

**Tri-County Regional
Hazard Mitigation Plan**
For
Clinton, Eaton, Ingham Counties
and
Delta Charter Township

DRAFT

Prepared by the Tri-County Regional Planning Commission

**For Ingham County
Emergency Management**

2014

**Insert Resolutions from
Ingham, Eaton, Clinton Counties
and Delta Charter Township**

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Preface

This Hazard Mitigation Plan is a pre-disaster planning effort that provides a framework to enhance the general health, welfare and safety of the community. 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. The all hazards approach considers the potential impact of natural, technological and social hazards and seeks to identify some level of mitigation for each hazard. Hazard mitigation 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 resources, 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.

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

Recognizing the importance of reducing vulnerability to natural and technological hazards, our region is actively addressing hazard mitigation through the development and subsequent implementation of this plan. There are many benefits to be realized from this effort including protection of public health and safety, preservation of important services, reduction of property damage and many more. These benefits help our region remain a vibrant, safe and enjoyable place to live.

An imperative part of the Hazard Mitigation planning process includes revising and updating this plan to incorporate changes in technology, population and economic interests. Our region has undergone significant change in the last ten years and will likely continue to experience change in the future.

Executive Summary

Clinton, Eaton and Ingham Counties and Delta Charter Township has an active Emergency Management community that continues implement programs and initiatives that improve the general health, safety and welfare of residents and economic interests. This Hazard Mitigation Plan provides additional hazard mitigation actions that complement and expand on existing efforts. The emphasis of this plan is on reducing the impacts of hazards to residents, government and businesses in the community. This plan serves as the foundation for hazard mitigation activities and actions within the region.

Although hazards can never be mitigated completely, implementation of recommendations in this plan will reduce loss of life, destruction of property, and economic losses that result from natural, technological and social hazards. The plan provides a path toward continuous, proactive reduction of vulnerability to hazards, which can result in repetitive and oftentimes severe social, economic and physical damage. One important goal for any community is to ultimately obtain a state of full integration of hazard mitigation concepts into the routine governmental and business functions and management practices.

This plan employs a broad perspective in examining multi-hazard mitigation activities and opportunities in the region. Emphasis is placed on hazards that have resulted in threats to the public health, safety and welfare, as well as the social, economic and physical fabric of the community. The plan addresses such hazards as floods, summer storms, winter storms, hazardous material incidents, and school/institutional violence. Each hazard is analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigative action. The plan also lays out the legal basis for planning and the tools to be used for its implementation.

The plan will be published in 2014 and should be considered a step towards fully integrating hazard mitigation into the normal operation of government and business. In the process of completing this plan substantial effort was made to incorporate a range of expertise and information regarding local hazards. There are, however, opportunities for the community to refine this plan to more accurately represent specific jurisdictions, businesses and changes that may occur within the county. This plan will remain active for a period of five years, in which time the region should remain engaged in the hazard mitigation process by examining potential updates. For guidance on the update process contact the appropriate state and federal emergency management agencies.

Purpose

The Tri-County Regional and Delta Charter Township Hazard Mitigation Plan has been created to protect the health, safety, and economic interests of residents by reducing the impacts of natural, technological and social hazards through hazard mitigation planning, awareness, and implementation. The adoption of this plan enables jurisdictions to remain eligible for a variety of federal hazard mitigation

grants for a period of five years. This plan has been written to meet the requirements of the Disaster Mitigation Act 2000.

This plan serves as the foundation for hazard mitigation activities throughout the region. Implementation of the actions and recommendations in this plan will provide for the continuous, proactive reduction of vulnerability to hazards that often result in repetitive social and economic losses. Reduction of vulnerability promotes an environment in the community that is prepared for potentially severe situations that adversely impact the residents and business functions.

The plan provides an overview of the community, examines potential hazards to the county, identifies goals and objectives concerning hazard mitigation and forwards mitigation strategies that can reduce vulnerability to potential hazards.

In 2004, Ingham, Clinton and Eaton Counties and Delta Charter Township adopted four separate hazard mitigation plans. In 2014, these same entities are adopting a combined plan that meets the requirements of FEMA. The current plan provides new data and new goals and objectives that are not a part of the past 2004 plan. In fact, due to the new data and objectives included in the 2014 State of Michigan Hazard Mitigation Plan, and new goals of our local emergency response agencies developed over the past 10 years, this 2014 Plan is not an update of the old plan, it is a complete rewrite.

Planning Process

This Plan examines multi-hazard mitigation activities and opportunities for the community. Emphasis is placed on hazards that have had a significant impact to the region in the past and will likely pose the greatest potential threat to the county in the future. The planning process was guided by the Local Hazard Mitigation Planning Workbook (EMD-PUB207), which provided information on completing a successful mitigation plan.

In 2012, the planning process began with a kick-off meeting for the steering committee including the emergency managers of the three counties and Delta Township and the Community Development Director of Eaton County. The Michigan State Police planning staff were in attendance at the meeting and provided an overview of the expected planning process for this project. The Steering Committee also reviewed the hazards and mitigation actions from the 2004 plans and narrowed them down to a new list of hazards and mitigation actions that address the known issues within our region nearly ten years later. This plan is a product of those discussions about known hazards.

Throughout 2012, TCRPC staff reviewed the existing Hazard Mitigation plans for the region and began editing the documents into one regional plan. Throughout 2012 and 2013, TCRPC staff also analyzed the region with newly acquired LiDAR data that provided a detailed view of topography in the region. LiDAR maps of the region are included as supporting documents to this plan.

In 2013, four public workshops were held in Ingham, Clinton, Eaton Counties and Delta Charter Township, respectively. Emergency managers, sheriff departments, planning staff and representatives from local jurisdictions attended the workshops. TCRPC staff reviewed the existing plans, and provided a summary of the new hazard mitigation strategies to be included in the 2014 plan. TCRPC staff then engaged the attendees to gain public input on the draft plans.

As a result of these activities, the bulleted list below represents a general outline used to complete The Plan. Detailed accounts of each process are narrated separately in their corresponding sections.

- community profile.
- hazards and risks.
- definition of goals and objectives.
- mitigation strategies.
- Implementation of the plan.
- Monitoring and periodic revision of the plan.

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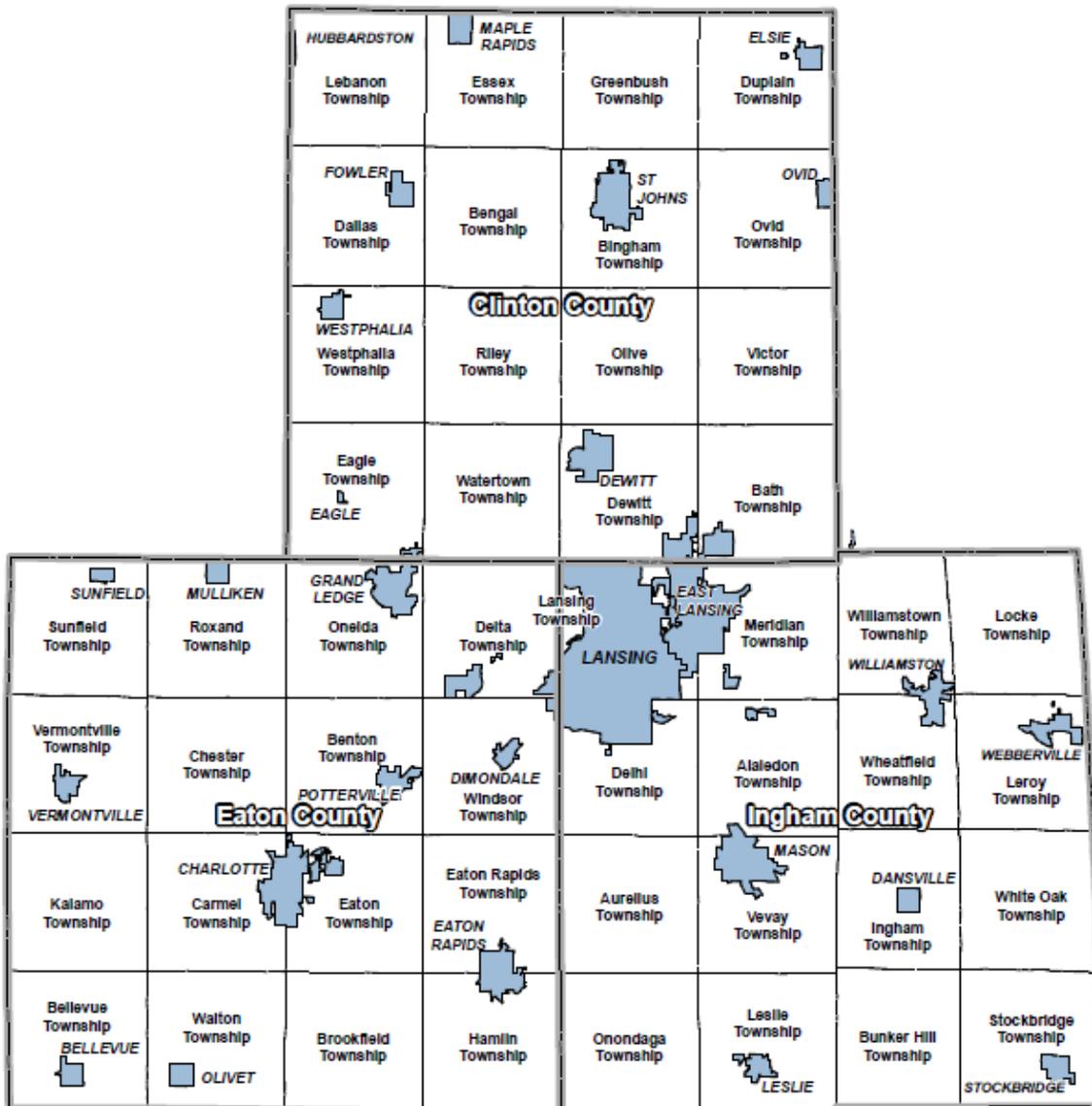
Chapter 1

Community Profiles

Community Profiles

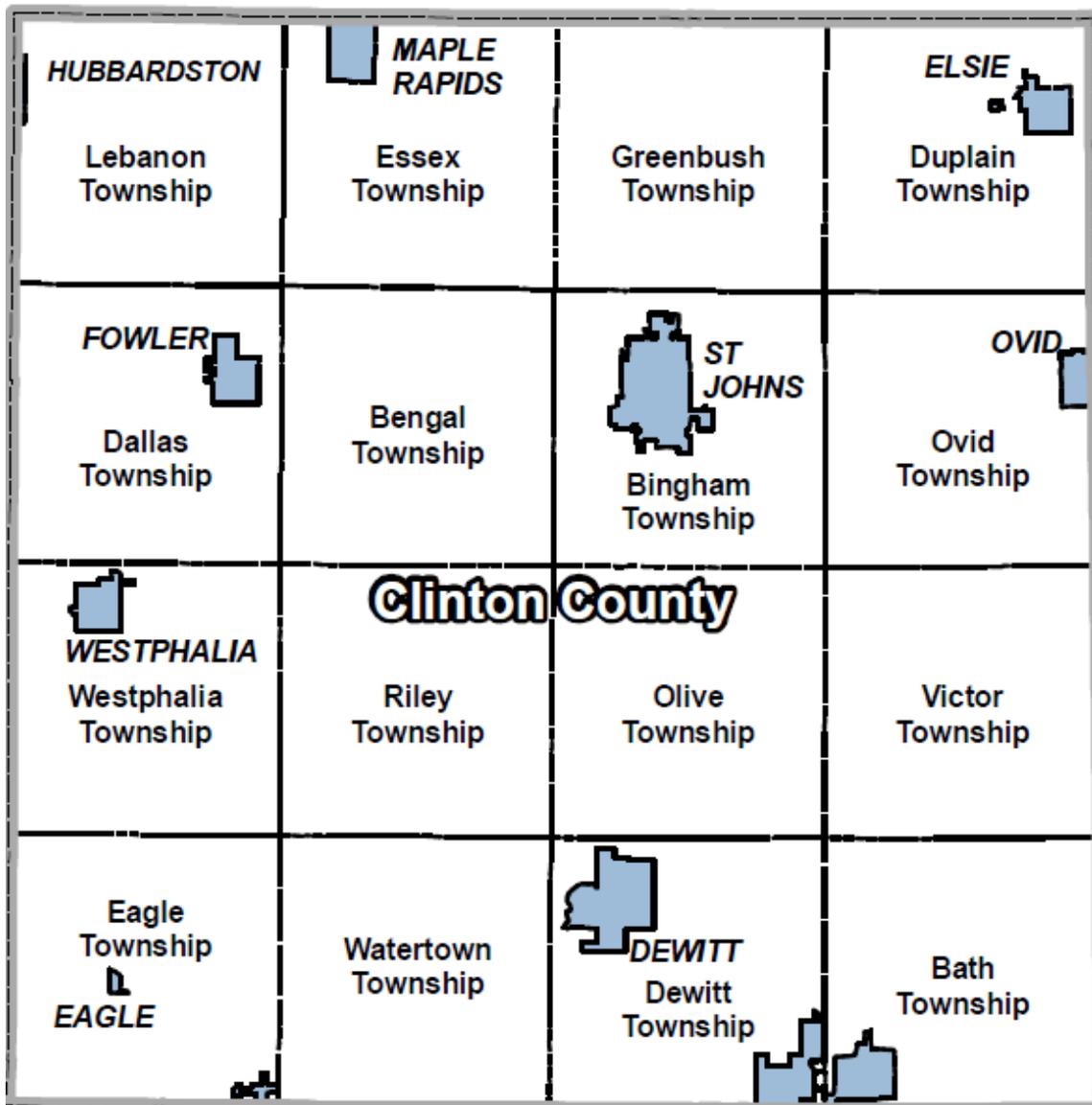
Introduction

The Community Profile is the first step in creating an effective hazard mitigation plan. The information and data in this chapter provide an in-depth look at the different characteristics of the region. Examination of characteristics that define each community's unique fabric is an effective means of identifying potential vulnerabilities that relate to a specific area in the county. The Community Profile contains a range of data and information specific to that area based on existing Comprehensive Plans, however, this data and information should not be considered comprehensive or all inclusive. The profiles are presented in alphabetical order, Clinton, Delta Charter Township, Eaton and Ingham.



