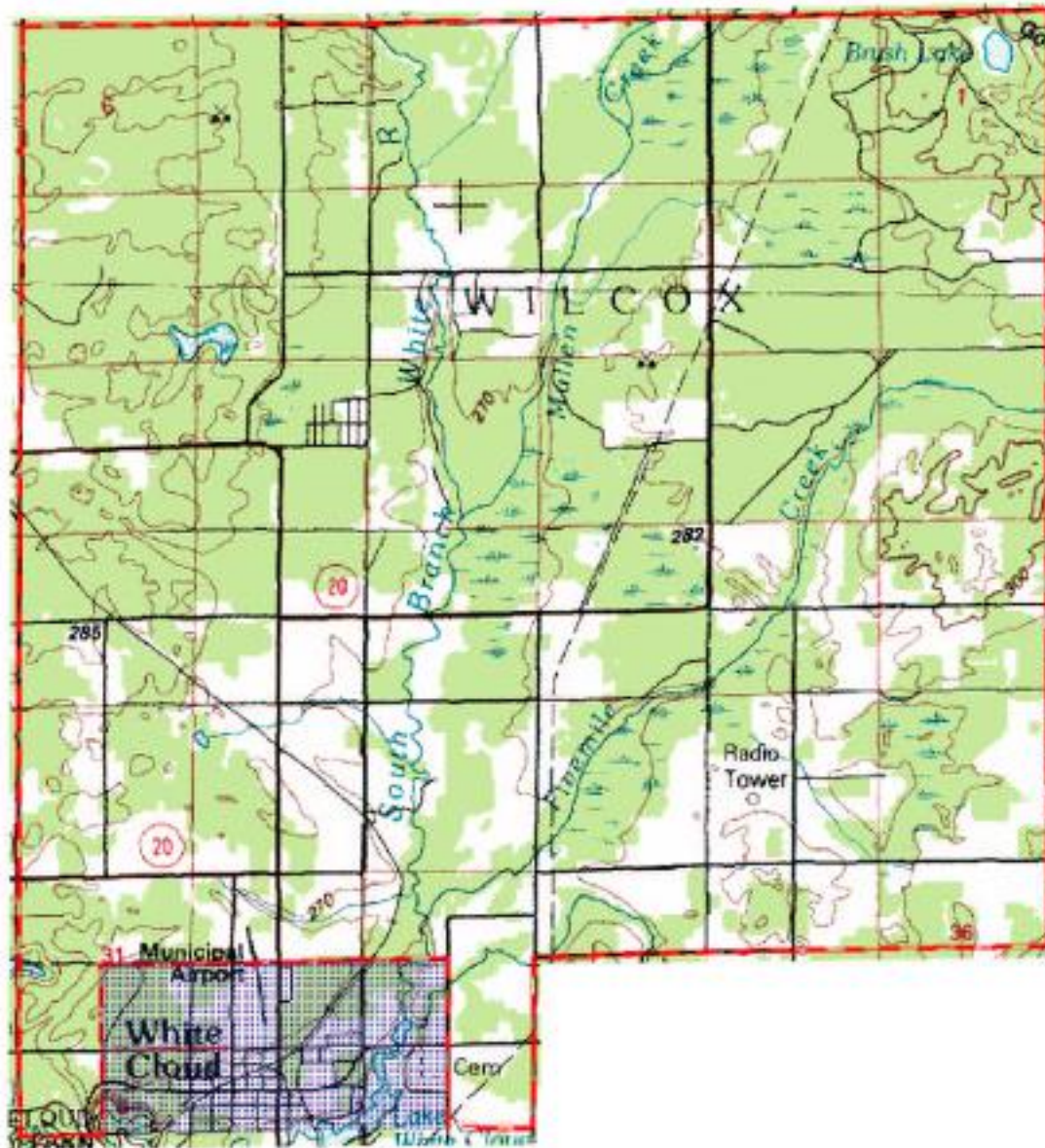


WILCOX TOWNSHIP

1.	major geographic features:	<ul style="list-style-type: none"> - White River, 3 creeks - 3 lakes - Dense forest (Manistee National Forest), scattered agriculture, and scattered open fields - 32.4 people per square mile of land area - 17.8 housing units per square mile of land area
2.	Population Concentrations	
a.	group homes:	- None Identified
b.	large apartment buildings:	- None Identified
c.	schools:	- None Identified
d.	large office buildings:	- None Identified
e.	other: (such as stadiums, concert halls, amusement parks, fairgrounds, correctional facilities, nursing homes, other special populations or large crowd assembly areas)	<ul style="list-style-type: none"> - Wee Care Child Care, 1423 Clinton (capacity 12) - White River Federal Park
f.	major employers:	- None Identified
3.	Population Shifts	
a.	daily:	<ul style="list-style-type: none"> - 422 commute to work with an average commuting time of 28 minutes - 214 school-aged children
b.	seasonal:	<ul style="list-style-type: none"> - 604 total housing units: 423 occupied/ 181 vacant - Of the vacant, 125 (69.1%) are seasonal, recreational, or occasional use
4.	Important or Critical Public and Private Facilities	
a.	police precincts:	- None Identified
b.	fire stations:	- None Identified
c.	public works yards:	- None Identified
d.	pumping stations:	- None Identified
e.	community shelters:	- None Identified
f.	community medical facilities, hospitals:	- None Identified
g.	historic places:	- None Identified
h.	other: (government buildings, record centers, major construction companies, warehouses, demolition companies, heavy equipment rental, emergency equipment, and vehicle storage areas, etc.)	- Township of Wilcox, 1795 N Evergreen Dr
5.	Vital or Critical Infrastructure	
a.	roads, railroads, and bridges:	<ul style="list-style-type: none"> - M-37, M-20 - Marquette Rail Railroad
b.	dams, power stations, water treatment plants, sanitary lift stations, etc.:	- None Identified
c.	other: (airports, pipelines, bus terminals, train stations, military bases, marine passenger ferry services, etc.)	- None Identified

6.	Socio-Economic Profile of Sector		
a.	total population (night):	1,098	
b.	peak population (seasonal):	1,423 (estimate)	
c.	percent over 65:	14.2	
d.	percent under 18:	23.1	
e.	percent below poverty level:	15.3	
f.	percent that are homeowners:	84.9	
g.	percent with disability or mobility limitation:	27.2	
h.	estimated property insurance coverage (Real Equalized Valuations):	Personal Property: \$528,600 Agricultural: \$0 Commercial: \$1,031,100 Industrial: \$185,500 Residential: \$26,989,500 Total: \$28,734,700	
i.	flood insurance coverage	Total Losses since 01/01/78: \$0 Total Payments since 01/01/78: \$0 Policies In-Force: 0 Total Insurance In-Force: \$0	
j.	location of floodplains:	- None Identified	
7.	Emergency Warning System Coverage		
a.	siren locations and/or description of warning system:	- None Identified	
b.	population covered by warning sirens or system:	- N/A	

