

HOUGHTON COUNTY



2013-2018 HAZARD MITIGATION PLAN

Prepared for: Houghton County
401 E. Houghton Ave., Houghton, MI 49931

Prepared by: Western Upper Peninsula Planning and Development Region
393 E. Lakeshore Drive, P.O. Box 365, Houghton, MI 49931



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Section 1: Community Profile

Why Plan for Hazard Mitigation in Houghton County?

Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce the risk to human life and property from natural, technological or human-related hazards. This is accomplished through coordination of resources, programs, and authorities. When successful, mitigation will lessen the impacts to such a degree that future events will remain only incidents and not become disasters.

Mitigation is an essential part of the emergency management process. When a disaster strikes and a community responds, often the focus of repairs and reconstruction is to restore damaged property to pre-disaster conditions as quickly as possible. These efforts expedite a return to "normalcy," yet replication of pre-disaster conditions leaves the community vulnerable to the same hazards, resulting in a cycle of damage, reconstruction, and damage again. Hazard mitigation allows this cycle to be broken by ensuring that post-disaster repairs and reconstruction take place after damages are analyzed and that sounder, less vulnerable conditions are produced.

Mitigation planning forces a community to identify potential hazards, assess vulnerability, and develop mitigation strategies to deal with those hazards long before an event occurs. The hazards and vulnerabilities are determined based on historical events, incidents in nearby communities, and scientific data and trends. Mitigation measures can be implemented systematically, as grant monies become available, or, in the worst case, through repair and reconstruction after a hazard event occurs.

The Houghton County Hazard Mitigation Plan was created to protect the health, safety, and economic interests of Houghton County residents and businesses by reducing the impact of natural, technological, and human-related hazards by identifying mitigation activities that can be undertaken by both the public and private sector. This document is intended to educate local policy makers and emergency service organizations about hazards and vulnerabilities in the county and to provide a comprehensive reference document for planning and mitigation activities.

Every community, including those in Houghton County, faces different hazards and has varying resources to deal with problems. Planning is one way to help mitigate the impact of hazards and ensure they are dealt with in an efficient way. Mitigation activities need funding, and an approved

local mitigation plan is a requirement for pre-disaster Federal mitigation funds under Section 104 of the Disaster Mitigation Act of 2000 (42 USC 5165). After November 1, 2004 a plan is needed for post-disaster mitigation funds under the Hazard Mitigation Grant Program. The requirements are spelled out in 44 CFR, Part 201 of the Code of Federal Regulations. The first hazard mitigation plan was prepared by Houghton County in 2005 to meet the requirements for obtaining funds through the Federal Emergency Management Agency (FEMA). To continue to be eligible for FEMA funds, the plan must be updated every five years. This 2012 plan update is intended to meet the ongoing requirements for obtaining funds through FEMA.

1.1 Planning Process

Development of the 2012 Houghton County Hazard Mitigation Plan began with a review of the 2005 plan and gathering new information from local sources, statewide data, and university data in order to update the hazard risks to municipalities within the County. WUPPDR staff then met with the County Emergency Coordinator and ad hoc committee to identify new projects to address existing and newly identified hazards.

Three formal surveys were created and distributed throughout the County to solicit information regarding each jurisdiction's particular hazards and potential mitigation measures. Of two initial surveys, one was for the general public, and another was directed toward local units of government and to other organizations interested in hazard mitigation, including the Houghton County Road Commission and Western Upper Peninsula Health Department. In 2013 a second, expanded survey was distributed to all local units of government to gather additional information. Personal contact was made with non-respondents. Information gathered through these means was evaluated and incorporated into the Hazard Mitigation Plan update.

Participants

Local officials have provided input to the plan upon request in order to complete necessary updates and revisions. Officials from whom information was directly received by survey and/or personal contact included:

- Glenn Anderson, Manager, City of Hancock
- Ann Volrath, Assistant Manager, City of Houghton

- Susan C. Dana, Comptroller, Village of Calumet
- Diana Langdon, President, Village of Copper City
- Robert Poirier, Clerk, Village of Lake Linden
- Edward Vertin, Administrator, Village of Laurium
- John Pastore, Deputy Clerk, Village of South Range
- Dennis Mulari, Supervisor, Adams Township
- Paul Lehto, Supervisor, Calumet Charter Township
- David Mattson, Supervisor, Chassell Township
- Frank Pentti, Supervisor and Fire Chief, Duncan Township
- Shawn Hagan, Supervisor, Elm River Township
- Glenn Ekdahl, Supervisor, Franklin Township
- Paul Kemppainen, Supervisor, Hancock Township
- Duane Fedie, Supervisor, Laird Township
- Steven Karpiak, Supervisor, Osceola Township
- Bruce Peterson, Supervisor, Portage Charter Township
- Glenn North, Supervisor, Quincy Township
- Dennis Racine, Treasurer, Schoolcraft Township
- David Chard, Supervisor, Stanton Township
- Brian Cadwell, Supervisor, Torch Lake Township

Revisions

Overall, revisions to the previous (2005) plan reflect changing priorities against a backdrop of continuing concerns. Flooding remains a high-priority issue, but the impact of a failure of the Portage Lift Bridge and its implications for daily life have come to the forefront. Demographic and land use information were updated. Mitigation goals remained generally the same. A number of completed actions were eliminated, and several have been retained or modified.