CLINTON COUNTY

Clinton County consists of the following Townships, Cities and Villages:



Source: TCRPC

Location and Regional Context

Clinton County is five hundred seventy-one (571) square miles in size and is centrally located in the lower peninsula of the State of Michigan. The County is bordered by Shiawassee County to the east, Gratiot County to the north, Ionia County to the west, and Eaton and Ingham Counties to the south. The City of Lansing, the State's capital is located immediately south of Clinton County in Ingham County. Interstate 69 and Interstate 96 as well as US-127 pass through the southern portion of the County. The major east-west connector is State Highway 21, which connects Flint to Grand Rapids. Considering its close proximity to Lansing, the County remains predominantly rural.

Population

Growth in Clinton County's resident population accelerated during the 1960's and 1970's with the construction and opening of regional highways. (I-496, I-96, I-69 and US-127). This trend continued during the 1970s and '80s and, by the 1990 Census, almost 58,000 people were living in the county. Though slowing somewhat through the decade of the 1990s, the county's rate of growth exceeds that of neighboring jurisdictions.

Clinton County's population is expected to approach 75,357 by 2020, a 9% increase from 69,360 residents in 2005. The combination of further regional in-migration and natural increase as county residents form new households and have children will result in continued growth to the year 2020 and beyond.

	POPULATION BY FORECAST YEAR								
Clinton County	2005	2010	2015	2020	2025	2030	2035	2040	2045
MCD	10,484	10,513	10,563	10,734	10,930	11,135	11,311	11,495	11,682
Bath Twp	1,241	1,252	1,279	1,323	1,380	1,434	1,474	1,512	1,548
Bengal Twp	2,391	2,413	2,467	2,556	2,670	2,777	2,857	2,989	3,155
Bingham Twp	1,259	1,270	1,299	1,346	1,407	1,464	1,506	1,546	1,585
Dewitt	4,396	4,412	4,452	4,518	4,602	4,681	4,740	4,796	4,849
Dewitt Twp	12,947	14,001	14,817	15,720	16,556	17,053	17,186	17,284	17,366
Duplain Twp	1,321	1,333	1,362	1,411	1,474	1,532	1,576	1,618	1,657
Eagle	130	141	149	158	166	171	173	174	174
Eagle Twp	2,220	2,237	2,276	2,342	2,426	2,504	2,563	2,618	2,672
East Lansing	1,020	1,022	1,028	1,036	1,045	1,054	1,059	1,063	1,066
Elsie	1,002	1,009	1,024	1,050	1,083	1,114	1,137	1,159	1,180
Essex Twp	1,227	1,238	1,266	1,313	1,372	1,428	1,470	1,509	1,547
Fowler	1,082	1,086	1,096	1,113	1,135	1,155	1,171	1,185	1,199
Grand Ledge	5	5	5	6	6	6	6	6	6
Greenbush Twp	2,126	2,145	2,192	2,269	2,368	2,461	2,530	2,596	2,659
Lebanon Twp	792	800	818	848	886	922	949	975	999
Maple Rapids	614	619	631	651	677	700	718	735	751
Olive Twp	2,323	2,344	2,394	2,478	2,584	2,685	2,820	2,983	3,166
Ovid	1,416	1,422	1,437	1,462	1,494	1,524	1,547	1,568	1,588
Ovid Twp	2,024	2,042	2,088	2,163	2,259	2,350	2,417	2,481	2,542
Riley Twp	1,797	1,813	1,853	1,920	2,004	2,084	2,144	2,200	2,254
St Johns	7,574	7,595	7,648	7,735	7,846	7,951	8,029	8,103	8,174
Victor Twp	3,241	3,262	3,314	3,399	3,508	3,610	3,686	3,758	3,828
Watertown Twp	4,460	4,823	5,104	5,415	5,702	5,874	5,920	5,953	5,981
Westphalia	835	839	848	863	882	899	913	925	937
Westphalia Twp	1,436	1,449	1,480	1,531	1,597	1,659	1,705	1,749	1,790
Total Clinton County	69,360	71,084	72,922	75,357	78,058	80,229	81,604	82,979	84,354
% Change vs 2005		2%	5%	9%	13%	16%	18%	20%	22%

Source: TCRPC

Clinton County's age distribution is consistent with those of the Region. There has been a segment of the population moving through the age groups that has not been replaced by a younger generation. Since 1990, the age groups between 18 and 44 have decreased and the population between 45 and older has increased.

This shift in age distribution demonstrates how the younger residents from ten (10) years ago have either moved away or just gotten older. Traditionally, a younger generation of residents is to fill in where the others have fallen away. In Clinton County this has not happened, however this is typical of the Region as a whole. There has not been an influx of young and middle age adults to fill in for the aging population.

Housing Characteristics

The supply of adequate and appropriate housing for all residents is essential to building strong neighborhoods, villages, cities, and the county. With a population of over 69,000, Clinton County must provide an assortment of housing options for all segments of the population.

In 2000, the County had 23,630 total housing units. This was an increase of seventeen percent (17%) from 1990. In 2000, eighty percent (80%) of all housing units were single family detached homes. Manufactured homes and multiple family housing make up for the rest of the housing, with manufactured homes accounting for nine percent (9%) of County housing. The 2000 single family housing percentage is an increase from the 1990 census which indicated that seventy-eight percent (78%) of the housing stock was one unit detached housing. Townships with the higher populations generally have a higher percentage of multiple family housing. However, this trend is not universal, and the Townships in the County vary between sixty-eight percent (68%) and ninety-eight percent (98%) single family.

Soils

Clinton County has been an agricultural community since its settlement in the early 1800's. Clinton County's rich agricultural soils have been separated in to eight (8) categories by the United States Department of Agriculture. The categories and their descriptions are the following:

- Marlette-Capac-Parkhill association: Well drained to very poorly drained, nearly level to steep sandy loams to clay loams on moraines and till plains.
- Capac-Parkhill-Marlette association: Very poorly drained to well drained, nearly level and gently sloping loams on till plains.
- Blount-Sims-Morley association: Very poorly drained, nearly level to sloping loams and silty clay loams on till plains and moraines.
- Boyer-Marlette-Houghton association: Well drained to moderately well drained, gently sloping to steep loamy sands to loams on moraines and very poorly drained muck in depressions.

- Boyer-Wasepi-Spinks association: Well drained to somewhat poorly drained, nearly level to moderately steep loamy sands and sandy loams on outwash plains, on terraces, and in old glacial drainageways.
- Sebewa-Matherton-Boyer association: Very poorly drained to somewhat poorly drained, nearly level loams in depressions and well drained, gently sloping loamy sands on terraces.
- Sloan-Houghton-Cohoctah association: Poorly drained to very poorly drained, nearly level loams and muck on flood plains.
- Houghton-Gilford-Adrain association: Very poorly drained, nearly muck and sandy loams in old lake basins and in depressed drainageways.

Water

Significant water features, including lakes and rivers in Clinton County include: Lake Ovid, Park Lake, Round Lake, Looking Glass River, Maple River, Muskrat Lake

Existing Land Use

Clinton County land use categories were determined through analysis and revision of existing land use maps and field inspections. In an effort to simplify analysis and allocation of future land use, several of the existing land use categories were combined into more generalized categories. These generalized categories, along with a brief description and examples, are provided below.

Clinton County's land use statistics have changed significantly since the previous inventory in 1978. According to the 1999 land use statistics, over ten percent (10%) of the County is single family residential. This is an increase from 3.14 percent in 1978. This increase comes at the expense to agricultural land whose land share dropped from seventy-four percent (74%) in 1978 to sixty-six percent (66%) in 1999, almost 29,000 acres.

Delta Charter Township

Delta Township is located in the northeastern corner of Eaton County, in the southcentral region of Michigan's Lower Peninsula. The Township's north and eastern borders are shared with the counties of Clinton and Ingham, respectively. To the south and west of Delta Township are the townships of Windsor and Oneida.

Delta Township is a Charter Township with a Supervisor, Clerk, Treasurer and four Trustees. The Township Hall is located on West Saginaw Highway (M-43) just east of the I-96/Saginaw Highway interchange. As a Charter Township, Delta Township has basic powers granted to general law townships by state statute as well as the power to level more millage (up to 5 mills or 10 mills with the electorate's approval) and protect itself from annexation. Those powers include

the ability to hire a manager, assessor, police or fire chief, superintendent and other necessary personnel. Townships are mandated to administer assessments, hold elections, and collect taxes. They are also responsible for financial administration, including budgets, accounting, investments and deposits. In addition, townships may enact and enforce ordinances, which include zoning ordinances.

Population Trends

The historic population trends for Delta Township from 1970 to 2000 are illustrated in the following graph. The Township's population grew a total of 70.6 percent between 1970 and 2000, about 20 percent more than Eaton County's overall population growth during the same time period. The population growth in Delta Township was also much greater than the four township/two city area consisting of DeWitt Township, Delhi Township, Lansing Township, Meridian Township, Lansing City, East Lansing City, and the Tri-County Region. It is estimated that between 2000 and 2020 a steady population growth of 1.15 percent annually, or 23.1 percent, will occur for Eaton County. During the same period, it is projected that Delta Township will experience a population change of 22 percent or 1.1 percent per year, slightly lower than the County as a whole

Household Composition

The number and type of households within the Township influence the social and economic dynamics, and consequently impact the quantity and character of land development. Households are the standard unit of measurement for evaluating and projecting the number of housing units, retail sales, and community facilities and services. Table 2-6 shows a decrease in the size of Delta Township, Eaton County, and Michigan households during the 1990 to 2000 period. which was greater than the average annual population growth during the 80s and 90s of percent. This differentiation between household and population growth is a trend seen in many communities across Michigan and the nation, and is caused by a decrease in the number of individuals living in each household (average household size). Therefore, even while the population of a community increases slowly, stabilizes or declines, the number of households tends to increase.

Age and Value of Housing

The quality and cultural significance of a community's housing stock are affected by its age. According to Table 2-10 approximately 64 percent of the Township's housing stock has been constructed since 1970. The remaining 36 percent were built prior to 1970, with over 28 percent built between 1950 and 1969.

Year Built	# of Dwelling Units	% of Total
1939 or earlier	533	4.2
1940-1949	328	2.6
1950-1959	1,028	8.1
1960-1969	2,615	20.8
1970-1979	3,402	27.0
1980-1989	2,851	22.7
1990-2000	1,802*	14.3

*Estimated from Township records 1990-11/30/99

Land Use Types

Delta Township has an area of approximately 23,096 acres, of which approximately 23 percent is classified natural resources as undeveloped land (Woodlands and Open Space), agricultural and vacant lands. The following graphs highlight the distribution of the major existing land uses by acreage and percentage, as identified on the Township's Existing Land Use Map.