Wilcox Township



Annex B

Community Hazards Profile and Evaluations

Hazards Profile and Evaluation – County of Newaygo, Michigan

Evaluation Criteria	Flooding / Dam Failure	Infrastructure Failure	Wildfires	Thunderstorm	Tornado	Severe Winter Weather
Historical Occurrence	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Excessive 4+ events/yr 10 pts x 20% = 2.0
Affected Area	Large Area >3 Juris. 10 pts x 20% = 2.0	Large Area >3 Juris. 10 pts x 20% = 2.0	Small Area 2-3 Juris. 7 pts x 20% = 1.4	Large Area >3 Juris. 10 pts x 20% = 2.0	Small Area 2-3 Juris. 7 pts x 20% = 1.4	Large Area >3 Juris. 10 pts x 20% = 2.0
Speed of Onset	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Low <12 Hours 7 pts x 10% = 0.7	Minimal No Warning 10 pts x 10% = 1.0	High >24 Hours 1 pt x 10% = 0.1
Casualty Effects	High Impact >10 injured 10 pts x 10% = 1.0	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	Low Impact <5 injured 4 pts x 10% = 0.4	Medium <10 injured 7 pts x 10% = 0.7	Low Impact <5 injured 4 pts x 10% = 0.4
Economic Effects	High >\$100k 10 pts x 10% = 1.0	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	Low <\$50k 4 pts x 10% = 0.4
Duration	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05	Minimal <12 Hours 1 pt x 5% = 0.05	Medium <1 Week 7 pts x 5% = 0.35
Seasonal Pattern	¼ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	¼ Year 1 Season 1 pt x 5% = 0.05
Predictability	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2
Collateral Damage	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Good <75% 7 pts x 5% = 0.35
Availability of Warnings	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Generally Not <50% 7 pts x 5% = 0.35	Available 100% 1 pt x 5% = 0.05
Hazard Score	7.55	7.40	6.95	6.65	5.90	5.90
Rank	1	2	3	4	5	6

Hazards Profile and Evaluation – County of Newaygo, Michigan (cont'd.)

Evaluation Criteria	Fires	Criminal	Hazardous Materials	Transport	Public Health	Drought
Historical Occurrence	High 2-3 events/yr 7 pts x 20%= 1.4	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2	High 2-3 events/yr 7 pts x 20%= 1.4	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2
Affected Area	Single Site <1 City 1 pt x 20%= 0.2	Single Site <1 City 1 pt x 20%= 0.2	Single Site <1 City 1 pt x 20%= 0.2	Single Site <1 City 1 pt x 20%= 0.2	Large Area >3 Juris. 10 pts x 20% = 2.0	Large Area >3 Juris. 10 pts x 20% = 2.0
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	High >24 Hours 1 pt x 10% = 0.1	High >24 Hours 1 pt x 10% = 0.1
Casualty Effects	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4
Economic Effects	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1	Medium <\$100k 7 pts x 10%= 0.7	Medium <\$100k 7 pts x 10%= 0.7
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x 5%= 0.35	Medium <1 Week 7 pts x 5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05	Long > 1 Week 10 pts x 5%= 0.5	Long > 1 Week 10 pts x 5%= 0.5
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	½ Year 2 Seasons 4 pts x 5%= 0.2
Predictability	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Highly Predict. 100% Accuracy 1 pt x 5%= 0.05	Highly Predict. 100% Accuracy 1 pt x 5%= 0.05
Collateral Damage	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x 5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2	Minimal Poss. <10% 1 pt x 5%= 0.05	Minimal Poss. <10% 1 pt x 5%= 0.05
Availability of Warnings	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Available 100% 1 pt x 5%= 0.05
Hazard Score	5.75	5.75	5.45	5.45	5.30	4.07
Rank	7	8	9	9	11	12

Hazards Profile and Evaluation – City of Fremont, Michigan

Evaluation Criteria	Infrastructure Failure	Hazardous Materials	Fires	Flooding / Dam Failure	Criminal	Wildfires	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Medium <\$100k 7 pts x 10% = 0.7	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Short <24 Hours 4 pts x 5% = 0.2	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	High Poss. >75% 10 pts x 5% = 0.5	Good <75% 7 pts x 5% = 0.35	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	6.85	6.35	6.35	5.75	5.40	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – City of Grant, Michigan

Evaluation Criteria	Infrastructure Failure	Fires	Flooding / Dam Failure	Hazardous Materials	Criminal	Wildfires	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Medium <\$100k 7 pts x 10% = 0.7	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	High Poss. >75% 10 pts x 5% = 0.5	Good <75% 7 pts x 5% = 0.35	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	6.35	6.35	6.25	5.75	5.40	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – City of Newaygo, Michigan

Evaluation Criteria	Infrastructure Failure	Criminal / Violent Crime	Flooding / Dam Failure	Hazardous Materials	Fires	Wildfires / Outdoor Fires	Transport / MCI
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2-3 events/yr 7 pts x 20% = 1.4	Medium 1 event/yr 4 pts x 20% = 0.8	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Medium <\$100k 7 pts x 10% = 0.7	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	High Poss. >75% 10 pts x 5% = 0.5	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	Good <75% 7 pts x 5% = 0.35	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	6.95	6.95	6.85	6.35	5.40	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – City of White Cloud, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires	Flooding / Dam Failure	Fires	Hazardous Materials	Criminal	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Minimal Poss. <10% 1 pt x 5% = 0.05	Some Poss. <50% 4 pts x 5% = 0.2	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	7.20	6.95	6.35	6.25	5.75	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Ashland Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Flooding / Dam Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <75% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	7.20	6.95	6.35	6.35	5.25	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Barton Township, Michigan

Evaluation Criteria	Wildfires	Infrastructure Failure	Fires	Flooding / Dam Failure	Criminal	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2 – 3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.55	6.80	6.35	6.35	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Beaver Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires	Flooding / Dam Failure	Fires	Criminal	Hazardous Materials	Transport
Historical Occurrence	High 2 – 3 events/yr 7 pts x 20% = 1.4	Moderate 1 events/yr 4 pts x 20% = 0.8	Low >1 event/yr 1 pt x 20%= 0.2	Moderate 1 events/yr 4 pts x 20% = 0.8	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x10%= 0.1	Medium <10 injured 7 pts x10%= 0.7	High Impact >10 injured 10 pts x10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x10%= 0.7	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Long > 1 Week 10 pts x5%= 0.5	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Medium <1 Week 7 pts x5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x5%= 0.5	¾ Year 3 Seasons 7 pts x5%= 0.35	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5
Predictability	Unpredictable Difficult 10 pts x5%= 0.5	Somewhat <50% Accuracy 7 pts x5%= 0.35	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5%= 0.2	Good <75% 7 pts x5%= 0.35	High Poss. >75% 10 pts x5%= 0.5	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x5%= 0.5	Generally Not <50% 7 pts x5%= 0.35	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5
Hazard Score	6.80	6.35	6.35	5.75	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Big Prairie Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Fires	Criminal / Violent Crime	Flooding / Dam Failure	Hazardous Materials	Transport / MCI
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Low <1 event/yr 1 pts x 20% = 0.2	Low <1 event/yr 1 pts x 20% = 0.2	Low <1 event/yr 1 pts x 20% = 0.2
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	7.20	6.35	6.35	6.35	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Bridgeton Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Flooding / Dam Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <75% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	7.20	6.95	6.35	6.35	5.25	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Brooks Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Flooding / Dam Failure	Hazardous Materials	Fires	Criminal / Violent Crime	Transport / MCI
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	7.20	6.95	6.85	6.35	6.35	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Croton Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Flooding / Dam Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport / MCI
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	7.20	6.95	6.35	6.35	6.25	4.85
Rank	1	2	3	5	6	7	7

Hazards Profile and Evaluation – Dayton Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Fires	Flooding / Dam Failure	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20%= 0.2	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Single Site < Neighborhood 1 pt x 20%= 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10%= 0.1	Medium <10 injured 7 pts x 10%= 0.7	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10%= 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x 5%= 0.35	Short <24 Hours 4 pts x 5%= 0.2	Long > 1 Week 10 pts x 5%= 0.5	Medium <1 Week 7 pts x 5%= 0.35	Medium <1 Week 7 pts x 5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5
Predictability	Unpredictable Difficult 10 pts x 5%= 0.5	Somewhat <50% Accuracy 7 pts x 5%= 0.35	Unpredictable Difficult 10 pts x 5%= 0.5	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5%= 0.2	Good <75% 7 pts x 5%= 0.35	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x 5%= 0.5	High Poss. >75% 10 pts x 5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5%= 0.5	Generally Not <50% 7 pts x 5%= 0.35	Unavailable No Warnings 10 pts x 5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5
Hazard Score	7.40	7.20	6.35	6.35	6.35	5.25	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Denver Township, Michigan