The preliminary draft plan was delivered in July 2013 to the Houghton County Courthouse and to all jurisdictions within Houghton County. These and neighboring jurisdictions were also informed about availability of the draft for review and comment at www.wupldr.org. The draft was made available for public review on that website, as noted in a July 24 Daily Mining Gazette article, and in print at the Courthouse. An informal opportunity for public comment was provided at a Houghton County

Board meeting on August 13, 2013. All suggestions were noted and incorporated as applicable into the final draft, which was presented to the Houghton County Board for a public hearing preceding adoption on October 8, 2013.

Jurisdictional Involvement

All units of government in Houghton County have participated in the development of the 2012 Houghton County Hazard Mitigation Plan as required for pre-disaster Federal mitigation funds under Section 104 of the Disaster Mitigation Act of 2000 (42 USC 5165). All units of government also participated in the 2005 Hazard Mitigation Plan. Letters of intent to participate from the following units of government are included as Appendix A:

- Houghton County
- Adams Township
- Calumet Charter Township
- Chassell Township
- Duncan Township
- Elm River Township
- Franklin Township
- Hancock Township
- Laird Township
- Osceola Township
- Portage Charter Township
- Quincy Township
- Schoolcraft Township
- Stanton Township
- Torch Lake Township
- Hancock City
- Houghton City
- Calumet Village
- Copper City Village
- South Range Village
- Lake Linden Village
- Laurium Village

Other Related Plans

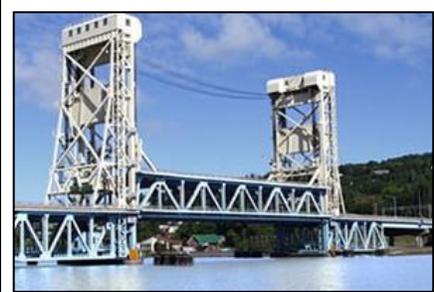
In order to avoid duplication of efforts, existing information, including Census data, climate and weather events, and other community characteristics and statistics were incorporated into this update.

Several local units of government have master plans and/or zoning ordinances in place. These plans inventory public resources related to hazard mitigation in detail. This plan does not conflict with any of those plans, nor is it inconsistent with the regional Comprehensive Economic Development Strategy. For more information about other existing master plans and related administrative mechanisms to carry out hazard mitigation, see **Section 4.1**. Michigan Technological University has its own Multi-Hazard Mitigation Plan. The Michigan Tech plan has been taken into consideration during the development of this plan and itself took the 2005 Houghton County plan into consideration.

The previous Hazard Mitigation Plan has, since its expiration in 2010, not always been relevant to specifically consider and explicitly include in other recent plans. After this updated plan is complete, hazard mitigation issues and priorities will be considered and incorporated as other plans are updated, with officials involved in hazard planning and response participating as appropriate. Mitigation actions will be included in capital improvements programs when applicable and feasible.

1.2 County Overview

Houghton County is located in the northwestern portion of Michigan's Upper Peninsula, on the southern coast of Lake Superior (see **Figure 1-1**). Over half of the county lies on the Keweenaw Peninsula, a 50-mile wide stretch of land that extends 75 miles out into the lake. The County's north and south portions are connected by the Portage Lake Lift Bridge. The bridge spans the Portage Waterway, which is connected to Lake Superior on both ends and splits the county and the Keweenaw Peninsula into northern and southern parts.



The Portage Lake Lift Bridge connects southern to northern Houghton County.

The county was organized in 1848 and named after Douglass Houghton, Michigan’s first geologist, who confirmed the existence of copper in the Keweenaw Peninsula. The City of Houghton serves as the County seat. Houghton County's history is intimately tied to the copper mining industry, which flourished in the area from 1843 well into the early 1900s. Due to the success of copper mining, Houghton County was once the fourth most populous county in Michigan, attracting thousands of Scandinavians, Cornish, Finnish, French Canadians, Germans, Slovaks, and other immigrants. However, low copper prices and the high cost associated with operating deep underground mines led to the decline and eventual closure of the mining industry. The entire region suffered, with population decreasing by over 50 percent between 1920 and 1970 (see **Table 1-1**).

Table 1-1: Historic and Projected Population

	1900	1920	1950	1970	1980	1990	2000	2010	2020
Houghton County	66,063	71,930	39,771	34,652	37,872	35,446	36,016	36,628	38,600

Today, educational and health care services have replaced mining as the major sources of employment. Houghton County’s two universities, Michigan Technological University and Finlandia University, draw students from around the world. The county has also become a popular place for retirees and summer cottages. The growing tourism industry is built around the area's historical resources, interesting geology, and many recreational opportunities. Lake Superior, the numerous inland lakes and streams, abundant forests, the various trail systems, and an annual average of 200 inches of snow make the county a destination for summer and winter outdoor recreation enthusiasts alike.

1.3 Population and Demographics

Houghton County is comprised of 14 townships, two incorporated cities, and five incorporated villages. In addition, it has numerous unincorporated small former mining communities where population remains concentrated. Virtually all of these communities are remnants of much larger settlements founded during the copper mining era. The county’s total 2010 population is 36,628 with approximately half of this population located north of the Portage Waterway (see **Table 1-2**). Population distribution is influenced largely by Michigan Technological University, whose students comprise nearly 20 percent of the population.