Land Use Type	Existing Acreage	% of Total Acreage
Single-Family Residential	5,582	24.2
Two-Family Residential	78	0.3
Multiple-Family Residential	571	2.5
Manufactured Home Park	38	0.1
Commercial	643	2.8
Office	281	1.2
Institutional	435	1.9
Industrial / Utility	1,644	7.1
Cemetery	47	0.2
Parks, Recreational (inc. golf courses)	1,042	4.5
Agriculture	4,632	20.1
Transportation Rights-of-way	2,716	11.8
Woodlands	2,214	9.6
Open Space / Vacant	2,164	9.4
Water / River / Wetlands	1,021	4.4
Total Acreage	23,096	100.00

Roads

The transportation network within the Township can be divided into four classifications: freeways, arterial, collector and local streets. These classifications are based on the service function of the street and its relationship to other streets in the Township. In total, the transportation network within the Township occupies more than 2,500 acres and consists of more than 175 miles of roads. Interstates 69, 96 and 496 are the principal highways within the Township. Interstate 69 is a major north/south highway in southern Lower Michigan passing through the Township and providing access to I-94 to the south and Flint (I-75) to the east. The traffic count on I-69 in 2003 in northern Delta Township was 32,500 daily vehicle trips while it was 28,300 trips at the Township's southern border.

Interstate 96 connects Delta Township with Grand Rapids on the west and Detroit on the east. Within the Township, I-96 and I-69 occupy much of the same highway right-of-way. Interstate 96 merges with I-69 north of the Township where they continue south several miles as a single highway until they split just south of Delta Township. Interstate 96 continues east while I-69 continues southwest. A traffic count of 63,000 vehicles per day was recorded in 2003 for I-96 and I-69 just south of M-43. The I-96, I-69, and I-496 junction is located in the southern portion of the Township, where I-496 penetrates east into the City of Lansing.

Traffic counts on I-496 within the Township in 2003 averaged between 24,700 daily vehicle trips near Canal Road to 33,300 near Waverly Road. Much of the traffic associated with these interstates typically bypasses Delta Township, as their origin and destination are locations outside of the Township.

Roads classified as arterial roads are roads that serve as the primary collectors of traffic generated on the collector and local streets in Delta Township. The collector streets in the Township generally follow a one-mile grid pattern which in most cases mirror the one-mile section lines of the Township, dating back to the 19th century survey of the area. Some of the major roads in the Township include the following east-west routes: Michigan Avenue, M-43/Saginaw Highway, Mt. Hope Highway, Willow Highway and St. Joe Highway, in addition to Creyts Road, Canal Road, Nixon Road, and Waverly Road, all north-south routes within the Township.

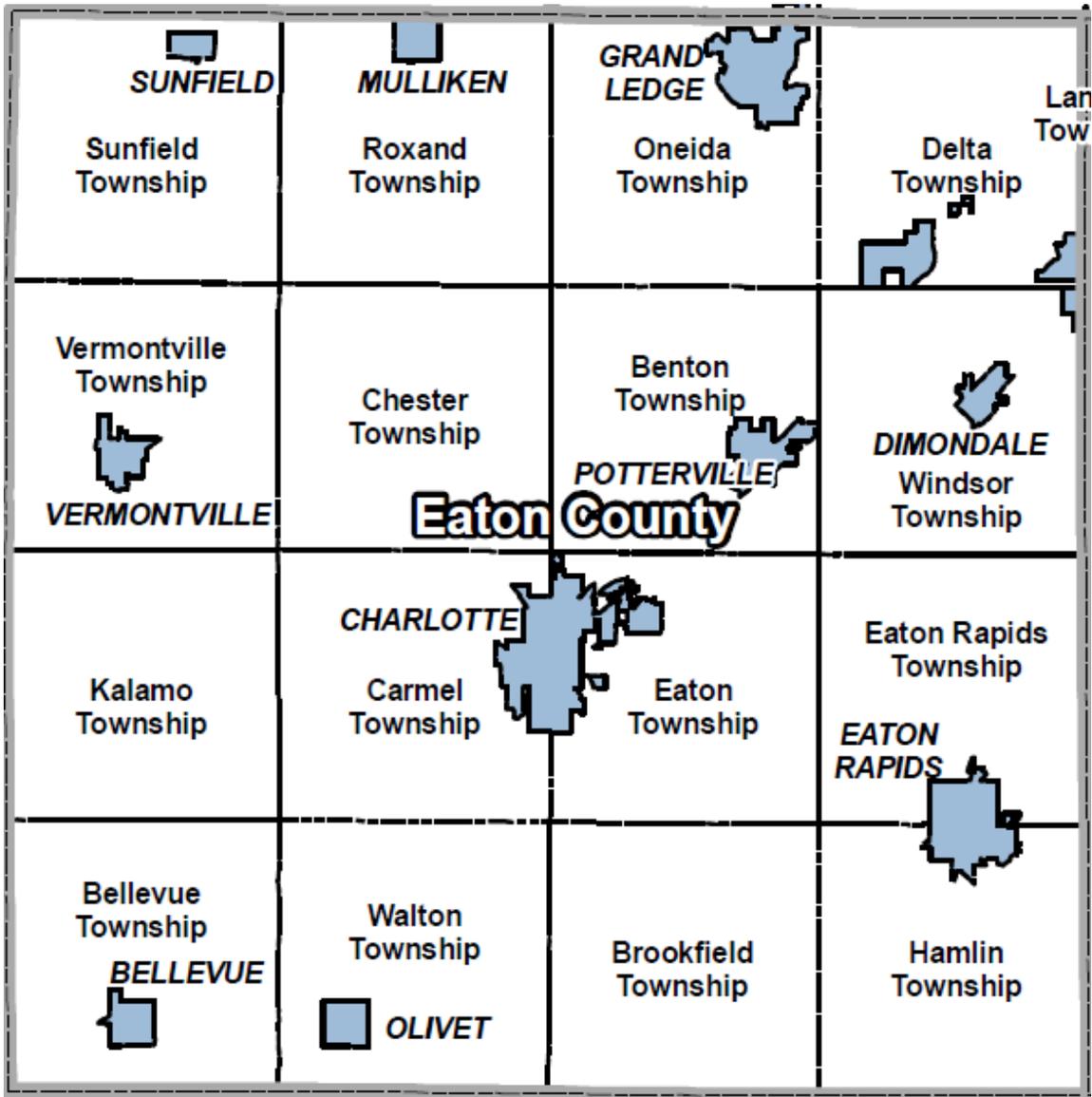
Water Resources

Delta Township, located in the Grand River Watershed, has over 410 acres of ponds, rivers and streams within its boundaries with the principal water feature being the Grand River. The Grand River occupies approximately 348 acres and stretches more than 10 miles in the northern and southeastern portions of the Township. More of the Grand River is located in Delta Township than any other single governmental unit in the Tri-County area. In addition, other water features in the Township include Miller and Carrier Creeks both tributaries of the Grand River. These creeks, and drains which feed them, flow from south to north draining much of the Township.

Some National Wetlands Inventory (NWI) regulated wetlands may exist within Delta Township. Prior to new development within the Township a NWI map should be consulted and an on-site field inspection conducted to more accurately determine whether regulated wetlands exist on the site in question.

Eaton County

Eaton County is located in south central Michigan as part of the Tri-County area encompassing Eaton, Ingham and Clinton Counties. The City of Lansing lies in the center of the three-county region and serves as the urban focal point. While the bulk of the urban area is within Ingham County, a portion of the City of Lansing extends into Eaton County at the furthest northeastern border.



Source: TCRPC

The County is a mixture of large tracts of rural farmlands, small communities and suburban communities located in the central and northeastern parts of the County. Intensive development is concentrated in Delta Township and in the center of Eaton County in the City of Charlotte the county seat, however, Windsor Township and Eaton Rapids have experienced increased development in recent years as well. Within Eaton County's approximate 580 square miles are twenty-seven units of government including, six (6) cities (including part of Lansing), five (5) villages and sixteen (16) townships. Eaton County has planning and zoning jurisdiction over all the unincorporated areas within the county.

Population Trends

According to the 2000 U.S. Census, the Eaton County population totaled 103,655 people. Eaton County's population has steadily increased over the past several decades, and is projected to do so through 2045. By 2020, the population is projected to be 109,008 persons, a 2% increase since 2005. By 2045, the population is projected to be 122,819, an increase of 15% since 2005.

POPULATION BY FORECAST YEAR									
Eaton County	2005	2010	2015	2020	2025	2030	2035	2040	2045
MCD									
Bellevue Twp	1,382	1,381	1,381	1,390	1,406	1,427	1,449	1,473	1,499
Bellevue	1,905	1,903	1,902	1,923	1,964	2,016	2,069	2,128	2,191
Benton Twp	3,008	2,970	2,986	3,098	3,239	3,360	3,450	3,533	3,610
Brookfield Twp	1,558	1,556	1,555	1,574	1,610	1,656	1,703	1,755	1,811
Carmel Twp	2,717	2,713	2,712	2,743	2,806	2,884	2,964	3,054	3,151
Charlotte	8,157	8,150	8,150	8,203	8,311	8,445	8,583	8,737	8,903
Chester Twp	1,910	1,908	1,908	1,922	1,950	1,984	2,020	2,059	2,102
Delta Charter Twp	31,131	30,736	30,902	32,059	33,517	34,770	35,702	36,559	37,355
Dimondale	1,342	1,341	1,340	1,350	1,371	1,396	1,422	1,451	1,482
Eaton Rapids	5,042	5,039	5,039	5,063	5,113	5,174	5,237	5,308	5,384
Eaton Rapids Twp	3,907	3,858	3,879	4,024	4,207	4,364	4,481	4,589	4,689
Eaton Twp	4,876	4,869	4,868	4,921	5,029	5,162	5,300	5,453	5,618
Grand Ledge	7,222	7,218	7,217	7,253	7,325	7,414	7,506	7,609	7,720
Hamlin Twp	3,331	3,327	3,327	3,360	3,429	3,514	3,602	3,700	3,805
Kalamo Twp	1,882	1,880	1,880	1,899	1,937	1,985	2,035	2,090	2,149
Lansing-Eaton	3,938	3,888	3,909	4,056	4,240	4,398	4,516	4,625	4,726
Mulliken	558,776991	551,89051	554,670601	575,432246	601,806321	624,084598	640,822288	656,210662	670,493539
Olivet	1,784	1,782	1,782	1,794	1,820	1,852	1,885	1,922	1,962
Oneida Charter Twp	4,403	4,347	4,370	4,534	4,740	4,917	5,049	5,170	5,283
Pottersville	2,027	2,001	2,012	2,087	2,182	2,264	2,324	2,380	2,432
Roxand Twp	1,480	1,479	1,478	1,491	1,518	1,550	1,584	1,621	1,662
Sunfield	415.270429	414.928153	414.880853	417.598147	423.108594	429.942867	436.993881	444.829202	453.310576
Sunfield Twp	1,895	1,892	1,892	1,915	1,960	2,017	2,075	2,140	2,210
Vermontville Twp	794	793	793	799	811	827	842	860	879
Vermontville	1449.09468	1448.9925	1446.702	1463.39093	1497.23469	1539.20905	1582.51458	1630.63713	1682.72757
Walton Twp	2,150	2,148	2,147	2,165	2,202	2,247	2,293	2,345	2,401
Windsor Charter Twp	6,923	6,922	6,922	6,929	6,942	6,956	6,968	6,979	6,989
Total Eaton County	107,189	108,515	108,769	109,008	112,151	115,172	117,721	120,270	122,819
% Change vs 2005		-1%	0%	2%	5%	7%	10%	12%	15%

Source: TCRPC

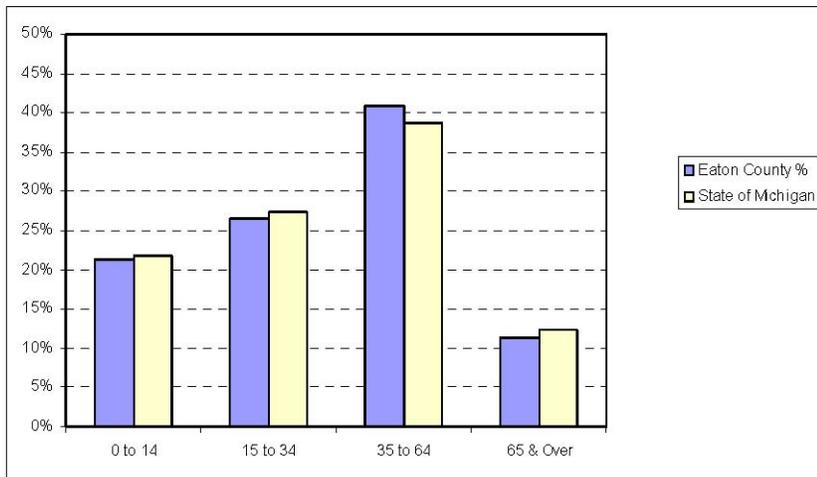
Age

The greatest percentage of the population, 40.9 percent, is within the 35 to 64 age group. The 2000 U.S. Census reported that Eaton County has a median age of 36.4 years. This is only slightly higher than the State of Michigan's reported median age of 35.5 years.