Evaluation Criteria	Wildfires	Flooding / Dam Failure	Infrastructure Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.20	6.95	6.80	6.35	5.75	4.65	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Ensley Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Fires	Flooding / Dam Failure	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20%= 0.2	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Single Site < Neighborhood 1 pt x 20%= 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10%= 0.1	Medium <10 injured 7 pts x 10%= 0.7	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10%= 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x 5%= 0.35	Short <24 Hours 4 pts x 5%= 0.2	Long > 1 Week 10 pts x 5%= 0.5	Medium <1 Week 7 pts x 5%= 0.35	Medium <1 Week 7 pts x 5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5
Predictability	Unpredictable Difficult 10 pts x 5%= 0.5	Somewhat <50% Accuracy 7 pts x 5%= 0.35	Unpredictable Difficult 10 pts x 5%= 0.5	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5%= 0.2	Good <75% 7 pts x 5%= 0.35	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x 5%= 0.5	High Poss. >75% 10 pts x 5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5%= 0.5	Generally Not <50% 7 pts x 5%= 0.35	Unavailable No Warnings 10 pts x 5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5
Hazard Score	7.40	7.20	6.35	6.35	6.35	5.25	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Everett Township, Michigan

Evaluation Criteria	Wildfires / Outdoor Fires	Flooding / Dam Failure	Infrastructure Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.20	6.95	6.80	6.35	5.75	4.65	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Garfield Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Flooding / Dam Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <75% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	7.20	6.95	6.35	6.35	5.25	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Goodwell Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Flooding / Dam Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport / MCI
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2-3 events/yr 7 pts x 20% = 1.4	Low <1 event/yr 1 pts x 20% = 0.2	High 2-3 events/yr 7 pts x 20% = 1.4	Low <1 event/yr 1 pts x 20% = 0.2	Low <1 event/yr 1 pts x 20% = 0.2	Low <1 event/yr 1 pts x 20% = 0.2
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10% = 0.1	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Unpredictable Difficult 10 pts x 5% = 0.5	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5% = 0.2	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5% = 0.5	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.40	6.95	6.35	5.75	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Grant Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Fires	Flooding / Dam Failure	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20%= 0.2	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Single Site < Neighborhood 1 pt x 20%= 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10%= 0.1	Medium <10 injured 7 pts x 10%= 0.7	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10%= 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x 5%= 0.35	Short <24 Hours 4 pts x 5%= 0.2	Long > 1 Week 10 pts x 5%= 0.5	Medium <1 Week 7 pts x 5%= 0.35	Medium <1 Week 7 pts x 5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5
Predictability	Unpredictable Difficult 10 pts x 5%= 0.5	Somewhat <50% Accuracy 7 pts x 5%= 0.35	Unpredictable Difficult 10 pts x 5%= 0.5	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5%= 0.2	Good <75% 7 pts x 5%= 0.35	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x 5%= 0.5	High Poss. >75% 10 pts x 5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5%= 0.5	Generally Not <50% 7 pts x 5%= 0.35	Unavailable No Warnings 10 pts x 5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5
Hazard Score	7.40	7.20	6.35	6.35	6.35	5.25	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Home Township, Michigan

Evaluation Criteria	Wildfires	Infrastructure Failure	Flooding / Dam Failure	Fires	Criminal	Hazardous Materials	Transport
Historical Occurrence	High 2 – 3 events/yr 7 pts x 20% = 1.4	High 2 – 3 events/yr 7 pts x 20% = 1.4	Low >1 event/yr 1 pt x 20%= 0.2	High 2 – 3 events/yr 7 pts x 20% = 1.4	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2
Affected Area	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x10%= 0.7	No Impact 0 injured 1 pt x10%= 0.1	High Impact >10 injured 10 pts x10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0
Economic Effects	Medium <\$100k 7 pts x10%= 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x5%= 0.35	Short <24 Hours 4 pts x 5%= 0.2	Long > 1 Week 10 pts x5%= 0.5	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Medium <1 Week 7 pts x5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5
Predictability	Somewhat <50% Accuracy 7 pts x5%= 0.35	Unpredictable Difficult 10 pts x5%= 0.5	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5
Collateral Damage	Good <75% 7 pts x5%= 0.35	Some Poss. <50% 4 pts x 5%= 0.2	High Poss. >75% 10 pts x5%= 0.5	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Generally Not <50% 7 pts x5%= 0.35	Unavailable No Warnings 10 pts x5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5
Hazard Score	6.95	6.80	6.35	5.75	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Lilley Township, Michigan

Evaluation Criteria	Wildfires	Infrastructure Failure	Fires	Flooding / Dam Failure	Criminal	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2 – 3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.55	6.80	6.35	6.35	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Lincoln Township, Michigan

Evaluation Criteria	Wildfires	Flooding / Dam Failure	Infrastructure Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.20	6.95	6.80	6.35	5.75	4.65	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Merrill Township, Michigan

Evaluation Criteria	Wildfires	Infrastructure Failure	Fires	Flooding / Dam Failure	Criminal	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	High 2 – 3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Long > 1 Week 10 pts x 5% = 0.5	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.55	6.80	6.35	6.35	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Monroe Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires	Flooding / Dam Failure	Fires	Criminal	Hazardous Materials	Transport
Historical Occurrence	High 2 – 3 events/yr 7 pts x 20% = 1.4	Moderate 1 events/yr 4 pts x 20% = 0.8	Low >1 event/yr 1 pt x 20%= 0.2	Moderate 1 events/yr 4 pts x 20% = 0.8	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x10%= 0.1	Medium <10 injured 7 pts x10%= 0.7	High Impact >10 injured 10 pts x10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x10%= 0.7	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Long > 1 Week 10 pts x5%= 0.5	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Medium <1 Week 7 pts x5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x5%= 0.5	¾ Year 3 Seasons 7 pts x5%= 0.35	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5
Predictability	Unpredictable Difficult 10 pts x5%= 0.5	Somewhat <50% Accuracy 7 pts x5%= 0.35	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5%= 0.2	Good <75% 7 pts x5%= 0.35	High Poss. >75% 10 pts x5%= 0.5	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x5%= 0.5	Generally Not <50% 7 pts x5%= 0.35	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5
Hazard Score	6.80	6.35	6.35	5.75	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Norwich Township, Michigan

Evaluation Criteria	Wildfires	Infrastructure Failure	Flooding / Dam Failure	Fires	Criminal	Hazardous Materials	Transport
Historical Occurrence	High 2 – 3 events/yr 7 pts x 20% = 1.4	High 2 – 3 events/yr 7 pts x 20% = 1.4	Low >1 event/yr 1 pt x 20%= 0.2	High 2 – 3 events/yr 7 pts x 20% = 1.4	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2
Affected Area	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x10%= 0.7	No Impact 0 injured 1 pt x10%= 0.1	High Impact >10 injured 10 pts x10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0
Economic Effects	Medium <\$100k 7 pts x10%= 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x5%= 0.35	Short <24 Hours 4 pts x 5%= 0.2	Long > 1 Week 10 pts x5%= 0.5	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Medium <1 Week 7 pts x5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5
Predictability	Somewhat <50% Accuracy 7 pts x5%= 0.35	Unpredictable Difficult 10 pts x5%= 0.5	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5
Collateral Damage	Good <75% 7 pts x5%= 0.35	Some Poss. <50% 4 pts x 5%= 0.2	High Poss. >75% 10 pts x5%= 0.5	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Generally Not <50% 7 pts x5%= 0.35	Unavailable No Warnings 10 pts x5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5
Hazard Score	6.95	6.80	6.35	5.75	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Sheridan Township, Michigan