Table 1-2: Population Change

Municipality	2000 Population	2010 Population	% Change, 2000-2010
Adams Township ¹	2,747	2,573	-5.9%
Calumet Charter Township ²	6,997	6,489	-6.9%
Chassell Township	1,822	1,812	-0.5%
Duncan Township	280	236	-15.7%
Elm River Township	169	177	4.7%
Franklin Township	1,320	1,466	11.3%
Hancock Township	408	461	13.0%
Laird Township	634	555	-12.5%
Osceola Township	1,908	1,888	-1.0%
Portage Charter Township	3,156	3,221	2.1%
Quincy Township	251	270	7.6%
Schoolcraft Township ³	1,863	1,839	-1.3%
Stanton Township	1,268	1,419	12.6%
Torch Lake Township	1,860	1,880	1.1%
Calumet Village	879	726	-14.6%
Copper City Village	205	190	-7.3%
Lake Linden Village	1,081	1,007	-9.4
Laurium Village	2,126	1,977	-7.0
South Range Village	727	758	4.3%
City of Hancock	4,323	4,634	7.1%
City of Houghton	7,010	7,708	9.1%
Houghton County	36,016	36,628	9.8%

¹Includes Village of South Range

²Includes Village of Calumet, Village of Laurium and Village of Copper City

³Includes Village of Lake Linden

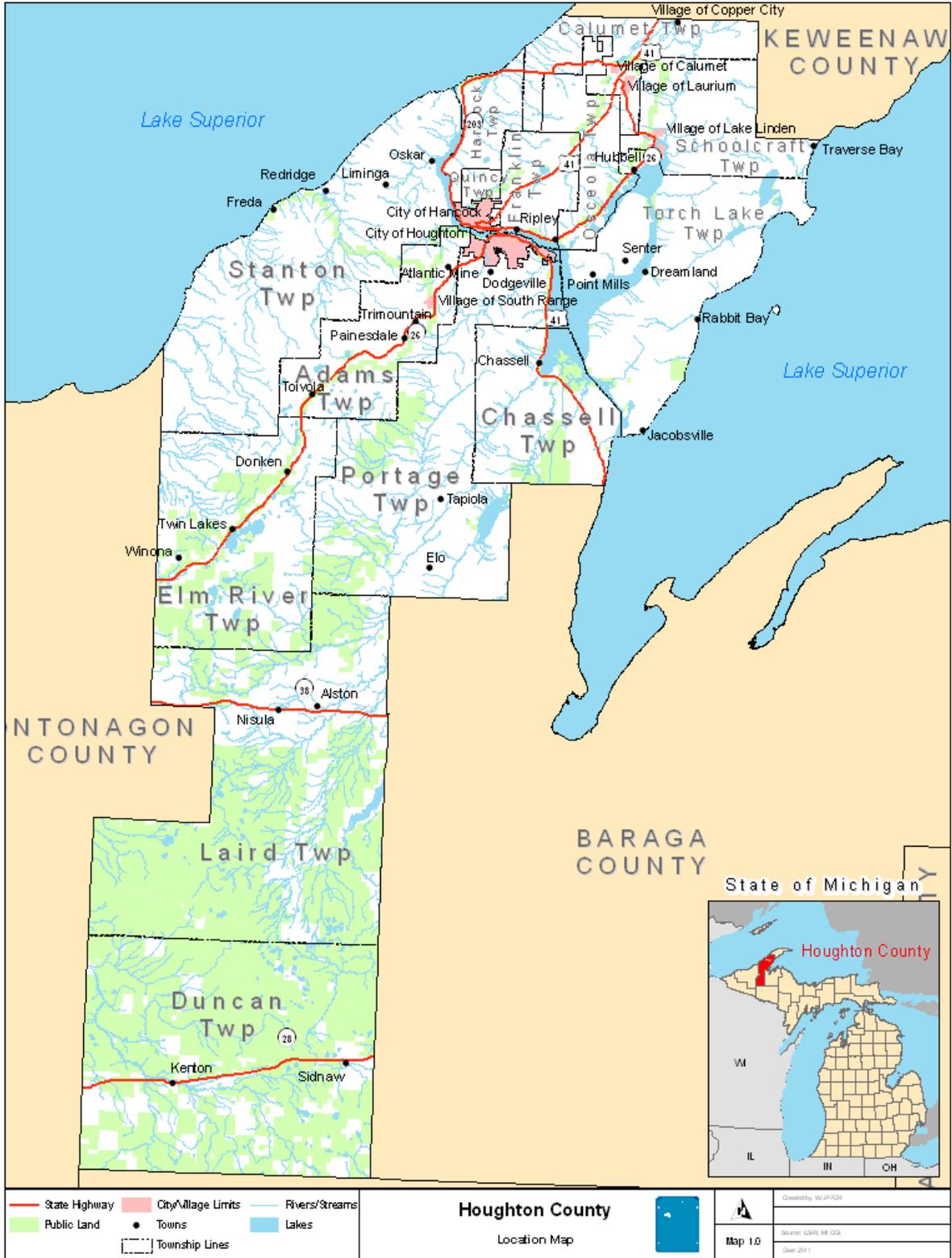


Figure 1-1: Location Map

Despite the county's overall gain in population (9.8 percent) between 2000 and 2010, the population centers of Laurium, Copper City, and Lake Linden actually lost 5 percent or more of their residents, while the Village of South Range and the Cities of Houghton and Hancock gained more than 5 percent.

About 20.6 percent of the population is under the age of 18, while 20.5 percent of the population is in the 18-24 age range, again due to the influence of Michigan Tech. About 15 percent of the population is over the age of 65, which is slightly higher than the Michigan and national averages of about 14 percent. About 95 percent of the population is White, with Asians, particularly Chinese, being the largest minority. Many Houghton County residents are of Finnish heritage. Poverty rates within Houghton County are estimated at 23.4 percent.