Housing

There are 42,118 housing units available in Eaton County based upon the 2000 U.S. Census data. These units are spread throughout the County; however, similar to the

	Owner Occupied	Rental Occupied
Eaton County	74.2%	25.8%
Delta Charter Township	64.3%	35.7%
City of Eaton Rapids	68.7%	31.3%
City of Charlotte	66.6%	33.4%
City of Grand Ledge	66.4%	33.6%
City of Olivet	46.0%	54.0%
State of Michigan	73.8%	26.2%



Source: U.S. Census Bureau, 2000

population, most are located in the urban centers and surrounding townships. Of the total housing units, approximately 72 percent are one (1)-unit structures (detached or attached). Approximately 74 percent of the units are owner-occupied, an increase of 1.3 percent from 1990 to 2000. Delta Charter Township and the cities of Eaton Rapids, Charlotte, Grand Ledge and Olivet are below the county average for percent of owner-occupied units. The highest amount of owner-occupied units within Eaton County is found in Eaton Township at 93.5 percent

Land Use Classifications

Agricultural (vacant) property remains the predominant land use in Eaton County, encompassing approximately 72.8 percent of the County's entire area. This demonstrates the rural and largely undeveloped nature of the community, even as land development has occurred in recent years.

Residential properties take up the next greatest amount of land area. Residential development currently occupies approximately 22.7% or 82,220 acres Eaton County's total land area. Residential uses are focused around the population centers and extend along the major transportation routes throughout the County.

Whereas, commercial and industrial land uses continue to make up a relatively small portion of the County's land area, with the majority of commercial land uses found in the concentrated population centers such as Delta Township, Grand Ledge, Eaton Rapids and Charlotte. There are a few scattered commercial sites within the more rural, western and southern portions of the County.

Geology

Overlain on the bedrock are gravels, sands, and clays that were deposited during four major glacial periods, the most recent of which is the Wisconsin which ended approximately 10,000 years ago. The glaciers, or ice sheets, left the Charlotte Morainic System in Eaton County. This system makes up the County's hills, valleys, and major river corridors, as well as a few areas of exposed bedrock. One such feature is a unique ledge complex of sedimentary rock along the Grand River in the City of Grand Ledge. These ledges rise up approximately 60 feet and appear for almost a mile in the City. This outcropping is one of the largest rock outcrops in central Michigan, and the seventh largest in the State.

The glacial deposits that cover more than half of the county (55%) are classified as "medium" textured and made up of sand and smaller-sized gravel. Glacial outwash (put down by running water from melting glaciers), makes up 23% of the county, and is found in association with today's streams and rivers. Medium texture end moraine material makes up another 20% of the County. Till that is deposited at the edges or ends of a glacier when it stalls in one position for some time is identified as "end moraine" material. Lastly, coarse-textured end moraine till is found in the southwest corner of the County, making up the remaining 2% of the County's land area.

Soils within the County are one of its most valuable natural resources. Agricultural land uses represent 62% (230,000 acres) of the County, and \$53,054,000 in revenues through agricultural products. While half of the County contains well and moderately drained soils (43% or 160,000 acres), 48% of the County contains somewhat poorly drained and poorly drained mineral soils. The map titled "Soils" on the following page identifies where these soil categories are

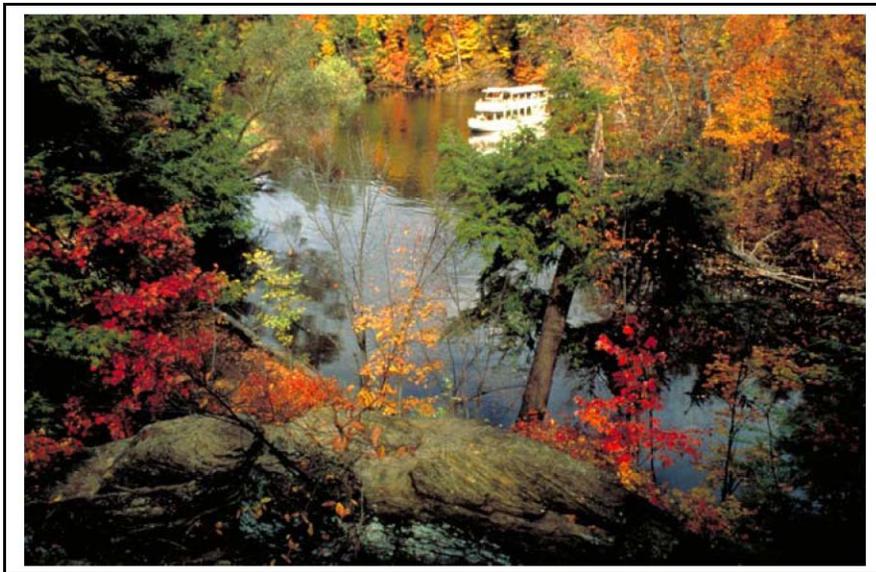
located. This plan also discusses “Prime Farmland” which are the most desirable agricultural soils, and where areas, if drained, would create prime farmland. The prime farmland map (Map 15) is found in the Agriculture chapter. Prime farmland and farmland of local importance makes up approximately 51% of the County, while prime farmland if drained makes up 43%. Areas that are not considered prime farmland are primarily in urban areas, or directly adjacent to rivers and other waterways.

Water Resources

Eaton County is part of three watersheds: the Upper Grand River watershed, covering approximately 34% (or 128,000 acres) of the County; the Thornapple River watershed (a sub-watershed of the Lower Grand River watershed), covering approximately 44% (or 163,000 acres) of the County; and the Battle Creek watershed (a sub-watershed of the Kalamazoo River watershed), which covers approximately 21% (or 79,000 acres) of the County.

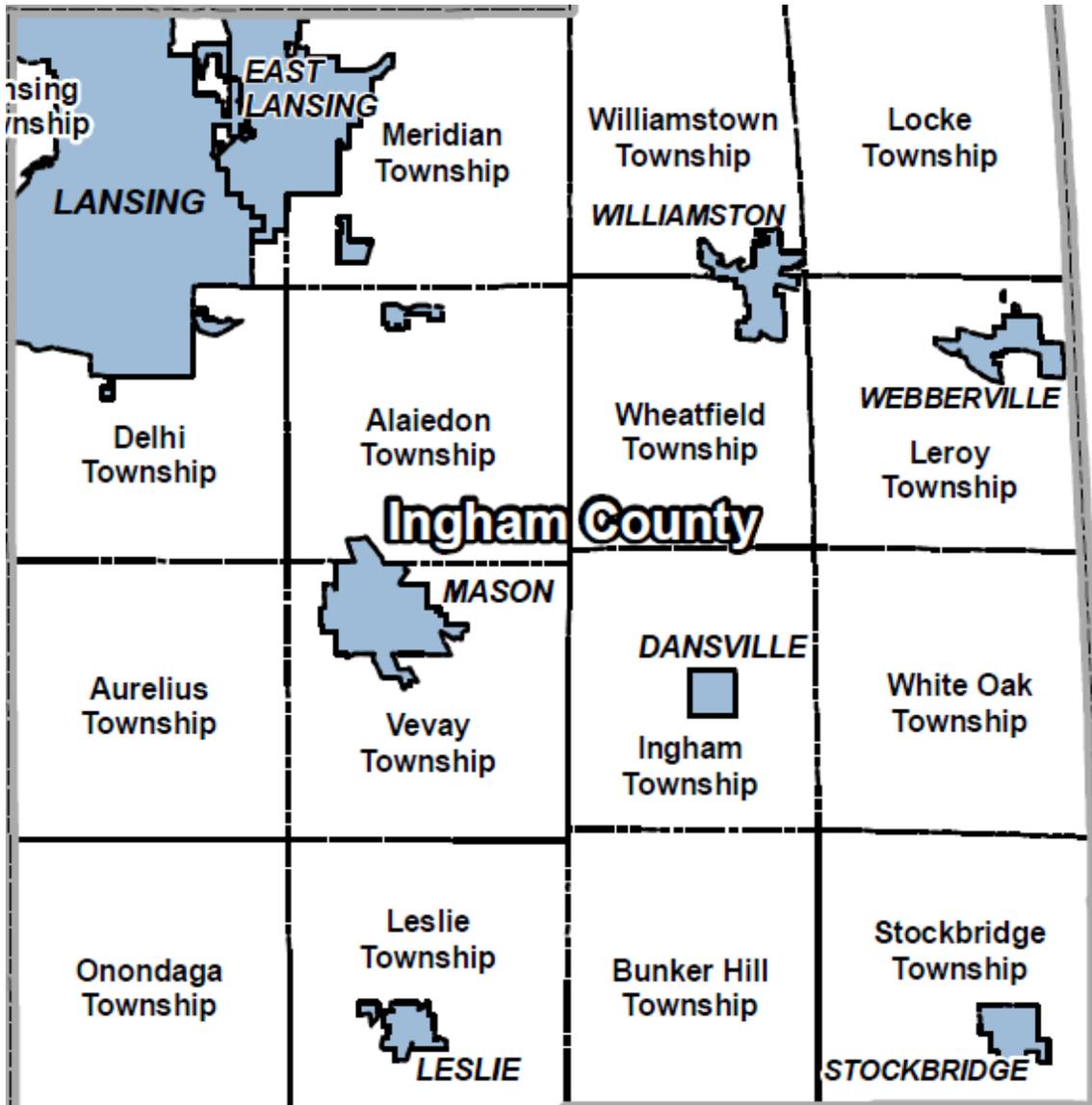
Since 1999, the County has participated in several watershed planning efforts, in conjunction with applying for and receiving a stormwater permit from the state through the Phase II Stormwater National Pollutant Discharge Elimination System (NPDES). The Eaton County Drain Commissioner's office has spearheaded these efforts in the County. Stormwater permits are required of government entities that contain urban areas of a specified density, and who own and operate municipal stormwater systems. The goal of NPDES is twofold: 1) to protect water *quality* in the nation's surface waters, and 2) to control the amount of stormwater that reaches streams and rivers (or stormwater *quantity*). The NPDES permit system does this through collaborative partnerships of local governments that have land area within a watershed. These governments, along with local conservation groups and interested residents, work together to protect water quality by minimizing pollutants in stormwater that is discharged into lakes and streams, and by maintaining pre-development flow patterns so that streams beds, and the aquatic organisms that live there, are maintained in a natural, healthy condition.

Watershed management plans were developed for the Upper Grand River, the Lower Grand River (which includes the Thornapple River sub-watershed), and the Battle Creek River. These plans describe the current condition of each watershed, and identify significant pollutants that need to be addressed in each watershed.



Ingham County

Ingham County is located in south central Michigan as part of the Tri-County area encompassing Eaton, Ingham and Clinton Counties. The following cities, villages and townships make up Ingham County. The City of Lansing has a separate approved Hazard Mitigation Plan and so the City of Lansing is not addressed in this plan.



Population Trends

Population statistics indicate that Ingham County has a larger share of the population base than Eaton or Clinton Counties. Ingham County's population has steadily increased over the past several decades, and is projected to do so through 2045. By 2020, the population is projected to be 279,954 persons, a 1% increase since 2005. By 2045, the population is projected to be 299,661, an

increase of 8% since 2005.

POPULATION BY FORECAST YEAR									
Ingham County	2005	2010	2015	2020	2025	2030	2035	2040	2045
MCD	2,857	2,787	2,818	2,884	2,957	3,010	3,056	3,099	3,141
Alaiedon Twp	2,857	2,787	2,818	2,884	2,957	3,010	3,056	3,099	3,141
Aurelius Twp	3,447	3,446	3,446	3,448	3,453	3,459	3,468	3,479	3,493
Bunker Hill Twp	2,058	2,052	2,052	2,066	2,094	2,127	2,167	2,214	2,268
Dansville	436	435	435	437	441	445	450	455	461
Delhi Twp	25,201	24,579	24,857	25,443	26,081	26,548	26,953	27,339	27,706
East Lansing	45,576	45,535	45,531	45,623	45,803	46,006	46,241	46,514	46,820
Ingham Twp	1,648	1,608	1,626	1,664	1,706	1,736	1,763	1,788	1,812
Lansing	110,180	107,461	108,676	111,237	114,026	116,070	117,840	119,528	121,133
Lansing Twp	8,009	7,811	7,900	8,086	8,289	8,437	8,566	8,689	8,805
Leroy Twp	2,161	2,161	2,161	2,162	2,164	2,167	2,171	2,176	2,183
Leslie	2,194	2,192	2,192	2,198	2,209	2,222	2,238	2,255	2,275
Leslie Twp	2,516	2,510	2,509	2,521	2,535	2,545	2,553	2,561	2,569
Locke Twp	1,748	1,743	1,743	1,754	1,776	1,801	1,830	1,863	1,901
Mason	7,937	7,741	7,829	8,013	8,214	8,361	8,489	8,611	8,726
Meridian Twp	38,556	38,493	38,486	38,629	38,907	39,220	39,583	40,004	40,476
Onondaga Twp	3,143	3,134	3,133	3,152	3,192	3,239	3,297	3,368	3,451
Stockbridge	1,277	1,275	1,274	1,280	1,290	1,302	1,315	1,331	1,348
Stockbridge Twp	2,421	2,361	2,388	2,444	2,505	2,550	2,589	2,626	2,675
Vevay Twp	3,646	3,556	3,596	3,681	3,773	3,841	3,900	3,955	4,009
Webberville	1,543	1,505	1,522	1,557	1,597	1,625	1,650	1,674	1,696
Wheatfield Twp	1,992	1,943	1,965	2,011	2,062	2,098	2,130	2,161	2,190
White Oak Twp	1,232	1,201	1,215	1,244	1,275	1,298	1,317	1,336	1,354
Williamston	3,199	3,120	3,155	3,229	3,310	3,370	3,421	3,470	3,517
Williamstown Twp	5,140	5,013	5,070	5,189	5,319	5,415	5,497	5,576	5,651
Total Ingham County	278,118	273,660	275,577	279,954	284,977	288,894	292,483	296,072	299,661
% Change vs. 2005		-2%	-1%	1%	2%	4%	5%	6%	8%

Source: TCRPC

Ingham County is the southeastern most county within the Lansing tri-county region – with Eaton County to the west and Clinton County to the northwest. This region, which is located in the central portion of Michigan's Lower Peninsula, encompasses 1,700 square miles, with Ingham County claiming 560.7 square miles. Overall, 90% of the tri-county region is classified as rural or small town. Approximately 85% of Ingham County is rural. The other counties surrounding Ingham County are Shiawassee to the northeast, Livingston to the east, Washtenaw to the southeast, Jackson to the south, Calhoun to the southwest and Ionia to the northwest. Major cities within this region are Lansing, Jackson, Ann Arbor and Battle Creek.