Evaluation Criteria	Infrastructure Failure	Wildfires / Outdoor Fires	Fires	Flooding / Dam Failure	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20%= 0.2	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8	Medium 1 event/yr 4 pts x 20%= 0.8
Affected Area	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Single Site < Neighborhood 1 pt x 20%= 0.2	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	No Impact 0 injured 1 pt x 10%= 0.1	Medium <10 injured 7 pts x 10%= 0.7	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Low <\$50k 4 pts x 10% = 0.4	Medium <\$100k 7 pts x 10%= 0.7	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x 5%= 0.35	Short <24 Hours 4 pts x 5%= 0.2	Long > 1 Week 10 pts x 5%= 0.5	Medium <1 Week 7 pts x 5%= 0.35	Medium <1 Week 7 pts x 5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	¾ Year 3 Seasons 7 pts x 5%= 0.35	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5	Year Round 4 Seasons 10 pts x 5%= 0.5
Predictability	Unpredictable Difficult 10 pts x 5%= 0.5	Somewhat <50% Accuracy 7 pts x 5%= 0.35	Unpredictable Difficult 10 pts x 5%= 0.5	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5	Unpredictable Difficult 10 pts x 5%= 0.5
Collateral Damage	Some Poss. <50% 4 pts x 5%= 0.2	Good <75% 7 pts x 5%= 0.35	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x 5%= 0.5	High Poss. >75% 10 pts x 5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Unavailable No Warnings 10 pts x 5%= 0.5	Generally Not <50% 7 pts x 5%= 0.35	Unavailable No Warnings 10 pts x 5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5	Unavailable No Warnings 10 pts x 5%= 0.5
Hazard Score	7.40	7.20	6.35	6.35	6.35	5.25	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Sherman Township, Michigan

Evaluation Criteria	Wildfires	Flooding / Dam Failure	Infrastructure Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.20	6.95	6.80	6.35	5.75	4.65	4.85
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Troy Township, Michigan

Evaluation Criteria	Wildfires	Infrastructure Failure	Flooding / Dam Failure	Fires	Criminal	Hazardous Materials	Transport
Historical Occurrence	High 2 – 3 events/yr 7 pts x 20% = 1.4	High 2 – 3 events/yr 7 pts x 20% = 1.4	Low >1 event/yr 1 pt x 20%= 0.2	High 2 – 3 events/yr 7 pts x 20% = 1.4	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2	Low >1 event/yr 1 pt x 20%= 0.2
Affected Area	Small Area 1/4 Juris. 7 pts x 20%= 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20%= 0.2	Single Site < Neighborhood 1 pt x 20%= 0.2	Multiple Sites > Neighborhood 4 pts x 20%= 0.4	Single Site < Neighborhood 1 pt x 20%= 0.2
Speed of Onset	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0	Minimal No Warning 10 pts x10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x10%= 0.7	No Impact 0 injured 1 pt x10%= 0.1	High Impact >10 injured 10 pts x10% = 1.0	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0	High Impact >10 injured 10 pts x10% = 1.0
Economic Effects	Medium <\$100k 7 pts x10%= 0.7	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	High >\$100k 10 pts x10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x5%= 0.35	Short <24 Hours 4 pts x 5%= 0.2	Long > 1 Week 10 pts x5%= 0.5	Short <24 Hours 4 pts x 5%= 0.2	Medium <1 Week 7 pts x5%= 0.35	Medium <1 Week 7 pts x5%= 0.35	Minimal <12 Hours 1 pt x 5%= 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	¾ Year 3 Seasons 7 pts x5%= 0.35	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5	Year Round 4 Seasons 10 pts x5%= 0.5
Predictability	Somewhat <50% Accuracy 7 pts x5%= 0.35	Unpredictable Difficult 10 pts x5%= 0.5	Fairly Predict. >50% Accuracy 4 pts x 5%= 0.2	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5	Unpredictable Difficult 10 pts x5%= 0.5
Collateral Damage	Good <75% 7 pts x5%= 0.35	Some Poss. <50% 4 pts x 5%= 0.2	High Poss. >75% 10 pts x5%= 0.5	Minimal Poss. <10% 1 pt x 5%= 0.05	High Poss. >75% 10 pts x5%= 0.5	Some Poss. <50% 4 pts x 5%= 0.2	Some Poss. <50% 4 pts x 5%= 0.2
Availability of Warnings	Generally Not <50% 7 pts x5%= 0.35	Unavailable No Warnings 10 pts x5%= 0.5	Most of the time >75% 4 pts x 5%= 0.2	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5	Unavailable No Warnings 10 pts x5%= 0.5
Hazard Score	6.95	6.80	6.35	5.75	5.75	5.65	4.25
Rank	1	2	3	4	5	6	7

Hazards Profile and Evaluation – Wilcox Township, Michigan

Evaluation Criteria	Wildfires	Flooding / Dam Failure	Infrastructure Failure	Fires	Criminal / Violent Crime	Hazardous Materials	Transport
Historical Occurrence	Excessive 4+ events/yr 10 pts x 20% = 2.0	Medium 1 event/yr 4 pts x 20% = 0.8	High 2-3 events/yr 7 pts x 20% = 1.4	Excessive 4+ events/yr 10 pts x 20% = 2.0	Low >1 event/yr 1 pt x 20% = 0.2	Low >1 event/yr 1 pt x 20% = 0.2	Medium 1 event/yr 4 pts x 20% = 0.8
Affected Area	Small Area 1/4 Juris. 7 pts x 20% = 1.4	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Large Area >1/2 Juris. 10 pts x 20% = 2.0	Single Site < Neighborhood 1 pt x 20% = 0.2	Single Site < Neighborhood 1 pt x 20% = 0.2	Multiple Sites > Neighborhood 4 pts x 20% = 0.4	Single Site < Neighborhood 1 pt x 20% = 0.2
Speed of Onset	Minimal No Warning 10 pts x 10% = 1.0	Medium 12-24 Hours 4 pts x 10% = 0.4	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0	Minimal No Warning 10 pts x 10% = 1.0
Casualty Effects	Medium <10 injured 7 pts x 10% = 0.7	High Impact >10 injured 10 pts x 10% = 1.0	No Impact 0 injured 1 pt x 10% = 0.1	Low Impact <5 injured 4 pts x 10% = 0.4	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0	High Impact >10 injured 10 pts x 10% = 1.0
Economic Effects	Medium <\$100k 7 pts x 10% = 0.7	High >\$100k 10 pts x 10% = 1.0	Low <\$50k 4 pts x 10% = 0.4	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	High >\$100k 10 pts x 10% = 1.0	Minimal <\$10k 1 pt x 10% = 0.1
Duration	Medium <1 Week 7 pts x 5% = 0.35	Long > 1 Week 10 pts x 5% = 0.5	Short <24 Hours 4 pts x 5% = 0.2	Short <24 Hours 4 pts x 5% = 0.2	Medium <1 Week 7 pts x 5% = 0.35	Medium <1 Week 7 pts x 5% = 0.35	Minimal <12 Hours 1 pt x 5% = 0.05
Seasonal Pattern	¾ Year 3 Seasons 7 pts x 5% = 0.35	¾ Year 3 Seasons 7 pts x 5% = 0.35	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5	Year Round 4 Seasons 10 pts x 5% = 0.5
Predictability	Somewhat <50% Accuracy 7 pts x 5% = 0.35	Fairly Predict. >50% Accuracy 4 pts x 5% = 0.2	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5	Unpredictable Difficult 10 pts x 5% = 0.5
Collateral Damage	Good <75% 7 pts x 5% = 0.35	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Minimal Poss. <10% 1 pt x 5% = 0.05	High Poss. >75% 10 pts x 5% = 0.5	Some Poss. <50% 4 pts x 5% = 0.2	Some Poss. <50% 4 pts x 5% = 0.2
Availability of Warnings	Generally Not <50% 7 pts x 5% = 0.35	Most of the time >75% 4 pts x 5% = 0.2	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5	Unavailable No Warnings 10 pts x 5% = 0.5
Hazard Score	7.20	6.95	6.80	6.35	5.75	4.65	4.85
Rank	1	2	3	4	5	6	7