Changes in population distribution in Houghton County create more community exposure to natural hazards both within and outside of high density areas. For example, as more people move to rural areas, the chance of wildfire is greater with additional human activities. Furthermore, increased density as well as dispersed populations can affect risk, as distance and a higher ratio of residents to emergency responders affect response time. The diversity of population makes it necessary to address varying needs and services especially in more vulnerable populations, including seniors, disabled citizens and children, as well as those living in poverty. The cost of recovery from natural hazards can place an unequal financial responsibility on the general population when only a small portion may benefit from government funds to rebuild private structures. Natural hazard discussions should include representatives from all members of the population to insure their input as part of the decision-making process.

1.4 Geography and the Environment

Houghton County's 1,071 square miles are comprised mostly of highlands, upland plains, and lake border plains. Over 80 percent of this land is covered by forest, mainly upland hardwoods. The county contains 923 miles of rivers and streams, over 20,000 acres of lakes and ponds, and 50 miles of Lake Superior shoreline. Elevation varies between 600 and 1,600 feet above sea level. As noted earlier, the County is divided by the Portage Waterway, which cuts through the area from east to west.

Major Rivers

Houghton County's major rivers are the Sturgeon, Otter, Trap Rock, Salmon-Trout, Pilgrim, Graveraet, Elm, Misery, Silver, Jumbo, and Ontonagon. The rivers are all within the Lake Superior basin. There are five watershed sub-basins within the county: Ontonagon, Keweenaw Peninsula, Sturgeon, Dead-Kelsey and Lake Superior (see **Figure 1-2**).

Climate

Houghton County lies within the Lake Superior Basin, which has a typical humid continental climate characterized by cold dry winters and warm humid summers. However, the lake exerts a strong microclimate influence on the immediate shoreline, generally resulting in cooler summers and milder winters than those experienced a few miles inland. This is due to the effect of Lake Superior on the air temperatures and the prevailing westerly winds.

The moderating effect of the lake is experienced in spring and summer months when the cool water tends to level out temperature extremes and reduces the likelihood of frost. Another effect of the lake is the formation of considerable cloudiness when cold air passes over the lake in late fall and early winter. This causes early and heavy snow possibilities, referred to as the "lake effect." Both these effects lessen as one moves away from Lake Superior.

The growing season in Houghton County is 132 days. Average temperatures in January are a low of 7 degrees Fahrenheit and high of 20 degrees Fahrenheit. In July average temperatures are a low of 54 and a high of 75. Annual precipitation averages 34 inches, while average snowfalls are in excess of 200 inches with records of over 300 inches of snow. The large amount of winter snowfall often results in heavy spring runoffs. Weather conditions can vary greatly from the northern to the southern portions of the County.

Geology

The surface geology of Houghton County is a complex of ground moraines, end moraines, outwash deposits, glacial lake shorelines, and lake outlet channels, all with related deposits. The bedrock geology and glacial activity have played key roles in shaping the present topography. Much of the landscape is dissected by drainage ways. Soils vary greatly throughout the county, with dune areas