Most of Ingham County's population is centered in the greater Lansing metropolitan area. Growth patterns tend to radiate primarily from the Lansing area outward, with growth decreasing as the distance from Lansing increases. There is a limited amount of commuting between the Lansing metropolitan area and outlying major cities such as Flint, Detroit, Ann Arbor, Jackson, Kalamazoo,

Grand Rapids and Saginaw. Most Ingham County residents work within the Lansing metropolitan area.

Geography

Ingham County topography is characterized as flat to gently rolling. Two major rivers traverse the county: the Grand River and the Red Cedar River. Several glacial eskers also pass through the county. Land uses include: 15% urban areas, 67% agriculture and open space, 14% woodland and 4% wetlands. Of the wetlands, only 0.5% is classified as water, including both rivers and lakes.

The soils of Ingham County are a direct result of glacial deposits made between 10,000 and 12,000 years ago. Soil properties vary depending on how the material was deposited. A key feature of Ingham County is that it contains one of the greatest concentrations of eskers in Michigan. Eskers are sand and gravel deposits of glacial streams that were confined by ice walls and left as ridges after the ice disappeared. The Mason esker extends for more than 35 miles from the Looking Glass River southeast of DeWitt to southeast of Mason. In places, this feature has gravel ridges extending more than 35 feet high, with a trough ranging in width from 200 feet to over one-half mile. The range in elevation in the county is from 800 to 1,000 feet above sea level. The topography in Ingham County ranges from nearly level to hilly, with a limited number of areas classified as steep.

Wetlands cover 4% of the county, with lakes and rivers accounting for 0.5%. Lake Lansing, located in the north-central part of the county, is the largest natural lake. Several smaller lakes are located in the southeastern portion of the county, but most of these are surrounded by muck soils. Natural water resources, particularly for recreation purposes, are extremely limited. The majority of the lands surrounding the existing lakes are privately owned. Artificial draining and filling of wetlands had been practiced in the past. However, state law now prohibits this practice to a large extent. This is seen as a limiting factor by the development industry and a necessary precaution by those seeking wetland protections

Both the Grand River and Red Cedar River are significant in their impact on the county. The Grand River flows to the north along the west side of the county. The Red Cedar River flows westward along the northern portion of the county. Both meet in Lansing and flow out toward the northwest corner. Ingham County is within the Grand River drainage basin.

Transportation

The people of Ingham County are dependent on the automobile for transportation. Other modes are available, but play a minor role in moving people. Roads are a corollary of autos and a means of connecting land uses and activity areas. Roads and highways in the county are part of the regional and state network. The freeways, particularly I-96, I-496 and U.S. Route 127, are

routes to destinations outside of Ingham County. Commercial centers are located adjacent to these routes to take advantage of the access.

The Capital City Airport, located north of Lansing, is the largest in the area. It is a full-service, all-weather, commercial-airline airport, serving the entire Lansing metropolitan area. In addition, there is one other small facility, Jewett Airport in Mason, which is used by crop dusters, small clubs and recreational pilots. Conrail, CSX and Canadian National operate railroads in the county. Some railways, however, are no longer in use.

Regional Snapshot: Geography and Climate

The continental type climate of mid-Michigan means that the area typically experiences larger temperature ranges than in locations of similar latitude near the Great Lakes, which moderates temperatures locally. The area seldom experiences prolonged periods of either extreme cold in the winter or extreme heat and humidity during the summer. The average possible sunshine is variable with about 28% during December and 70% during July with an annual average of 51%.

Mid-Michigan has moderately warm summers with an average of eleven days annually reaching or exceeding 90°F. There have been occasions with temperatures exceeding 100°F, but this is a rare event in mid-Michigan. The record for temperature maximum occurred in 1936 with a temperature of 106°F. Winter weather in the county can bring extreme cold, but the Great Lakes typically modify the coldest arctic air masses. The area averages eleven days annually when the minimum temperature reaches zero or below. There is an average of fifty-seven days where the temperature does not rise above the freezing mark (32°F).

The average number of heating degree days in January is approximately 1360 and approximately 450 on average in October. On average the month of July brings 200 cooling degree days to the area, while in May the number of cooling degree days is closer to thirty. The average date of the last freezing temperature in the area is May 11th and the average date of the first freezing temperature is October 3rd. On average mid-Michigan experiences 145 freeze-free growing days.

Since Michigan is located on the northeast fringes of the Midwest tornado belt, mid-Michigan has experienced occasional severe weather events. The primary form warmer weather activity, however, comes in the form of afternoon showers and thundershowers. Thunderstorms will occur in the area an average of about 33 days during the spring, summer and early fall.

Month	Avg. Max	Avg. Min	Mean	Rec. Max	Rec. Min
January	28.5°	13.0°	20.7°	60°	-23°
February	31.6°	13.7°	22.6°	62°	-30°
March	41.3°	22.6°	31.9°	77°	-15°
April	57.1°	34.5°	45.8°	88°	8°
May	69.7°	44.5°	57.1°	92°	23°
June	79.1°	54.1°	66.6°	100°	34°
July	83.2°	58.3°	70.7°	106°	41°
August	81.2°	56.8°	69.0°	100°	36°
September	73.2°	49.4°	61.3°	99°	27°
October	61.5°	39.8°	50.6°	87°	16°
November	46.2°	30.1°	38.1°	77°	-6°
December	33.5°	19.4°	26.4°	67°	-14°

All temperatures are in degrees Fahrenheit.

Month	Mean Liquid	Max Daily	Avg. # of days with			Mean Snowfall	Max Monthly Amount	Max Daily Amount	Max Total Depth
			.10	.25	.50				
January	1.37	1.28	4	2	1	10.0	28.1	17.0	26
February	1.12	1.05	3	2	1	6.8	38.0	7.0	22
March	1.99	2.15	5	3	1	6.6	24.0	12	14
April	3.19	3.35	7	4	2	1.9	11.6	8.7	10
May	2.84	3.35	6	4	2	0	T	0	0
June	3.20	3.39	6	4	2	0	0	0	0
July	3.22	4.25	6	4	2	0	0	0	0
August	3.57	3.42	6	4	2	0	0	0	0
September	2.95	9.35	6	4	2	0	T	0	0
October	2.60	3.79	6	3	1	0.3	6.0	6.0	3
November	2.33	2.12	5	3	1	3.0	14.0	9.0	8
December	1.86	1.81	5	3	1	7.7	17.0	10.0	15

T = Trace.

Precipitation values given in inches.

Land Use Patterns

Land use patterns develop according to geographic location, land use and zoning policies, and environmental, economic, social and cultural influences. The location of a building, the routing of a street or highway, construction of sanitary sewers, and many other factors affect, and have an effect on, the shape of existing and future land use patterns. The primary land use in mid-Michigan includes agriculture and forest. The Table below displays the general land use

types, their corresponding acreage and percent of total.

Land use	Acreage	Percent of Total
Agriculture	217,000	58.0
Forest	86,000	23.0
Open/Range	36,200	10.0
Urban/Built Up	14,250	4.0
Wetland	13,000	3.5
Water	2,700	>0.5
Source: Figures derived from 1978 land use data.		

Source: TCRPC

County Commissioners and Township Trustees have adopted their respective master plans to facilitate future development in the region. Many of the stated missions in the plans identify with preserving the rural character of the area and protecting the environment while also providing for commercial and residential development. Future development will continue to be most concentrated in the urbanized areas, while rural development will likely continue in the near future along section roads, efforts are underway to implement farmland preservation mechanisms and enact local zoning ordinances that promote development in areas adjacent to existing developments in urban areas, such as urban service boundaries and density zoning. County and Township planning officials are also implementing zoning that promotes cluster development, rather than the linear development that is occurring in rural areas.

Commercial development, like residential, is greatest in the areas of the county seats with the density being highest in the central business districts. Commercial and light industrial facilities beyond the downtown areas are located on or around county roads. It is expected that this trend will continue into the future as these locations provide obvious transport advantages for light industry and accessibility for commercial customers.

Geography and Climate:

Land use Patterns

Known Hazardous Areas & Landuse Conflicts

The U.S. Environmental Protection Agency identifies two National Priorities in the study area for the Plan. Sites registered as National Priorities are eligible for long-term cleanup actions under the Superfund Program. These sites are scored in relation to their impact to public health and environment. One is located in Grand Ledge, and the other in Lansing Charter Township.

Infrastructure & Historic Characteristics

The region's public infrastructure, excluding transportation features, is limited to population centers where sewer and water services are provided by the local municipality. The most comprehensive systems (sewer/water) are in place to serve residents in urbanized areas.

The public warning systems include seventeen sirens that are located throughout the region. Many locations, however, that have been developed recently are not covered by warning sirens. Key locations not covered by warning sirens include the Morrey Charter School, Deerfield Park, Herrick Park, new development in the Village of Lake Clinton and new development in western Union and Deerfield Townships.

Key Community Facilities/Organizations: Major Community Services

Community services include a full suite of activities and departments that serve county, municipal and community interests. Mid-Michigan residents receive fire service from cities, villages, and townships. Police service is provided countywide by the Sheriffs Department, and Township-wide by various township police forces but is supplemented on state routes by the Michigan State Police. Other policing entities include the Michigan State University police.

There are several clinics and hospitals located throughout the region. The Sparrow Health System and McClaren Greater Lansing Hospital serves the region offering a full range of health and wellness services from the Hospital campuses and off-site locations. Hayes Green Beach Hospital in Charlotte provides a full range of health care for the Eaton County area, and Clinton Memorial Hospital is located in St. Johns and serves the greater Clinton County area.

The counties provide emergency operations services on a countywide basis through their Emergency Operations Centers (EOCs). The EOC offices are co-located with 911 Dispatch, which also provides countywide 911 dispatch services.

Public Works exist at the municipal level in the City of Charlotte, City of Mason, City of St Johns, the Lansing Board of Water and Light (serving many townships), East Lansing and Meridian Township , the City of Williamston, City of Grand Ledge, and Delta Charter Township among many others.

Key Community Facilities/Organizations: Utility Services

Consumers Energy Company, the Lansing Board of Water and Light, and Detroit Edison provide utilities in the region.

Utility gas is the most common form of heating fuel type for households in the county. Bottled, tank or LP gas, however, also provides a large portion of the heat fuel to houses that are located primarily beyond traditional gas utility lines found in urbanized areas.

Key Community Facilities/Organizations: Emergency/Crisis Service Organizations

There are a number of organizations that operate in the region that provide emergency and/or crisis services. Among these organizations is the Central Michigan Chapter of the American Red Cross. The Red Cross has developed a "Disaster Plan" that provides information relating to the region. The plan can be viewed by contacting the Red Cross. Organizations operating in the community that provide emergency and/or crisis services are listed at Listening Ear at <http://www.listeningear.com/resource.html>.

Key Community Facilities/Organizations: Higher Learning Institutions

Michigan State University is the only four-year institution that is located the region. Lansing Community College, a two-year institution, has a branch campus in Delta Charter Township but its central location is in Lansing.