Annex C

Acknowledgements & Documentation

Newaygo County LEPT
2015 MEMBERSHIP ROSTER

Member's Name	Group Represented
Abby Watkins	Newaygo County Emergency Services
April Richardson	Newaygo County CERT/MRC
Phil Duer	Newaygo County Board of Commissioners
Larry Lethorn	Newaygo County Board of Commissioners
Pat Gardner	Newaygo County Board of Commissioners
Cyndie Miller	Newaygo County Central Dispatch
Mark Johnson	Newaygo County Equalization
Tobi Lake	Newaygo County Administration
Melanie Carrier	Newaygo County Administration
Donna Kipp	Newaygo County Administration
Chad Palmiter	Newaygo County Sheriff's Office
Jeff White	MSP Hart Post
Phil Smalligan	Newaygo County Fire Chiefs Association
Jason Wolford	Newaygo County Fire Chiefs Association
Kathy Miller	Spectrum Health Gerber Memorial
Jeff Stockhill	Life EMS
(Vacant)	Newaygo County Medical Control Authority
Bret Haner	District 10 Public Health Department
Karen (Schaper) Ripke	District 10 Public Health Department
Curtis Franks	Newaygo County Police Chiefs Assoc
Dale Twing	Newaygo County Drain Commissioner
Scott Woodside	Newaygo County Mental Health
John Agnello	Newaygo County Commission on Aging
Sue Dejong	Newaygo County Medical Care Facility
Jim Meike	Elected Official
Bob Dakin	Law Enforcement
Richard Wheeler	Media
David Norton	EMS
Debbie Baersler	Hospital
Nate Sparks	Agriculture
Pat Conklin	Operator

Newaygo County Hazard Management Plan Update
2012 ADVISORY COMMITTEE

Name	Title	Agency	Email Address
Abby Watkins	Director	Emergency Services	abbym@co.newaygo.mi.us
Dan Dowdy	Deputy Director	Emergency Services	esdeputydirector@co.newaygo.mi.us
Tobi Lake	Administrator	County Administrator	tobi@co.newaygo.mi.us
Bret Haner	Emergency Preparedness Coordinator	District 10 Health Department	bhaner@dhd10.org
Ryan Coffey	Land Use Educator	Land Use Educator	coffeyry@anr.msu.edu
Lori Schultz	Lake / Newaygo DHS	Lake / Newaygo DHS	schultzl2@michigan.gov

MEETINGS

Meetings for the purpose of updating the Newaygo County Hazard Management Plan; including lists of attendees and synopses of comments and discussion pertaining to hazard mitigation.

January 17, 2012: Newaygo County LEPT Meeting

Attendees:

Sarah Bowman – NCMH	Stanley Nieboer – Commissioner
Abby Watkins – Emergency Services	Marcy Dix – Administration
Dan Dowdy – Emergency Services	Dawn Bushouse – Lake/Newaygo DHS
Lloyd Walerczyk – Newaygo PD	Mark Johnson – Equalization
Chad Palmiter – Sheriff's Office	Donna Kipp – Administration
Kathy Miller – Spectrum GMH (Phone)	Theresa Buttleman – Emergency Services
Stephen Carlson – WMSRDC (Guest)	

Synopsis:

Introduction of Hazard Mitigation planning and a presentation of the anticipated planning process for updating the Newaygo County Hazard Management Plan. Also discussed establishment of the Hazard Mitigation Advisory Team.

March 20, 2012: Newaygo County LEPT Meeting and Hazard Mitigation Public Hearing

Attendees:

NAME	PHONE	E-MAIL
Bill Sudy		
Dawn Bushouse	687-3340	dbushouse@newaygo.org
Amanda M. Ansh	934-3030	amansh@newaygo.org
Sam Ames	934-3030	sames@newaygo.org
Roy Wright	652-7984	rwright@newaygo.org
Mark Dix	689-1523	mdix@newaygo.org
Marcy Dix	689-7223	mdix@newaygo.org
Sarah Bowman	689-7330	sbowman@newaygo.org
Bernie Gerencer	689-7094	bernie@newaygo.org
Bret Haer	231-305-8647	bhaer@newaygo.org
Stephen Carlson	231-722-7878	scarlson@wmsrdc.org

Synopsis:

Public meeting to discuss hazard mitigation at the beginning of the planning process. It was noticed in the Fremont Times-Indicator, discussed in the WMSRDC electronic newsletter, and announced in the survey mailing. The meeting featured a presentation about the hazard mitigation planning process, and the public was invited to comment upon and discuss the survey that was distributed to 146 community individuals, and made available on the WMSRDC website.

March 20, 2012: Newaygo County LEPT Meeting

Attendees:

(Record Unavailable)

Synopsis:

Gave a brief overview of the Hazard Mitigation project and requested participation from the attendees. Also discussed the surveys that have been sent out to local jurisdictions. The meeting was very well attended by local officials from around the county.

October 23, 2013: Water, Woods & Wetlands Regional Forum

Attendees:

ALISA	GONZALES-PENNINGTON	DEQ CIM	OFFICE OF GREAT LAKES-CIM
GARY	WILSON	Great Lks environmental	CHICAGO COMMENTATOR, GREAT LAKES ECHO
MATTHEW	CHILD	International JC	IJC - GREAT LAKES REGIONAL OFFICE
ANNA	KORNOELJE	Kzee environmental	KALAMAZOO NATURE CENTER
STEPHANIE	SWART	MDEQ	MDEQ OFFICE OF THE GREAT LAKES
ROBERT	SWEET	MDEQ	MDEQ NON POINT SOURCE PROGRAM
JON	ALLAN	MDEQ	DIRECTOR, MICHIGAN OFFICE OF THE GREAT LAKES
SUZANNE	DIXON	MDNR	LEAGUE OF WOMEN VOTERS-DIRECTOR-DNR
SHAWN	HOWARD	Mi environmental	NATURE CONSERVANCY IN MICHIGAN
JEAN	WEIRICH	Mi environmental	WILDFLOWER ASSOCIATION OF MICHIGAN
STEPHANIE	BARRETT	Mkg Co. elected	MUSKEGON COUNTY INTERIM DRAIN COMMISSION
SUSIE	HUGHES	Mkg Co. elected	MUSKEGON COUNTY COMMISSIONER
LUFE	ALVAR	Mkg Co. Veterans	MUSKEGON COUNTY VETERANS BOARD
KIM	ARTER	Mkg local elected	LAKETON TOWNSHIP SUPERVISOR
LEA	MARKOWSKI	Mkg local official	CITY OF MUSKEGON COMMISSIONER
DAVID	SHEEHY	Mkg local official	LAKETON TOWNSHIP ZONING ADMINISTRATOR
RON	BROWN	Mkg Non-Profit	MUSKEGON ENVIRONMENTAL RESEARCH & EDUCATION SOCIETY
DARLENE	DEHODY	Mkg resident	MUSKEGON COUNTY RESIDENT
TOM	MATYCH	Mkg resident	MUSKEGON COUNTY RESIDENT
BILLIE	HOLMES	MLWP	JACKSON HILL NEIGHBORHOOD ASSOC. & MLWP
CATHERINE	SWATEK	MLWP	MUSKEGON LAKE WATERSHED PARTNERSHIP
THERESA	BERNHARDT	MLWP	MUSKEGON LAKE WATERSHED PARTNERSHIP
WAYNE	GROESBECK	MLWP	MUSKEGON LAKE WATERSHED PARTNERSHIP & MRWA
NANCY	BURMEISTER	MRWA	MUSKEGON RIVER WATERSHED ASSEMBLY
GARY	NOBLE	MRWA	MUSKEGON RIVER WATERSHED ASSEMBLY
DENNIS	DONAHUE	NOAA	NOAA GLERL LAKE MICHIGAN FIELD STATION
TERRY	HEATLIE	NOAA	NOAA FISHERIES
JOEL	DARUNG	Non-Profit	DARLINS CETACEANS
LISA	DUTCHER	Oceana Co. RC	RSK CONSULTANT - OCEANA COUNTY ROAD COMMISSION
TOM	BOOM	Private Business	BARR ENGINEERING
ERIC	JOHNSON	Private Business	WEST SHORE CONSULTANTS
BOB	KRENN	Private Business	TIMBER BRIDGES
KELLY	RKE	Private Business	CARDNO JF NEW
CHRIS	WARREN	Private Business	BARR ENGINEERING COMPANY
ELAINE	ISELY	Regional environmental	WEST MICHIGAN ENVIRONMENTAL ACTION COUNCIL
JENNIFER	MCKAY	Regional environmental	TIP OF THE MITT WATERSHED COUNCIL
CAROLYN	ULSTAD	Regional environmental	MACATAWA AREA COORDINATING COUNCIL
RICK	WESTERHOF	USFWS	US FISH & WILDLIFE SERVICE
CHARLES	BYERS	USGS	US GEOLOGICAL SURVEY
JOE	DURIS	USGS	USGS - MICHIGAN WATER SCIENCE CENTER
RYAN	OSTER	USGS	USGS MICHIGAN WATER SCIENCE CENTER
DENNIS	MARVIN	utilities	CMS ENERGY
TANYA	CABALA	Wh. Lk. PAC	WHITE LAKE PUBLIC ADVISORY COUNCIL
GREG	MUND	Wh. Lk. PAC	WHITE LAKE PUBLIC ADVISORY COUNCIL
THOMAS	TISUE	Wh. Lk. PAC	WHITE LAKE PUBLIC ADVISORY COUNCIL
TOM	HAMILTON	Wh. R. WP	WHITE RIVER WATERSHED PARTNERSHIP
STEPHEN	CARLSON	WMSRDC	WMSRDC SENIOR PLANNER
JOSHUA	CROFF	WMSRDC	WMSRDC PLANNER
SANDEEP	DEY	WMSRDC	WMSRDC EXECUTIVE DIRECTOR
KATHY	EVANS	WMSRDC	WMSRDC ENVIRONMENTAL PROGRAM MANAGER
JOEL	FITZPATRICK	WMSRDC	WMSRDC TRANSPORTATION PLANNER
AMY	HANCK	WMSRDC	WMSRDC
ERIN	KUHN	WMSRDC	WMSRDC ECONOMIC DEVELOPMENT PROGRAM MGR
BRIAN	MULNIK	WMSRDC	WMSRDC TRANSPORTATION PROGRAM MGR
MARY	SEIGER	WMSRDC	WMSRDC
RUTH	OLSEN		
VIRGINIA	O'TOOLE		

Synopsis:

WMSRDC staff discussed hazard mitigation at the “Water, Woods, & Wetlands” regional forum on October 23, 2013 in Muskegon, Michigan. The hazard mitigation session addressed the potential for coordination between hazard mitigation and a variety of environmental initiatives. Examples of successful mitigation projects in Michigan highlighted many common interests, such as culvert improvements, flood control, and stream bank stabilization.

May 20, 2014: Newaygo County LEPT Meeting

Attendees:

Abby Watkins, Emergency Services	April Richardson, Emergency Services
John Agnello, COA	Phil Deur, Commissioner
Chad Palmiter, Sheriff's Office	Hunter Niederer, Sheriff's Office Marine
Jacob Neuton, Sheriff's Office Marine	Tyler Sheppard, Sheriff's Office Marine
Jesse Reichle, Sheriff's Office Marine	Stephen Carlson, WMSRDC
Tobi Lake, Administrator	Dale Twing, Drain Commissioner
Donna Kipp, Administration	Teressa Hamilton, Equalization
Melanie Carrier, Administration	Lori Schultz, Department of Human Services

Synopsis:

Extensive review of April 2014 Flood. Also a discussion of the 1-year grant extension and made plans to hold public meetings in the coming months.

July 15, 2014: Newaygo County LEPT Meeting

Attendees:

Abby Watkins, Emergency Services	April Richardson, Emergency Services
Steve Hatting, National Forest Service	Gayle Davis, American Red Cross
Phil Smalligan, Fire Chiefs Association	Larry Lethorn, Board of Commissioners
Jodie McGarry, Administration	Julie S, Newaygo CMH
Melanie Carrier, Administration	Shellie Perigo, Equalization
Dawn Locke, Department of Human Services	Karen Ripke, DHD 10
Cyndie Miller, Central Dispatch	Dale Twing, Drain Commissioner

Synopsis:

A review and discussion regarding the Community Hazard Rankings. Oil leak discovered on the Muskegon River in Bridgeton Township on June 30. It is a 100-year old pipeline that had been previously capped by the Michigan DEQ.

August 19, 2014: Newaygo County LEPT Meeting

Attendees:

Abby Watkins, Emergency Services	April Richardson, Emergency Services
Kathy Miller, Spectrum Health Gerber	Stephen Carlson, WMSRDC
Melanie Carrier, Administration	Sarah Bouman, NCMH
Phil Smalligan, Fire Chiefs Association	Gayle Davis, Red Cross
Phil Deur, Commissioner	Chad Palmiter, Sheriff's Office
Mark Johnson, Equalization	Tobi Lake, Administration
Cyndie Miller, Central Dispatch	

Synopsis:

A review and discussion regarding the following hazard sections of the Newaygo County Hazard Management Plan: Criminal Incidents, Drought, Fires, and Wildfires.

September 16, 2014: Newaygo County LEPT Meeting

Attendees:

Abby Watkins, Emergency Services	April Richardson, Emergency Services
Peg Muckey, Newaygo County Med Control	Rich Kooistra, Equalization
Gayle Davis, Red Cross	Karen Ripke, DHD10
Donna Kipp, Administration	Chad Palmiter, Sheriff's Office
Dale Twing, Drain Commissioner	

Synopsis:

A review and discussion regarding the following hazard sections of the Newaygo County Hazard Management Plan: Flood and Dam Failure, Severe Thunderstorms and Tornadoes, Severe Winter Weather, Public Health, and Hazardous Materials Incidents.

October 21, 2014: Newaygo County LEPT Meeting

Attendees:

	Name	Agency
1	Karen Ripke	DHHS 10
2	April Richardson	Emergency Services
3	Donna Ginn	Executive Director THS
4	Stephen Carlson	NMISRC
5	CLATS FRANK	Freemont PD
6	Sandy Siegel	Sgt. Gabele Memorial
7	Scott Woodside	NCMH
8	Jaden McLeary	Admin
9	Dennis Kipp	Admin
10	Tyler Ginn	Equalization
11	Paula D. Ellis	ARC
12	Chad Palmer	NCSO
13	Margaret Taylor	ARC
14	W. J. (Jill)	Fire Chiefs
15	Tracy Miller	Sullivan
16	John Wauson	SHSAA
17	Chris Velle	Salvage Army

Synopsis:

A review and discussion regarding the following hazard sections of the Newaygo County Hazard Management Plan: Infrastructure Failure and Transportation Accidents.