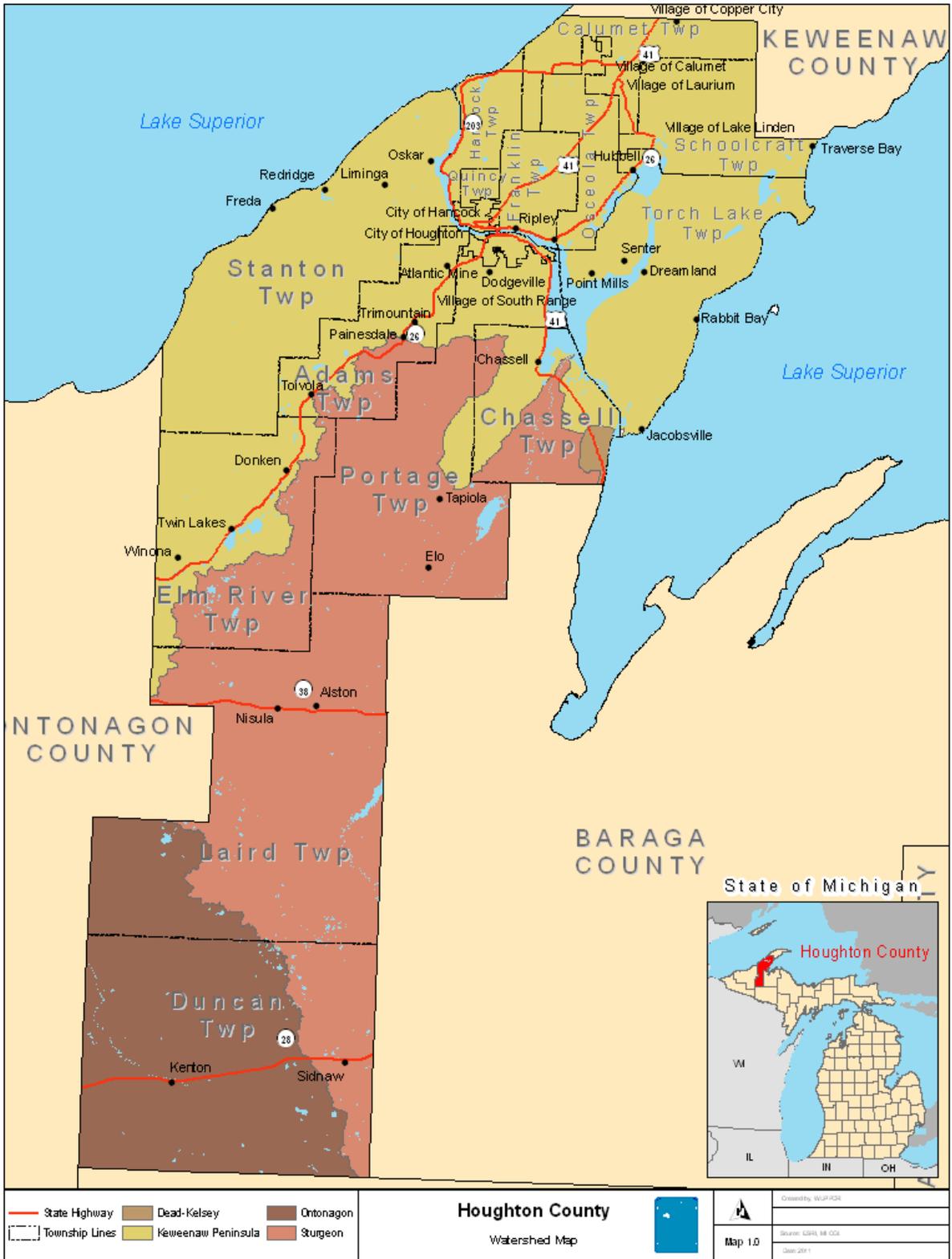


Figure 1-2: Watersheds Map

near Traverse Bay and F.J. McLain State Park to extensive deposits of stratified alluvium and organic deposits in the Sturgeon River Valley south of Chassell.

1.5 Land and Development

For the most part, residential development is concentrated in established communities with the largest numbers in Houghton/Hancock and Calumet/Laurium (see **Figure 1-3**). There are scattered pockets of houses along portions of Highways U.S. 41 and M-26 and other major roads, particularly in the northern part of the county. Low-density homes, cabins, cottages, and camps can be found in rural areas throughout the county. The waterfronts are dominated by residential development, except for segments where road access is currently unavailable.

Business development tends to be centered in Houghton/Hancock and Calumet/Laurium with strip development radiating outward from these business cores. Downtown areas continue to have a primary role in local commerce, but chain store and restaurant development outside of the downtowns has a substantial impact on the area.

The Ottawa National Forest in southern Houghton County occupies the majority of the land in Laird and Duncan Townships and 23 percent of the county as a whole. Copper Country State Forest is made up of three large units in Elm River, Laird, Portage Charter, and Chassell Townships. Two small portions of Baraga State Forest are located in Chassell and Torch Lake Townships. Overall, there are 44,200 acres of land in the State Forests. In addition, F.J. McLain State Park and Twin Lakes State Park occupy nearly 600 acres. Altogether, 201,941 acres, or 30 percent of Houghton County is part of a state or national forest, park, or recreation area.

Land use and development is directed by zoning regulations in less than half of Houghton County's municipalities (see **Figure 1-4**). The lack of land use planning and zoning leaves much of the County more vulnerable to land use-related hazards. The following municipalities have zoning ordinances in effect: City of Hancock, City of Houghton, Village of Calumet, Village of South Range, Calumet Charter Township, Chassell Township, Duncan Township, and Portage Charter Township. There are no zoning ordinances in place for the Village of Laurium, Village of Lake Linden, Adams Township, Elm River Township, Franklin Township, Hancock Township, Laird Township, Osceola Township, Quincy Township, Schoolcraft Township, and Torch Lake Township.