Michigan State University (MSU) is located in the City of East Lansing and has an enrollment of more than 40,000 students on the local campus. Additionally, MSU employs approximately 10,000 faculty and staff. MSU's campus occupies a large portion of the City of East Lansing, and MSU will continue to provide benefits to the community in the future, but it also presents new challenges with respect to new potential threats to public safety and welfare.

Key Community Facilities/Organizations: Major Events & Activities

Major events and activities occur frequently in mid-Michigan. The most frequent locations for big events include Michigan State University and the County fairgrounds. These venues host entertainment events throughout the year, but only MSU hosts sporting events that have the potential of drawing crowds from 5,000-50,000 persons. There are other events that take place in mid-Michigan. For a complete schedule of entertainment events, including concerts, performances and sporting events visit Michigan State University's website at <http://www.msu.edu/>.

Crime & Civil Disturbance

Mid-Michigan has not had any major patterns or trends of serious crime or civil disturbance.

Chapter 2

Hazard Analysis

Hazard Analysis

Introduction

This section of the plan involves examining *all hazards* and determining a level of risk/vulnerability that each hazard presents. The all hazard analysis process examines the risk/vulnerability of the community to technological hazards, natural hazards and social hazards. The hazard analysis process used included identifying hazards faced, determining a level of risk/vulnerability to each hazard and providing a summary of each hazard in terms of: 1) Hazard Name/Description; 2) Location of hazard; 3) History of hazard occurrence; 4) Likelihood of future occurrence and 5) Analysis category. The hazard analysis used for this plan is the process suggested in the Local Hazard Mitigation Planning Workbook. The Michigan Hazard Mitigation Plan of 2014, offers the following summary of Clinton, Eaton (Delta), and Ingham County's top hazards:

CLINTON COUNTY – Top hazards include **flooding**, and ice/sleet storms (with associated power failures). Some coordination with other forms of planning has been evidenced, through a partnership with the Tri-County Regional Planning Commission, a consulting firm, and use of MSU expertise during plan development. Proposed mitigation actions include the identification and acquisition of vulnerable flood-prone properties, and the floodproofing of basements. County planning for land use and capital improvements will reportedly be directed to incorporate hazard mitigation strategies in their updates. **(Severe winds)**

EATON COUNTY – Their top hazards include **flooding** and **tornadoes**. Proposed mitigation actions included dam replacements, identification of repetitively damaged structures, acquisition or relocation of repetitive-loss properties, and expanded identification of urban flood-prone areas. Recommendations are in-place for hazard mitigation considerations to inform comprehensive planning process in the county (which has a county planning office). **(Severe winds)**

INGHAM COUNTY – Top hazards include **flooding** and **tornadoes**. Within the county, the plan for the City of Lansing was updated and FEMA-approved in October 2013. In 1975 a severe flood event occurred that inundated 250 homes and businesses. In 2003 and 2007, damaging tornadoes occurred in the county, causing a death, destroyed structures and vehicles. Mitigation actions include the updating of flood maps, relocation or acquisition of repeatedly flood-damaged structures, and encouragement of safe room construction. **(Severe winds)**

Hazard Identification

The hazard identification process seeks to determine hazards that pose a threat to jurisdictions. A hazard is an event that could occur and result in damage to social, economic or natural resource interests.

Risk Assessment

The next step in the hazard analysis process involved compiling the Hazard Mitigation data in the region. An initial cursory assessment using GIS, surveys and the community profile was conducted to determine general vulnerabilities and risk in the region. The general assessment was completed purely through qualitative means related to the community profile stakeholder input, and maps produced from GIS. The general assessment, however, did provide a good starting point to understanding the hazard rating process and the many variables that impact risk and vulnerability.

Infrastructure Failures

Hazard Description

Infrastructure failures are described as the failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services. Such interruptions could last for periods of a few minutes to several days or more. 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 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 mitigative steps 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.

Geographic Location of Hazard

Infrastructure failures can impact the entire population of the region. The most vulnerable populations to infrastructure failures (elderly, children, ill etc.) live throughout the county and can be significantly impacted from even a localized event. The most common type of event is power outages that result from severe summer storms or winter storms, which can occur anywhere in the region.

Previous Occurrences

- **LOW**

Localized infrastructure failures that impact a small area and number of people occur annually in Clinton County. Larger failures are less common, but have occurred as recently as August 2003 when the northeast United States was impacted by a significant power failure. Survey results indicate that respondents considered a significant failure, such as the August 2003 event, to occur less

frequently than localized events. So, a low occurrence was determined based on a significant failure. This does not take away from the importance of preparing for localized failures that occur more frequently, as indicated by the hazard identification surveys. Therefore, this plan addresses both significant and localized events.

Likelihood of Future Occurrences

- **Moderate**

Infrastructure failures can result from many hazards and have the potential to affect a large population. The most common hazards that the region has experienced include severe weather events, including winter and summer storms. These events can and do lead to a number of infrastructure failures both locally and regionally. Fortunately, there are many existing actions that have taken place, or that are planned that decrease vulnerability to infrastructure failures. Most notable are improvements to the drain system, local dam improvements and maintenance of power line easements.

Analysis Type

Advanced – see Identifying Alternatives for mitigation strategies

Severe Winter Weather Hazards

Hazard Description

Severe winter weather events can be ice and sleet storms and snowstorms. Ice storms can create hazardous conditions and property damage by accumulating on surfaces. Sleet storms differ from ice storms in that sleet is similar to hail (only smaller) and can be easily identified as frozen rain drops (ice pellets) when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth can cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires, etc. with ice, sometimes causing extensive damage. When electric lines are downed, inconveniences are felt in households and economic loss and disruption of essential services is often experienced in affected communities. Mid-Michigan has had numerous damaging ice storms over the past few decades.

Snowstorms often bring a rapid accumulation of snow and many instances high winds, cold temperatures and decreased 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 light and powdery, which is 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. The cost of clearing the snow from roads, parking areas and sidewalks can be enormous.

Mid-Michigan is beyond the most intense lake snow areas that receive more heavy snow events due to enhancement from the Great Lakes. However, the

area can experience lake snow bands where visibility and driving conditions become hazardous.

Geographic Location of Hazard

Severe winter weather events can impact the entire county or large areas within the region. The greatest overall impact of a severe winter weather event would affect the populated areas where social and economical interests would be impacted the most.

Previous Occurrences

- **High**

Winter weather events that lead to hazardous conditions occur annually in the region. Although many of these events are not significant, they do and can lead to infrastructure failures and economic losses to both businesses and government. Survey results indicate that severe weather events have the potential to impact the greatest number of residents, largest geographic area and are likely to occur more than once annually.

There are several significant winter weather events that have impacted mid-Michigan. However, two of the most notable events include the 1978 snowstorm that paralyzed the entire state and the 1922 ice storm. High winds and heavy snow target Michigan, in what some meteorologists termed the “white hurricane”. A Presidential Disaster was declared for all of Michigan as a result of the storm.

The 1922 ice storm that brought heavy rains to southern Michigan and blizzard conditions to areas like Sault Saint Marie. Fallen trees and branches produced the most damage to power and telegraph lines. Steel towers carrying power even buckled from the weight of the ice event. Damage estimates are difficult to determine, but most dollar figures came from damage sustained by power and telegraph infrastructure.

Likelihood of Future Occurrences

- **High**

Severe winter weather events will continue to affect mid-Michigan annually causing hazardous travel conditions, infrastructure failures and economic impacts to business and government.

Analysis Type

Advanced – see Identifying Alternatives for mitigation strategies

Note: Mitigation strategies that decrease vulnerability to this hazard were designed to promote public awareness and manage infrastructure failures.

Severe Winds & Tornadoes

Hazard Description

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 system. 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. Wind events can be caused by winter storms, thunderstorms and mid-latitude cyclones, which can produce gale forced winds across a large area.

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.

Geographic Location of Hazard

Wind events are another hazard that has the potential to impact the entire county. Gale storms and winter storms are wind events that have the greatest potential to affect all jurisdictions in the county. Severe thunderstorms typically impact a local area, or swath through the county, with downbursts associated with cellular storms or linear storms. Vulnerability to tornadoes has been mitigated to a large extent with National Weather Service watch and warning systems and county emergency sirens. However, there are areas and populations that may not have access to media outlets or be within audible range of an emergency siren. These areas and populations are especially vulnerable along with those residing in mobile homes or manufacture homes lacking a safe room.

Previous Occurrences

- **High**

Severe wind events occur frequently in mid-Michigan and can impact the area during any season. The most common wind event in the county is associated with thunderstorms and typically affects only a small area. Wind events typically result in infrastructure failures and property damage to homes and businesses. The National Weather

There have been several significant wind events in mid-Michigan. One of the most memorable occurred on July 4th as a result of a severe thunderstorm that formed a squall line and moved through the area. Crowds of spectators waiting for the fireworks were sent scrambling from the approaching storm. Fortunately, there were no injuries, but the Mount Pleasant Municipal Airport received significant damage along with downed power lines and street flooding.

On Sunday May 31, 1998 a powerful line of thunderstorms raced across mid-Michigan affecting mid-Michigan. Winds in areas were estimated to be 130 miles per hour causing extensive property and infrastructure damage. In central Michigan nearly 20,000 residents lost power and more than 900,000 lost power statewide. Total damages were estimated statewide at over 50 million dollars and a Presidential Major Disaster Declaration was issued for 13 counties.

One of the strongest storms ever recorded in the Great Lakes moved across Michigan on November 10th and 11th. The storm brought long lived winds that damaged buildings, downed trees and power lines. Wind speeds of 50 to 80 miles per hour were common leaving 500,000 electrical customers without power. This storm occurred on the 23rd anniversary of the gale storm that sunk the Edmond Fitzgerald.

Likelihood of Future Occurrences

- **High**

Wind events that have the potential to cause even minor power outages will likely occur more than once per year in mid-Michigan. Although the potential for significant damages or casualties is low, even minor events can lead to inconveniences for residents, government and commerce. This is especially true for special needs populations and facilities.

Analysis Type

Advanced – see Identifying Alternatives for mitigation strategies

Note: Mitigation strategies that decrease vulnerability to this hazard were designed to limit the impacts of infrastructure failures.

Riverine and Urban Flooding

Hazard Description

Riverine flooding is defined as the periodic occurrence of overbank flows of rivers and streams resulting in partial or complete inundation of the adjacent floodplain. Riverine floods are generally caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Riverine floods occur on river systems whose tributaries may drain large geographic areas and encompass many independent river basins. Flooding on large river systems may continue for several days.

Flash flooding differs from riverine flooding in extent and duration. Flash floods are brief, heavy flows on small streams or in normally dry creeks. Flash floods are normally the result of locally intense thunderstorms resulting in significant rainfall. Flash floods are typically characterized by high velocity water, often carrying large amounts of debris. Urban flooding involves the overflow of storm sewer systems and is usually caused by inadequate drainage following heavy rainfall or rapid snowmelt.

Geographic Location of Hazard

Flooding events in mid-Michigan are typically riverine or minor urban events that lead to water backing up on streets as a result of clogged drainage systems. Urban flooding is common during the spring and fall when debris is more likely to clog drainage infrastructure and normally presents only minor inconveniences to the community. These urban floods occur in the cities and villages in mid-Michigan with drainage infrastructure in place (see Map 2).

Riverine flooding can occur on any of the streams in mid-Michigan with the largest being the Grand River, Red Cedar River and Looking Glass River, which drains from east and south to west. To view geographic locations in Clinton County that are vulnerable to riverine flooding.

Previous Occurrences

- **High**

Urban and riverine flooding occur often in mid-Michigan, but typically these events cause little or no damage and present only minor inconveniences to area businesses and residents. Urban flooding occurs several times annually on a minor basis with street flooding being the primary concern. Riverine flooding occurs most often during the fall or spring and is typically limited to localized areas without significant economic or social impact. National Weather Service records indicate flooding events have occurred in mid-Michigan 10 times from 1950-2003. The total damage reported from these events is approximately 100,000 dollars.

Likelihood of Future Occurrences

- **High**

Although it is not common to experience significant flooding in mid-Michigan, flood events do occur annually that have the potential to cause infrastructure failures, property damage and street flooding. Additionally, mid-Michigan has experienced a substantial flood event, which will likely occur again in the future.

Analysis Type

Advanced – see Identifying Alternatives for mitigation strategies

Hazardous Material Incidents (Transportation)

Hazard Description

All modes of transportation carry thousands of hazardous material shipments on a daily basis through, or near local communities. The uncontrolled release of hazardous materials during transport is capable of posing a risk to health, safety, property or the environment.

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 exist in the area and the large number of hazardous material shipments that occur on a daily basis.

Geographic Location of Hazard

The region is prone to a variety of transportation based incidents involving hazardous materials. The transport of agricultural chemicals used in farm production is a common occurrence and one that the general public has little

awareness to. There are also several pipelines that transport natural gas through the county, three primary road transportation routes and a rail transport route that runs north and south through the area.