December 16, 2014: Newaygo County LEPT Meeting

Attendees:

	Name	Agency
1	April Richardson	ES
2	Greg Clark	DNR PAR
3	Stephen Carlson	NMISRC
4	Jana Wilson	Fire Chiefs
5	Phil Scott	COMM.
6	Mike Frank	ED
7	CLATS FRANK	FRS
8	John Guelle	COA
9	Tracy Fox	COA
10	Paula D. Ellis	ARC
11	Scott Woodside	NCMH
12	John Guelle	FFD
13	Melanie Carter	Admin
14	Todd Laker	Admin
15	Karen Ripke	DHHS
16	Chad Palmer	NCSO
17	John Wauson	Life EMS
18		

Synopsis:

A review and discussion of revised Action Agenda. Proposed action items were distributed to the committee prior to meeting. Biggest concerns with regards to flooding are NFIP enforcement (primarily tanks in the floodplain) and the warning system.

January 20, 2015: Newaygo County LEPT Meeting and Hazard Mitigation Public Meeting

Attendees:

	Name	Agency
1	Phil Deane	N.C. Comm.
2	Curtis Franks	Fremont PD
3	John Gagliardi	COA
4	Chad Palmer	NCSC
5	Stephen Carlson	WMSRDC
6	Don Thomas	Med. HAZ Post
7	Steve Hatching	Forest Service
8	Kathy Miller	SHS
9	Frank Russo	MSP & MHSF
10	Tim Ediger	Fire Chiefs
11	Scott Whitehead	Health
12	Karen Roper	DHS 10
13	Dawn Cook	DHS
14	John McBarney	Admin.
15	Cynthia Miller	911
16		

Synopsis:

The LEPT hosted a public meeting to offer the public an opportunity to participate during the drafting process. There were no comments from the public at the meeting, and no comments were submitted prior to the meeting. The meeting was noticed in the Fremont Times-Indicator on January 7, 2015 and on the Newaygo County Emergency Services website. Following the public meeting, WMSRDC staff conducted a work session, whereas the proposed set of hazard mitigation action items were reviewed, discussed, and prioritized utilizing interactive polling technology.

REFERENCES

Many resources, documents, and websites were researched and referenced during the development of this plan. The following resources were most helpful during this process:

AGENCIES & ORGANIZATIONS

West Michigan Shoreline Regional Development Commission
Newaygo County Planning Commission
Newaygo County Road Commission
Newaygo County Clerk's Office
Michigan State Police, Emergency Management and Homeland Security Division
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Michigan Historical Center Preservation Office
American Red Cross, Lakeshore & West Shore Chapter
United States Census Bureau
United States Geological Survey
National Weather Service, Grand Rapids
Newaygo County Fire Chiefs Association
Federal Emergency Management Agency, National Flood Insurance Program
Newaygo County Local Emergency Planning Team
Muskegon County Local Emergency Planning Team
Gerber Memorial Hospital
Huron Manistee National Forest Forestry Division
Pipeline and Hazardous Materials Safety Administration
Wolverine Power Company
Consumers Energy

DOCUMENTS

Newaygo County Parks and Recreation Plan 2012-2016
Newaygo County Community Wildfire Protection Plan 2010
Newaygo County 2010 Master Plan
Michigan Hazard Analysis (July 2012)
Michigan Hazard Mitigation Plan (updated March 2011)
Hazard Mitigation Plan for Kent and Ottawa Counties (revised 2012)

WEB SITES

National Climatic Data Center: <http://www.ncdc.noaa.gov/>
FEMA www.fema.gov
Michigan Geographic Data Library: www.mcgi.state.mi.us/mgdl/
MLIVE: www.mlive.com

PUBLIC NOTICES

Public notices published during the Newaygo County Hazard Management Plan Update planning process.

March 7, 2012 – Fremont Times-Indicator

NOTICE OF PUBLIC HEARING REGARDING HAZARD MITIGATION

The West Michigan Shoreline Regional Development Commission (WMSRDC), in cooperation with Newaygo County Emergency Services, has begun the process of updating the Newaygo County Hazard Management Plan. Public input is requested regarding natural and man-made hazards that pose a threat to people and property in Newaygo County. A public hearing to discuss Hazard Mitigation and receive input from the community will take place at 2:00 PM on March 20, 2012 at the Newaygo County Emergency Operations Center located at 306 North Street, White Cloud, MI, 49349. Additional information about the Newaygo County Hazard Management Plan Update is available at www.wmsrdc.org. Please direct any questions to Mr. Stephen Carlson, Associate Planner, at (231) 722-7878, extension 11 or at scarlson@wmsrdc.org.

January 7, 2015 – Fremont Times-Indicator

NOTICE OF PUBLIC MEETING REGARDING HAZARD MITIGATION

Public input is requested for the Newaygo County Hazard Management Plan, which is being developed by Newaygo County Emergency Services with assistance from the West Michigan Shoreline Regional Development Commission (WMSRDC). The "Community Profile" and "Hazard Analysis" sections of the plan are currently available for review at countyofnewaygo.com/EmergencyServices.aspx under the "Hazard Management Plan" tab. The public is invited to comment on these sections at the Newaygo County Local Emergency Planning Team meeting at 1:00 PM on January 20, 2015 at the Newaygo County Emergency Operations Center, 306 North Street in White Cloud. The meeting will also feature an interactive session to prioritize recommended action items of the Hazard Management Plan. Written comments may also be emailed to scarlson@wmsrdc.org prior to the meeting. Please direct any questions to Mr. Stephen Carlson, Senior Planner, at (231) 722-7878.

Annex D

Potential Hazard Mitigation Funding Sources

Source: Michigan Hazard Mitigation Plan (Updated March 2011)

STATE AGENCY MITIGATION FUNDING PROGRAMS

Funding Sources for Hazard-Specific Measures	Drought	Earthquake	Extreme Temperatures	Wildfire	Dam Failure	Riverine Flooding	Great Lakes Shoreline Flooding	Subsidence	Hail	Lightning	Severe Wind	Tornadoes	Ice and Sleet Storms	Snowstorms	FINANCIAL ASSISTANCE	TECHNICAL ASSISTANCE
MICHIGAN DEPARTMENT OF AGRICULTURE																
Conservation Reserve Enhancement Program						X					X				X	X
Intercounty Drain Program (available to drain commissioners only)					X	X										X
MICHIGAN DEPT. OF ENVIRONMENTAL QUALITY																
Coastal Management Program							X								X	X
Michigan Great Lakes Protection Fund							X								X	
State Revolving Fund (Loan)						X									X	
Wetland Program Development (also see 66.461 in CFDA)						X	X								X	
MICHIGAN DEPT. OF NATURAL RESOURCES																
Land & Water Conservation Fund						X	X								X	
Michigan Habitat Improvement Fund Project Grants						X									X	
Michigan Natural Resources Trust Fund				X		X									X	
Michigan Volunteer Fire Assistance				X											X	
Recreational Trails Program Grants						X	X								X	
Community Forestry Program											X	X	X		X	X
MICHIGAN DEPARTMENT OF STATE POLICE																
Emergency Management Performance Grants (also see 97.042 in CFDA)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Flood Mitigation Assistance (also see 97.029 in CFDA)						X	X								X	
Hazard Mitigation Grant Program (also see 97.039 in CFDA)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Federal Disaster Assistance to Individuals and Households in Presidential Declared Disaster Areas (also see 97.048 in CFDA)		X		X		X	X	X			X	X			X	
Presidential Declared Disaster Assistance - Disaster Housing Operations For Individuals And Households (also see 97.049 in CFDA)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Presidential Declared Disaster Assistance To Individuals And Households - Other Needs (also see 97.050 in CFDA)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Disaster Grants-Public Assistance (Presidentially Declared Disasters) (also see 97.036 in CFDA)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Pre-Disaster Mitigation (also see 97.047 in CFDA)			X	X		X	X				X	X			X	
Severe Loss Repetitive Program (also see 97.110 in CFDA)						X	X								X	
Repetitive Flood Claims (also see 97.092 in CFDA)						X	X								X	
MICHIGAN DEPARTMENT OF TRANSPORTATION																
Transportation Economic Development Fund						X	X								X	
MICHIGAN ECONOMIC DEVELOPMENT CORP																
Community Development Block Grant Program (also see 14.218,14.219, 14.228 in CFDA)						X	X								X	
Urban Land Assembly						X	X								X	
MICHIGAN STATE HOUSING DEVELOPMENT AUTHORITY																
CDBG Housing Resource Fund (Inc HOME) (also see 14.239 in CFDA)						X	X		X		X	X			X	
Home/Property Improvement Loans						X	X		X		X	X			X	
MICHIGAN DEPARTMENT OF TREASURY																
Michigan Finance Authority-Local Gov't Loan Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Michigan Finance Authority-State Aid Note	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