Figure 1-3: Land Cover/Use Map

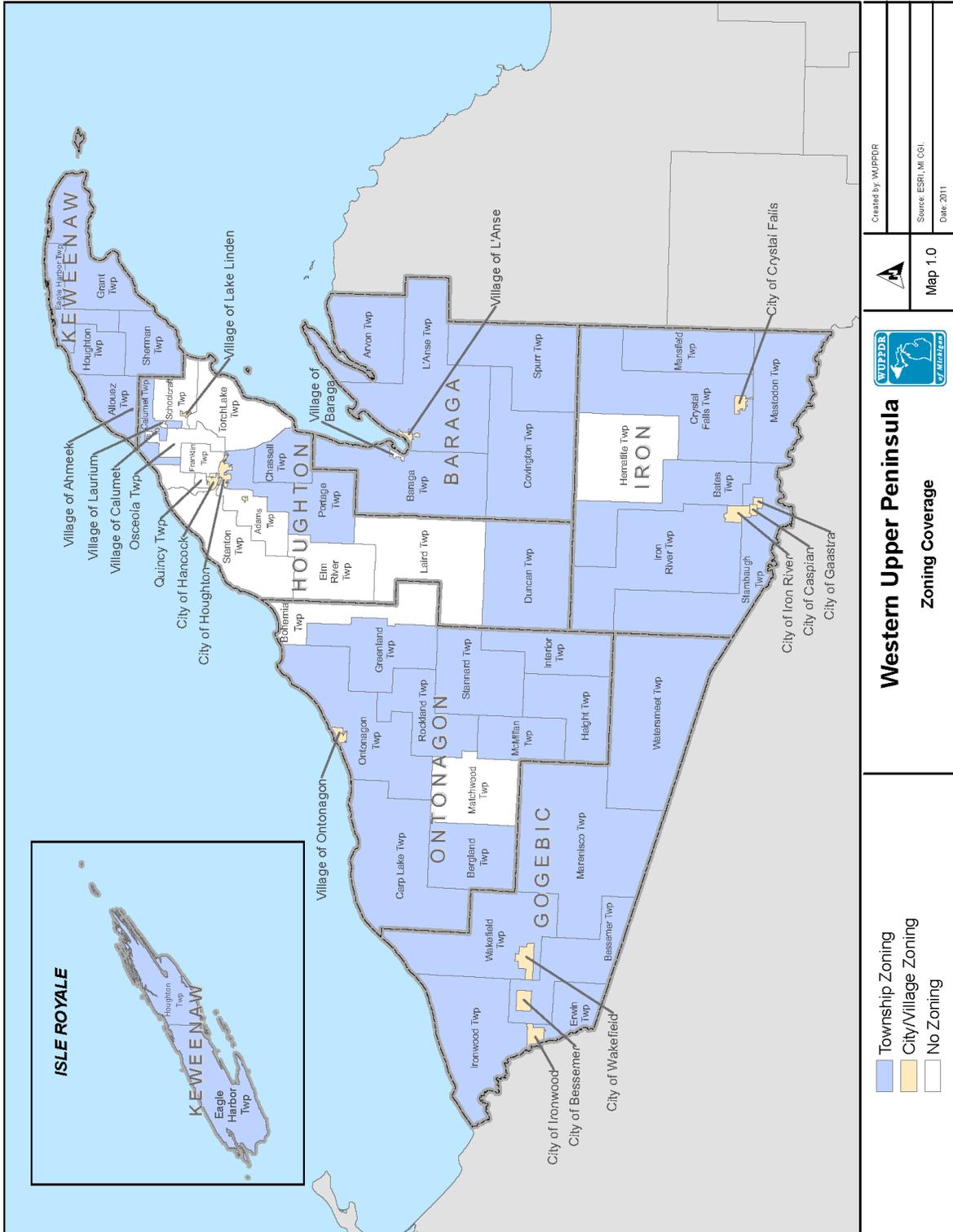


Figure 1-4: Western Upper Peninsula Zoning Coverage Map

1.6 Housing and Community Development

Three quarters of the housing stock in Houghton County is in the form of single-family detached homes. The housing is relatively old with almost half of the houses built before 1940 (see **Table 1-3**). Nearly a quarter of the housing stock is vacant. Some growth is occurring, as 5.9 percent of all homes have been built within the last 10 years. However, this is well below the national average of 10 percent. The median housing value in Houghton County is \$86,900, which is 70% less than the national median. The lower housing cost leads to a relatively high homeownership rate, although this is not indicated in the census figures because of the large number of students who rent.

Compared to Michigan as a whole (5.5 percent), Houghton County has a large proportion of seasonal housing—15 percent. This reflects the growing importance of the area as a vacation destination and retirement community.

Table 1-3: Housing Statistics

Area	Housing Units	Occupied Units	Median Value	Seasonal Units	Built Pre-1940	Built in Last 10 Years ¹
Adams Township	1,189	1,026	\$66,800	50	477	66
<i>South Range Village</i>	<i>395</i>	<i>343</i>	<i>\$73,700</i>	<i>9</i>	<i>785</i>	<i>4</i>
Calumet Charter Twp.	3,595	2,721	\$58,200	302	2,750	77
<i>Calumet Village</i>	<i>512</i>	<i>376</i>	<i>\$71,000</i>	<i>22</i>	<i>273</i>	<i>0</i>
<i>Copper City Village</i>	<i>112</i>	<i>80</i>	<i>\$70,600</i>	<i>17</i>	<i>79</i>	<i>0</i>
<i>Laurium Village</i>	<i>1,059</i>	<i>814</i>	<i>\$67,300</i>	<i>41</i>	<i>785</i>	<i>34</i>
Chassell Township	983	755	\$120,100	168	272	59
Duncan Township	428	125	\$126,300	279	50	25
Elm River Township	338	80	\$136,300	237	86	49
Franklin Township	632	546	\$98,200	33	347	33
Hancock Township	273	165	\$134,100	103	53	20
Laird Township	445	244	\$110,700	162	145	27
Osceola Township	921	764	\$74,000	65	516	64
Portage Charter Twp.	1,672	1,320	\$114,900	215	521	149
Quincy Township	128	112	\$109,400	5	80	12
Schoolcraft Township	1,061	802	\$71,300	168	474	46
<i>Lake Linden Village</i>	<i>568</i>	<i>481</i>	<i>\$66,000</i>	<i>27</i>	<i>271</i>	<i>6</i>
Stanton Township	787	515	\$123,200	184	277	89
Torch Lake Township	1,557	790	\$107,900	694	479	96
City of Hancock	2,111	1,882	\$85,700	61	1,269	105
City of Houghton	2,516	2,380	\$129,000	35	929	223
Houghton County	18,636	14,232	\$86,100	2,761	8,735	1,140

¹To March 2010

Schools

Schools are some of the largest institutions in the county and could potentially see great impacts from the hazards discussed in this plan. Houghton County is comprised of nine separate school districts, which are all part of the Copper Country Intermediate School District. **Table 1-4** shows the school districts, grade levels, number of students, and number of instructors at each of the schools in Houghton County.