Previous Occurrences

- **High**

Although significant hazardous transportation incidents are not common in mid-Michigan, agricultural based incidents occur frequently and present potential risks to a localized area annually. These incidents can be problematic, but are typically managed effectively by local emergency responders and hazardous material response teams.

Likelihood of Future Occurrences

- **High**

Hazardous transportation events involving agricultural chemicals pose an annual risk for residents. Additionally, there is a substantial proportion of the areas population that lives in proximity to a primary rail, road or pipeline transportation route. The potential exists into the future for an event to significantly impact these populations.

Analysis Type

Advanced – see Identifying Alternatives for mitigation strategies

Note: Mitigation strategies that decrease vulnerability to this hazard were designed to raise public awareness, which is perceived as low, and examine the ever changing transportation routes.

Hazardous Material Incidents (Fixed Site)

Hazard Description

These incidents are defined by the release of hazardous materials from a fixed site, 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.

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

Geographic Location of Hazard

. Sites registered as EPA National Priorities are eligible for long-term cleanup actions under the Superfund Program. These sites are scored in relation to their impact to public health and environment. Consideration also needs to be given to agricultural activities and associated chemical use/storage throughout the county. Generally, these materials and the potential risks associated with them can impact many areas. However, the area and impact of an event would limit the impact.

Previous Occurrences

- **High**

The U.S. Environmental Protection Agency does report releases of hazardous materials into the air, water and land annually in mid-Michigan. Most of these releases are in and around Mount Pleasant and do not pose a threat to the community. There are also spills and leaks that occur in agricultural areas, however, these are also managed effectively by local emergency response officials without a significant risk to the community.

Likelihood of Future Occurrences

- **High**

There is a high likelihood that minor fixed site events will continue to occur. Most of these events will present little or no risk to the community and will be managed by local emergency response officials.

Analysis Type

Standard – not included in advanced analysis due to the small population affected, small geographic coverage of event and limited number of locations that store/use hazardous materials that present a significant risk to area.

Petroleum and Natural Gas Pipeline Accidents

Hazard Description

Petroleum and natural gas pipeline accidents are characterized as a 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.

According to 1998 figures released by the U.S. Department of Transportation (Pipeline Division), Michigan gas companies had to repair 9,300 leaking underground gas lines. The Michigan Public Service Commission indicates that many more gas line breaks go unreported. Michigan ranks second in the nation, Texas is first, in the number of gas line repairs to damaged lines.

Geographic Location of Hazard

There are several oil and gas pipelines that traverse the region. Areas adjacent to existing pipelines are the most prone to an event. Many of these locations are in proximity to the densely populated areas.

Previous Occurrences

- **Low**

Occurrence of this hazard in mid-Michigan is low. Research indicates a low frequency of events that typically impact a very small geographic area and number of people.

Likelihood of Future Occurrences

- **Low**

The potential of a future occurrence, simply based on the number of pipelines in the area, will continue to exist. The likelihood of such an event is very low, but the potential does exist.

Analysis Type

Standard – although there are several pipelines that traverse the area, the limited geographic area and population affected restricted the need for advanced analysis of pipeline events. A lack of public awareness contributed to the moderate ranking of this hazard, which if increased would significantly reduce the hazard ranking for pipeline events.

Extreme Temperatures

Hazard Description

Prolonged periods of very high or very low temperatures, often accompanied by exacerbating conditions such as high humidity and lack of rain, or heavy snowfall and high winds. Extreme temperatures, whether extreme heat or extreme cold, share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in poor health. The major threats of extreme heat are heatstroke (a major medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense. The major threats of extreme cold are hypothermia (also a major medical emergency) and frostbite. Michigan is subject to both temperature extremes.

In many instances other related weather events are linked to extreme temperatures. Extreme heat events can bring with them the potential for drought conditions that result in economic loss to agricultural interests. Extreme cold weather events are often accompanied, or initiated by a severe snowstorm or blizzard conditions. These corollary events often enhance the risk and impact to areas experiencing extreme temperature events.

Geographic Location of Hazard

All locations are vulnerable to extreme temperature events. Of special interest, however, are residents that are elderly, of special needs or children who are more likely to feel the impact of temperature extremes.

Previous Occurrences

- **High**

Extreme temperatures affect the region several times annually. Most of these events are short lived and managed effectively by existing programs and initiatives that assist susceptible populations. Significant long term events are much less frequent, but have occurred in mid-Michigan.

Likelihood of Future Occurrences

- **High**

The frequency of future events is likely to remain similar to historical occurrences. This is reflected very well in the hazard identification surveys. Extreme temperatures will continue to affect the area several times annually with most events impacting only a small percentage of the population.

Analysis Type

Standard – extreme temperatures are common the area and have been effectively managed by local and state programs and initiatives. Vulnerability to this hazard will be further reduced as the Health Department continues to identify vulnerable populations.

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Chapter 3

Goals & Objectives

Goals and Objectives

Introduction

Goals and objectives are used in hazard mitigation planning to identify broad measures that are capable of reducing vulnerability to potential hazards. Goals are established to define general guidelines for what a community would like to achieve concerning hazard mitigation. Goals have been supplemented with objectives, which provide more detail in the steps required to meet a specific goal.

The development of goals and objectives for this plan were aimed at reducing the impacts of the identified hazards. Many of the goals and objectives, however, will also reduce vulnerability to other hazards not included in the top ten. Goals and objectives may also reduce vulnerability to more than one hazard, especially those concerning weather related hazards.

For mid-Michigan most of the hazards are weather related, or occur most often due to extreme weather related events. For example, severe summer storms can often result in localized infrastructure failures and have a significant impact on specific populations. In this example severe weather can lead to a second hazard – infrastructure failure. Priority was given to those goals that reduce vulnerability to the most frequently occurring hazards and those hazards that have historically had the greatest impact on the area. Consideration was also given to the number of hazards mitigated by specific goals when determining priority.

Determining Goals & Objectives

The goals and objectives were determined using a two-step process. Initially, the workgroup discussed broad ideas regarding goals and objectives. Careful examination was made to determine a general path towards establishing effective goals and objectives. Next, a draft was created outlining a set of goals and accompanying objectives that were derived from the workgroup meetings.

More than thirty invitations were mailed to officials in all units of local government, local emergency response officials, and other stakeholders. During the meetings a presentation was given that reviewed the hazard mitigation process, the history of the project and results of the process to date.. It is important to note that the goals and objectives for this plan were aligned, where applicable, with goals and policies set forth in the Comprehensive Plans for each county and the township

- I. **GOAL:** Increase the county's ability to provide assistance to special needs populations (elderly, disabled, impoverished) in preparing for severe weather (summer & winter) events.
 - Coordinate efforts with Red Cross and other community organizations in the county.

- Educate special needs facilities on how to prepare for and respond to potential hazards, especially private establishments.
- II. GOAL:** Identify gaps in community wide emergency response to hazards.
- Conduct multi agency exercises for potential hazards to identify gaps and develop solutions.
- III. GOAL:** Provide protective measures from severe wind, hail and tornadoes.
- Construct shelters and raise awareness to safe rooms and other construction methods that provide protective measures from wind events.
 - Provide audible warning system based on density measures computed from local address data and census data.
 - Raise public awareness of severe weather events and preventative actions.
- IV. GOAL:** Decrease vulnerability of county to infrastructure failures caused by natural and human induced events.
- Include policies developed in Comprehensive Plans and local emergency response plans that address hazard mitigation plan.
 - Rehabilitate infrastructure where applicable (stormwater, water, sewerage, under ground utilities etc.).
 - Identify and inventory generators in county that could be used to during emergencies as additional resource.
- V. GOAL:** Reduce the impacts of riverine/urban flooding.
- To preserve or improve the water quality of the County's water resources, such their tributaries, lakes, and wetlands.
 - To preserve the natural character of adjacent lands along the rivers.
- VI. GOAL:** Reduce the vulnerability of county to hazardous material incidents from transportation.
- Raise public awareness regarding how accidents occur and what to do.
 - Review the local traffic patterns and regulations regarding hazardous material transportation issues
- VII. GOAL:** Increase the ability of county to respond to public health emergencies.
- Establish local/regional surveillance and monitoring programs.

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Chapter 4

Mitigation Strategies

Mitigation Strategies

Introduction

An important component of the hazard mitigation planning process is to develop a list of actionable mitigation strategies. The actionable strategies represent projects or processes that result in lessening the community's vulnerability to the top ten hazards. Mitigation strategies are the result of a process that identifies actions that are intended to meet objectives and ultimately goals that have been set for the community. These strategies must present actions that are equitable to the community, technically possible, do not pose environmental harm and are economically feasible.

Mitigation strategies presented in this plan are intended to meet the requirements of the Federal Emergency Management Association (FEMA) for FEMA funded mitigation projects. To meet FEMA requirements a mitigation project must provide a cost-benefit to the community. This implies that the benefit of a project must be greater than the cost. Mitigation strategies in this plan were selected to a large extent based on an approximate cost-benefit analysis that relied on data obtained from this hazard mitigation plan and estimated project costs.

The result of a hazard can produce significant economic losses, property damage not included, and are often difficult to measure. Economic losses often take more time to work entirely through a community and linger long after the actual disaster event. Government and business alike can experience economic hardships that eventually impact residents and other government functions or businesses in the community. A simple example that reflects these losses is easily identifiable during a long winter where above average snow and ice removal is required. The additional funding required to remove the snow is taken from other programs or budget items, thus resulting in a potential loss or reduction of a services, employees, business function or other benefit to the local community.

The measurable costs and less clear costs associated with a hazard event can be difficult to determine. For this plan, however, the mitigation strategies that have been accepted and approved fall into two broad categories in regard to cost-benefit. First, there are mitigation strategies that are partially underway, or have secured funding to initiate in the near future. For these mitigation strategies no cost-benefit was conducted. The second category of mitigation strategies required an estimated cost-benefit analysis. In recommending these mitigation strategies it was determined that the costs are both feasible and justified by the potential benefit they bring to the community. Every effort was made to insure that actions can be accomplished and reduce vulnerability, which to a large extent was determined by the financial commitment, personnel commitment, other resource commitment and benefits provided to the county.

Mitigation Strategies

Mitigation strategies are the result of identifying and refining a range of potential alternatives for mitigation actions. Mitigation strategies presented here can improve the health, safety and general welfare for citizens, business and government. There are, however, limitations to actionable items in any plan that is adopted by any organization. Two primary limitations for the mitigation strategies presented in this plan include funding opportunities and the general political processes that direct limited resources across expanding needs. Consideration to these limitations is reflected in the selection of mitigation strategies, which seek to reduce vulnerability with actions that have been previously identified in an existing plan, that are volunteer based, that introduce manageable financial commitment from local government, or that provide a funding option from an external agency. Unfunded mitigation strategies have been estimated to provide a benefit over cost.

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

Objective: *Coordinate efforts with Red Cross and other community organizations in the county.*

A. Mitigation Strategy: Promote Red Cross's information for special needs populations regarding preparedness for severe weather events through brochure distribution and educational meetings.

Potential Lead Organization/Department: Local EOC, community not for profit organizations

Initiation Date: 6 months.

Potential Funding Sources: Local EOC, Local Government, Community Organizations

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations exist.

Review and Evaluation:

Implementation: has the project been implemented?

Outcomes: list and describe outcomes to the community.

- B. Mitigation Strategy:** Develop and promote contact list for local disaster planning and assistance organizations (Listening Ear, FIA, Commission on Aging, Red Cross) to be promoted to special needs populations.

Potential Lead Organization/Department: Emergency Operations Center, Red Cross, other community organizations

Initiation Date: 12 months.

Potential Funding Sources: Local Government, State of Michigan, Community Organizations, Federal Government

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations exist.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- C. Mitigation Strategy:** Hold public seminar(s) on disaster planning and preparedness for special needs populations, caretakers planning officials and facilities caring for special needs populations.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center, Red Cross, other community organizations

Initiation Date: 36 months.

Potential Funding Sources: Local EOC, Local Government, Community Organizations

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations, caretakers and facilities exist.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- D. Mitigation Strategy:** Seek funding for NOAA weather radios for facilities caring for special needs populations and special needs populations living independently.

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 6 months.

Potential Funding Sources: Local EOC, State EMD, FEMA, Local Government, SCT Two-percent Funding

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations, caretakers and facilities exist.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- E. Mitigation Strategy:** Give disaster kits to caretakers of special needs populations, including hospice patients, and facilities caring for special needs populations.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 3 years.

Potential Funding Sources: Local EOC, State EMD, FEMA, Local Government,

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations, caretakers and facilities exist.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

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

- A. Mitigation Strategy:** Mass mail all special needs facilities a brochure on facility disaster preparedness.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center, Red Cross, other community organizations

Initiation Date: 12 months.