FEDERAL HAZARD MITIGATION FUNDING SOURCES

Funding Sources for Hazard-Specific Measures	Drought	Earthquake	Temperatures	Wildfire	Dam Failure	Riverine Flooding	Shoreline Flooding and Erosion	Subsidence	Hail	Lightning	Severe Wind	Tornadoes and Ice Storms	Storms	Snowstorms	FINANCIAL ASSISTANCE	TECHNICAL ASSISTANCE
10.054 Emergency Conservation Program	X					X					X	X			X	
10.069 Conservation Reserve Program						X					X	X			X	X
10.072 Wetlands Reserve Program						X	X								X	X
10.202 Cooperative Forestry Research				X							X	X			X	
10.410 Very Low to Moderate Income Housing Loans			X	X		X	X	X	X	X	X	X			X	
10.411 Rural Housing Site Loans and Self Help Housing and Development Loans						X	X								X	
10.417 Very Low Income Housing Repair Loans/Grants			X	X		X	X	X	X	X	X	X			X	
10.445 Direct Housing Natural Disaster (Very Low/Low Income Loans)				X		X	X		X	X	X	X			X	
10.652 Forestry Research						X	X				X	X			X	
10.664 Cooperative Forestry Assistance				X											X	
10.760 Water & Waste Disposal Sys. for Rural Comm.						X	X								X	
10.763 Emergency Community Water Assistance Grants	X					X	X								X	
10.766 Community Facilities Loans & Grants	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
10.768 Business and Industry Loans	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
10.770 Water/Waste Disposal Loans/Grants						X	X								X	
10.773 Rural Business Opportunity Grants						X	X								X	
10.850 Rural Electrification Loans and Loan Guarantees										X	X	X	X	X	X	
10.901 Resource Conservation and Development	X	X	X	X		X	X									X
10.902 Soil and Water Conservation	X	X	X	X		X	X									X
10.904 Watershed Protection and Flood Prevention					X	X	X								X	X
10.913 Farm and Ranch Land Protection Program						X	X								X	
10.914 Wildlife Habitat Incentive Program						X	X								X	
11.300 Investments for Public Works and Economic Development Facilities					X	X	X								X	
11.303 Economic Development Technical Assistance						X	X								X	X
11.307 Economic Adjustment Assistance					X	X	X				X	X			X	
11.419 Coastal Zone Mgmt. Administration Awards							X									X
11.462 Hydrologic Research	X				X	X	X								X	
11.463 Habitat Conservation							X								X	
11.477 Fisheries Disaster Relief	X			X	X	X	X								X	
11.478 Center for Coastal Ocean Research_Coastal Ocean Program							X								X	
11.550 Public Telecommunication Facilities-Planning & Construction												X			X	
12.101 Beach Erosion Control Projects							X								X	
12.102 Emergency Rehabilitation of Flood Control Works or Federally Authorized Coastal Protection Works					X	X	X								X	
12.103 Emergency Operations Flood Response & Post-Flood Response					X	X	X								X	
12.104 Flood Plain Management Services					X	X	X									X
12.105 Protection of Essential Highways, Highway Bridge Approaches, and Public Works					X	X	X								X	
12.106 Flood Control Projects					X	X	X								X	
12.108 Snagging and Clearing for Flood Control					X	X	X								X	
12.109 Protection, Clearing and Straightening Channels						X	X								X	
12.111 Emergency Advance Measures for Flood Protection					X	X	X								X	
14.218 Community Development Block Grants/Entitlement Grants	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
14.228 Community Development Block Grants-State's Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

FEDERAL HAZARD MITIGATION FUNDING SOURCES (CONT.)

Funding Sources for Hazard-Specific Measures	Drought	Earthquake	Temperatures	Wildfire	Dam Failure	Riverine Flooding	Shoreline Flooding and Erosion	Subsidence	Hail	Lightning	Severe Wind	Tornadoes and Ice Storms	Storms	Snowstorms	FINANCIAL ASSISTANCE	TECHNICAL ASSISTANCE
14.218 Community Development Block Grants/Entitlement Grants	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
14.219 Community Development Block Grants -Small Cities Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
14.228 Community Development Block Grants-State's Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
14.239 HOME Investment Partnerships Program						X	X		X	X	X	X			X	
14.246 Community Development Block Grant/Brownfields Economic Development Initiative						X	X				X	X			X	
14.250 Rural Housing and Economic Development	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
14.511 Community Outreach Partnership Center Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
15.623 North American Wetlands Conservation Fund						X	X								X	
15.904 Historic Preservation Fund Grants-In-Aid						X	X	X	X	X	X	X	X	X		X
15.916 Outdoor Recreation-Acquisition, Development and Planning (Land and Water Conservation Fund Grants)						X	X								X	
15.918 Disposal of Federal Surplus Real Property for Parks, Recreation, and Historic Monuments						X	X									
15.921 Rivers, Trails, and Conservation Assistance						X	X									X
47.041 Engineering Grants	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
59.008 Disaster Assistance Loans		X		X		X	X	X	X	X	X	X	X	X	X	
66.461 Regional Wetlands Program Development Grants						X	X								X	
66.469 Great Lakes Program							X								X	
81.042 Weatherization Assistance for Low-Income Persons			X												X	
97.018 National Fire Academy Training Assistance				X												X
97.022 Flood Insurance						X	X									X
97.023 Community Assistance Program - State Support Services Element (NFIP)						X	X									X
97.024 Emergency Food and Shelter National Board Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.026 Emergency Management Institute-Training Assistance	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
97.028 Emergency Management Institute-Resident Education Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
97.029 Flood Mitigation Assistance						X	X								X	
97.030 Community Disaster Loans	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.031 Cora Brown Fund	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.036 Disaster Grants - Public Assistance (Presidentially Declared Disasters)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.037 Disaster Housing Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.039 Hazard Mitigation Grant Program	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.041 National Dam Safety Program					X											X
97.042 Emergency Management Performance Grants	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.044 Assistance to Firefighters Grant				X											X	
97.045 Cooperating Technical Partners						X	X								X	
97.046 Fire Management Assistance Grant				X											X	
97.047 Pre-Disaster Mitigation		X		X		X	X	X			X	X			X	
97.048 Disaster Housing Assistance to Individuals and Households in Presidential Declared Disaster Areas	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.049 Presidential Declared Disaster Assistance - Disaster Housing Operations for Individuals and Housholds	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.050 Presidential Declared Disaster Assistance to Individual and Households - Other Needs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
97.092 Repetitive Flood Claims						X	X								X	
97.110 Severe Repetitive Loss Program						X	X								X	