Table 1-4: Schools

School District / School Name	Location	Grades	Students	Instructors
Adams Township Schools				
South Range Elementary School	South Range	K – 6	215	13
Jeffers High School	Painesdale	7 – 12	209	13
Public Schools of Calumet, Laurium, & Keweenaw				
Horizons Alternative School	Mohawk	9 - 12	50	7
CLK Elementary School	Calumet	K – 5	698	35
Washington Middle School	Calumet	6 – 8	352	23
Calumet High School	Calumet	9 – 12	406	26
Chassell Township Schools				
Chassell K-12 School	Chassell	K – 12	261	17
Dollar Bay-Tamarack City Area Schools				
Thomas R. Davis Elementary School	Dollar Bay	K – 6	167	7
Dollar Bay High School	Dollar Bay	7 – 12	129	12
Elm River Township School				
Elm River Township School	Winona	K – 6	6	2
Hancock Public Schools				
Hancock Elementary School	Hancock	K – 5	405	24
Hancock Middle School	Hancock	6 – 8	197	12
Hancock Central High School	Hancock	9 – 12	243	16
Houghton-Portage Township School District				
Houghton Elementary School	Houghton	K – 5	612	32
Houghton Middle School	Houghton	6 – 8	311	18
Houghton Central High School	Houghton	9 – 12	407	31
Lake Linden-Hubbell Public Schools				
Lake Linden-Hubbell Elementary School	Lake Linden	K – 6	275	13
Lake Linden-Hubbell High School	Lake Linden	7 – 12	249	22
Stanton Township Public Schools				
E.B. Holman School	Atlantic Mine	Pre-K 8	138	8

Two institutions of higher education are located in the county. Michigan Technological University is located in the City of Houghton and, as described in Section 1-7, is one of the largest employers with the largest student body (roughly 7,000) in the county. Finlandia is a private college in Hancock with hundreds of students. Michigan Tech, which has its own Multi-Hazard Mitigation Plan, is at considerable risk of several hazards due to its size.

Historic Features

At one time Houghton County was dotted with mine shafts, rock houses, stamp mills, and smelters, and communities all dedicated to the processing of copper. Many remnants of these activities remain, though not all are protected or have even been explored completely. Preservation efforts are expected to continue into the future, making more of these sites assets to a growing heritage tourism industry. Below are a few historic highlights within Houghton County.

Keweenaw National Historical Park

Keweenaw National Historical Park (KNHP) was established in 1992 to commemorate the heritage of copper mining on the Keweenaw Peninsula, the only place in the world where commercially abundant quantities of elemental copper occurred. The copper mines were critical to the industrial development of the United States and were also the site of America's first large scale hard rock industrial mining operations. Many mine shafts in the area reached over 9,000 feet deep.

The park consists of approximately 1,700 acres within the two units of the park, and much of the area is and will remain in private ownership. The KNHP acquires and preserves key structures and sites for interpretive activities. The park also includes a cooperative of 19 separate sites, spread out over more than 100 miles from Copper Harbor in Keweenaw County to the Porcupine Mountains in Ontonagon County. The sites in Houghton County are:

- A.E. Seaman Mineral Museum on the Michigan Tech campus in Houghton
- Calumet Theatre in downtown Calumet
- Chassell Heritage Center in Chassell
- Copper Range Historical Museum in South Range
- Coppertown USA Museum in Calumet
- Delaware Copper Mine off Highway U.S. 41, 12 miles south of Copper Harbor

- Finnish American Heritage Center & Historical Archive in Hancock
- Houghton County Historical Museum complex in Lake Linden
- Keweenaw Heritage Center at St. Anne's in downtown Calumet
- Laurium Manor Inn in Laurium
- Quincy Mine Hoist & Underground Mine on U.S. 41, just north of Hancock
- Upper Peninsula Fire Fighters Memorial Museum in downtown Calumet

Copper Country Archives

The Copper Country Archives were established in 1969 to preserve and make available for research printed and manuscript materials related to the Copper Country. The archives are located at the J.R. Van Pelt Library on the campus of Michigan Technological University in Houghton.

Hancock Pewabic House and Museum

The Hancock Pewabic House and Museum, located in Hancock, is dedicated to the research, preservation and display of the life and career of Mary Chase Perry Stratton (founder of Pewabic Pottery) and the City of Hancock.

Champion #4 Shaft-Rockhouse

The shaft is located on the Chassell-Painesdale Road, one-quarter mile off Highway M-26. Originally constructed in 1902, the Champion #4 Shaft-Rockhouse is the oldest shaft-rockhouse standing in the Keweenaw. Painesdale Mine and Shaft, Inc. offers tours of the hoist and shaft house and is working to preserve and restore the structure.

1.7 Employment and Industry

Ninety percent of Houghton County residents age 25 and older have the equivalent of a high school diploma or more education, and about 35.5 percent are college graduates. Of those in the civilian labor force, 5.7 percent are unemployed. Nearly 42 percent of the population 16 years and over is not in the labor force, which again may reflect the large number of students in the county. In 2010 the median household income was \$33,220 and the per capita income was \$18,325. This varies widely throughout the county, from a median household income of \$33,083 in Laurium to \$18,750

in the neighboring Village of Calumet. In Houghton County, about 23.5 percent of the population lives in what the Census Bureau defines as poverty.

Over 25 percent of the civilian workers in the county are employed by state and local government. The government sector dominates because Michigan Technological University is a state-assisted institution and because several federal and state service agencies maintain branch offices in Houghton County. Other major employment sectors include educational and health services (38.8 percent of jobs) and retail (10 percent), reflecting the area's growing tourist economy. The construction industry accounts for 7 percent of all jobs. Just over 7 percent of jobs are in manufacturing, mainly centered around lumber, newspaper publication, and some high-tech industries.