Potential Funding Sources: Local EOC, Local Government, Community Organizations

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations reside in special needs facilities.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- B. Mitigation Strategy:** Encourage each facility to conduct annual disaster drills.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: potential 12 months.

Potential Funding Sources: Local EOC, State EMD, FEMA,

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations reside in special needs facilities.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- C. Mitigation Strategy:** Develop internal facility emergency/disaster warning systems.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 36 months.

Potential Funding Sources: Local EOC, State EMD, FEMA, Private

Geographic Area Impacted: Localized

Notes: Geographic area is limited to specific locations where special needs populations reside in special needs facilities.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

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

Objective: *Conduct multi agency exercises for potential hazards to identify gaps and develop solutions.*

- A. Mitigation Strategy:** Conduct annual orientations with each response agency regarding the county disaster plan.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 24 months.

Potential Funding Sources: Local EOC, Local Government, SCT Two-percent Funding

Geographic Area Impacted: County

Notes: None

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- B. Mitigation Strategy:** Conduct disaster drills with each response agency to exercise county disaster plan.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 24 months.

Potential Funding Sources: Local EOC, State EMD, FEMA, Local Government,

Geographic Area Impacted: County

Notes: None

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- C. Mitigation Strategy:** Conduct a full scale disaster drill every third year with as many agencies as possible.

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 60 months.

Potential Funding Sources: Local EOC, State EMD, FEMA, Local Government, SCT Two-percent Funding

Geographic Area Impacted: County

Notes: Over time this will address response management for all hazards identified in this plan.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

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

Objective: *Construct shelters and raise awareness to safe rooms and other construction methods that provide protective measures from wind/storm events.*

- A. Mitigation Strategy:** Encourage the construction of shelters at City and County Parks.

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 24 months.

Potential Funding Sources: Local EOC, State EMD, FEMA, Local Government

Geographic Area Impacted: Localized

Notes: This is currently being investigated and pursued in some parks throughout the county. Most shelters are in the form of concrete restroom/washrooms.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

B. Mitigation Strategy: Encourage the construction of shelters at mobile home/manufactures housing communities.

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: potential 24 months.

Potential Funding Sources: Local EOC, Sate EMD, FEMA, Local Government, SCT Two-percent Funding

Geographic Area Impacted: Localized

Notes: None

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

C. Mitigation Strategy: Increase public awareness of safe rooms and enhanced construction methods in newly constructed homes through brochures, Internet and other literature to be made available from county and private entities.

Hazard Addressed: addresses three hazards – 3, 7, 8

Potential Lead Organization/Department: Emergency Operations Center, Community Development

Initiation Date: 24 months.

Potential Funding Sources: Local EOC, FEMA, Local Government, , Private

Geographic Area Impacted: County

Notes: Geographic impact would be focused to residents who pursued this mitigation action and this would likely be experienced in the higher growth townships surrounding Mount Pleasant.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- D. Mitigation Strategy:** Ensure that all schools located in Clinton County are within the outdoor warning siren range and have indoor warning capabilities (indoor weather warning via NOAA Weather Radios).

Hazard Addressed: addresses all hazards

Potential Lead Organization/Department: Emergency Operations Center, Clinton-Gratiot ISD, Local School Districts

Initiation Date: 12 months.

Potential Funding Sources: Local EOC, FEMA, , State of Michigan

Geographic Area Impacted: Localized

Notes: None

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

Objective: *Raise public awareness of severe weather events and preventative actions.*

- A. Mitigation Strategy:** Increase attendance at National Weather Service Spotter classes through media (local weather stations, Internet, newspapers, etc.).

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 12 months.

Potential Funding Sources: Local EOC, FEMA, NOAA, ,

Geographic Area Impacted: County

Notes: Effective and cost efficient means of improving spotter network in community.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- B. Mitigation Strategy:** Create public service announcements regarding severe weather events.

Potential Lead Organization/Department: Emergency Operations Center

Initiation Date: 36 months.

Potential Funding Sources: Local EOC, FEMA, Local Government,

Geographic Area Impacted: County

Notes: None

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

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

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

- A. Mitigation Strategy:** Discourage unplanned sprawl conditions in area without exist infrastructure.

Potential Lead Organization/Department: Local Legislative Body, Community Development, Planning Boards

Initiation Date: 6 months

Potential Funding Sources: Local Government

Geographic Area Impacted: Localized to Regional

Notes: This strategy is included as an actionable item in the County's comprehensive plan.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

Objective: *Rehabilitate infrastructure where applicable (storm water, water, sewerage, under ground utilities etc.).*

A. Mitigation Strategy: Identify infrastructure that needs rehabilitation.

Potential Lead Organization/Department: Drain Commission, Public Works

Initiation Date: 12 months

Potential Funding Sources: Local Government, State of Michigan,

Geographic Area Impacted: Localized to Regional

Notes: None

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

B. Mitigation Strategy: Suggest local governments find sources of funding (Michigan Hazard mitigation funding, local budgets, local grantors, etc...) to fund rehabilitation projects.

Potential Lead Organization/Department: Local Governing Body, Community Development, Local EOC

Initiation Date: 36 months

Potential Funding Sources: Local Government

Geographic Area Impacted: Localized to Regional

Notes: This strategy is aimed at increasing awareness regarding potential funding mechanisms that exist to rehabilitate infrastructure.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- C. **Mitigation Strategy:** Create a digital GIS layer displaying locations of generators throughout county.

Potential Lead Organization/Department: Local EOC

Initiation Date: 48 months.

Potential Funding Sources: Local EOC, State EMD, FEMA, Local Government,

Geographic Area Impacted: County

Notes: Generators would be used to provide energy for potential shelters and other emergency operations.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

5. Goal: Reduce the impacts of riverine/urban flooding.

Objective: *To preserve or improve the water quality of water resources, such Rivers, their tributaries, lakes, and wetlands.*

- A. **Mitigation Strategy:** Create an overlay zoning district which can be applied to the lands abutting water resources to manage growth and

development, ensure sufficient setback distances, and preserve natural features.

Potential Lead Organization/Department: Local Governing Body, Community Development, Planning Boards

Initiation Date: 36 months

Potential Funding Sources: Local Government, FEMA,

Geographic Area Impacted: Localized to Regional

Notes: This strategy is included as an actionable item in the County's comprehensive plan.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community

- B. Mitigation Strategy:** Work with the Department of Environmental Quality to enforce water quality regulations.

Potential Lead Organization/Department: Local Governing Body, Community Development

Initiation Date: 36 months

Potential Funding Sources: Local Government, Michigan DEQ

Geographic Area Impacted: Localized to Regional

Notes: This strategy is included as an actionable item in the County's comprehensive plan.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- C. Mitigation Strategy:** Consider the potential impacts of stormwater runoff on water quality.

Hazard Addressed: addresses one hazards – 4

Potential Lead Organization/Department: Community Development, MSU Extension, MDEQ

Initiation Date: 60 months

Potential Funding Sources: Local Government, Michigan DEQ, EPA, FEMA

Geographic Area Impacted: Localized to Regional

Notes: This strategy is included as an actionable item in comprehensive plans.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

Objective: *To preserve the natural character of adjacent lands along the rivers..*

- A. **Mitigation Strategy:** Provide incentives to preserve frontage and vegetation along the river banks.

Potential Lead Organization/Department: Local Governing Body, Community Development, Planning Boards

Initiation Date: 36 months

Potential Funding Sources: Local Government, FEMA,

Geographic Area Impacted: Localized to Regional

Notes: This strategy is included as an actionable item in comprehensive plans.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

- B. Mitigation Strategy:** Create an overlay zoning district which can be applied to the lands along the river banks.
- Potential Lead Organization/Department:** Local Governing Body, Community Development, Planning Boards
- Initiation Date:** 36 months
- Potential Funding Sources:** Local Government, FEMA,
- Geographic Area Impacted:** Localized to Regional
- Notes:** This strategy is included as an actionable item in comprehensive plans.
- Review and Evaluation:**
- Implementation:** has the project been implemented.
- Outcomes:** list and describe outcomes to the community.
- C. Mitigation Strategy:** Consider the established federal flood plain boundaries as a part of any proposed regulations.
- Potential Lead Organization/Department:** Local Governing Body, Community Development, Planning Boards
- Initiation Date:** 48 months
- Potential Funding Sources:** Local Government, FEMA
- Geographic Area Impacted:** Localized to Regional
- Notes:** This strategy is included as an actionable item in comprehensive plans.
- Review and Evaluation:**
- Implementation:** has the project been implemented.
- Outcomes:** list and describe outcomes to the community.
- D. Mitigation Strategy:** Encourage cooperative and coordinated planning efforts among neighboring communities.

Potential Lead Organization/Department: Local Governing Body, Community Development, Planning Boards

Initiation Date: 24 months

Potential Funding Sources: Local Government

Geographic Area Impacted: Localized to Regional

Notes: This strategy is included as an actionable item in comprehensive plans.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

6. Goal: Reduce the vulnerability of hazardous material incidents on fixed sites and in transportation.

Objective: *Raise public awareness regarding how accidents occur and what to do.*

- A. Mitigation Strategy:** Hold public seminars on disaster planning and preparedness for transportation events.

Potential Lead Organization/Department: Local EOC, Road Commission

Initiation Date: 60 months.

Potential Funding Sources: Local EOC, State EMD, Local Government, State of Michigan, FEMA,

Geographic Area Impacted: Localized to Regional

Notes: Cost effective means of raising public awareness to a hazard that the public has little knowledge of.

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

Objective: *Review the local traffic patterns and regulations regarding hazardous material transportation issues.*

A. Mitigation Strategy: Contact MDOT and local law enforcement authorities to review where the most hazardous locations are.

Potential Lead Organization/Department: Local EOC

Initiation Date: 60 months.

Potential Funding Sources: Local EOC, State EMD, Local Government, State of Michigan, FEMA,

Geographic Area Impacted: Localized to Regional

Review and Evaluation:

Implementation: has the project been implemented.

Outcomes: list and describe outcomes to the community.

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Chapter 5

Plan Closure

Plan Closure

Introduction

The hazard mitigation planning process will end _____. It is recommended that the Counties and Township formally adopt this plan prior to the close of _____. Adoption of this plan requires that a resolution be adopted by County and Township indicating formal adoption of this plan as the final plan. Formal adoption of this plan will make it active for a period of five years, in which time consideration should be given to updates for the next planning period. The Hazard Mitigation Plan will officially be transferred to the Emergency Operations Center as will responsibilities for maintenance. The transfer will include all materials used to create the plan and a CD containing digital documentation and maps.

Post Planning Role

The Tri-County Regional Planning Commission provided planning work during the planning process. In large part, this was due to the availability of grant funding and a limitation of resources required in completing this plan. On transfer of deliverables, TCRPC will have completed its role in this planning process. The TCRPC will aid the counties and township during the transfer and adoption phase in any means possible. Any future involvement by TCRPC will depend on the availability of staff and funding.

TCRPC will maintain digital copies of all data and information used and produced for this plan, including GIS data and maps. Distribution of this data and information, including the plan, shall be directed to the Emergency Operations Center. TCRPC will maintain contact with the County and Township Emergency Operations Coordinators and provide assistance on a limited basis. All requests and questions regarding this plan shall be directed to the County and Township Emergency Operations Centers.

Implementation

During the development of this plan key individuals came together, raised awareness and leveraged support for mitigation planning. While many of these individuals and agencies are integral components of the mitigation strategies, successful implementation will continue to require an engaged audience that extends beyond stakeholders.

Specific project implementation should consider what is most feasible in terms of resources, financial commitment and the ability to connect a project publicly to hazard mitigation. Successful implementation and reduction of vulnerabilities can leverage tremendous public and political support. Engaging in attainable projects first will facilitate further projects and support for future planning activities.

Maintenance and Updates

The Hazard Mitigation Plan will be active for five years beyond the close of the grant cycle. During this time it is imperative that maintenance and updates be considered. To remain active with the planning process it is recommended that the workgroup meet annually beginning one year from the adoption of this plan to consider maintenance. The maintenance meetings should be held for three sequential years and focus primarily on changes in the community, such as population shifts, new development patterns and changes to local, state and federal priorities. Routine maintenance regarding the review and evaluation of mitigation strategies should be conducted quarterly to insure connectivity to projects and the stakeholders. Additionally, the maintenance topic should be introduced and discussed, when possible, at other forums such as local emergency response meetings.

It is recommended that during the fourth year, meetings are scheduled at least on a quarterly basis to initiate discussion and strategies for updating this plan. During year five of this plan, it is recommended that work be organized to effectively create the next version of a Hazard Mitigation Plan in future meetings should carefully consider changes to the community and improving information as foundations for updating this plan. Maintenance and updates to this plan are the responsibility of the County and Township Emergency Operations Centers.

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Appendices

I. Regional Topo Maps