Michigan Tech has a major influence on the region's economy, especially Houghton and Hancock. It is by far the area's largest employer, and it has been estimated that the university contributed \$30,000,000 annually to the local economy from 2001 to 2006, including employee compensation, the purchase of supplies and services, and dollars spent by students, donors, and visitors. Health services account for the second, third, and fourth largest employers, Portage Health System, the County of Houghton, and Aspirus Keweenaw.

1.8 Public Works and Transportation

Public Works and Roads

Houghton County has a Road Commission with multiple facilities and considerable staff and equipment resources. The Commission is responsible for county roadways but does not plow state and federal highways in winter. Most municipalities have public works agencies for maintenance and development of transportation and other infrastructure. Townships also have staff for maintenance of facilities and utilities. All such agencies are resources for implementation of related mitigation actions.

Houghton County is crossed by several major State and US highways (see **Figure 1-5**). Thirty-four miles of Highway U.S. 41, which starts in the northernmost part of the Keweenaw Peninsula and runs 1,990 miles to Miami, Florida, are in Houghton County. Highway M-26 starts in Copper Harbor in Keweenaw County and runs southwest until it intersects US-45, about five miles beyond Mass City

in Ontonagon County. Forty-six miles of M-26 are in Houghton County, although a four-mile stretch is shared with U.S. 41. Twelve miles of M-38 traverse central Houghton County, passing through Nisula en route from Baraga to Ontonagon. M-28, which spans virtually the entire Upper Peninsula, runs from Interstate 75 in the east to US-2 at the City of Wakefield in the west. Fifteen miles of M-28 cross southern Houghton County, passing through the communities of Kenton and Sidnaw. In addition to these major routes, there are 858 miles of roads owned and maintained by the Houghton County Road Commission.

The Houghton County Road Commission operates from six locations including their headquarters in Ripley and garages in Calumet, Trimountain, Elo, Alston, and Kenton. The county also contains many miles of seasonal roads with a number in southern Houghton County being built and maintained by the U.S. Forest Service. Each incorporated community owns and maintains the local street networks within its limits. Highways in Houghton County are maintained by the Michigan Department of Transportation.

Portage Lake Lift Bridge

Historically, Portage Lake and the Portage River provided a natural pathway across the Keweenaw Peninsula, dividing it almost in half. In the 1860s the current ship canal, referred to as the Portage Waterway, was completed connecting Lake Superior via Portage Lake on the east to Lake Superior on the west. Completion of this canal made the Keweenaw an island, rather than a peninsula.

In 1875, a bridge was built to connect Houghton and Hancock (located on opposite sides of Portage Lake.) This bridge was rebuilt and underwent major repairs before the Portage Lake Lift Bridge was built in 1959. This bridge now spans the waterway and is recognized as the heaviest aerial lift bridge in the world. The unique double deck bridge has two levels for traffic. The upper level is for vehicular traffic and the lower level was originally used for trains. Trains no longer run in the Keweenaw but snowmobiles use the lower level during the winter months. The Portage Lake Lift Bridge is a vital link providing the only land entrance to the northern portion of Houghton County and Keweenaw County. A permanent committee has developed, and continues to review and update, a phased response plan to address short, medium, and long-term outages that may occur.

Rail

Although rail service played a critical role in the development and economic growth of the Keweenaw Peninsula, most tracks that connected population centers, mines, and ports have been removed. Today these corridors serve as snowmobile, off-road vehicle, hiking, and biking trails. The only recently active line in Houghton County, the Escanaba and Lake Superior Railroad, which runs through southern Houghton County on its course from Escanaba to Ontonagon, is in the process of abandonment.

Ports

Domestic port facilities are available in Houghton. The Portage Waterway provides refuge to ships and boats seeking an alternate route when Lake Superior seas do not allow safe passage around the Keweenaw Peninsula.

Airports

Houghton County Memorial Airport (CMX) is located four miles northeast of Hancock at an elevation of 1,095 feet. The un-towered airport is owned by Houghton County and operates year-round. The airport maintains two paved runways, with the longest one, 13/31, extending 6,501 feet. Only runway 13/31 is open from November 1 to April 15. Commercial air service to Chicago – O’Hare is provided by SkyWest (United Airlines). The airport also offers fuel, parking and hangars, airframe, and power plant service, and flight instruction. Aircraft operations average 44 flights per day, with 37 percent being local general aviation, 30 percent transient general aviation, 19 percent commercial, 13 percent air taxi service, and less than one percent military.

Prickett-Grooms Field Airport (6Y9) is located in Baraga County one mile northeast of Sidnaw at 1,372 feet. The 2,000-foot turf runway is rough and in poor condition, becoming soft when wet. The airport is closed November through April and when snow-covered, since the runway is not plowed. The airport has no facilities and provides no services except free parking and camping on the field. It sees an average of 160 operations per year, all of which are transient general aviation.

Transit

Indian Trails Bus Company serves Houghton and Hancock with daily direct trips to Green Bay, Wisconsin. Transfers can be made in Escanaba, Michigan to buses headed for other destinations. Both the cities of Houghton and Hancock operate transit systems. The Houghton Motor Transit Line provides both scheduled and on-demand services for the City of Houghton. Hancock Public Transit provides on-demand bus service in the City of Hancock. Superior Coaches and Delivery in Houghton offers charter bus service. Taxicab service is available in the Calumet, Hancock, and Houghton areas.

1.9 Police, Fire, and Emergency Services

Police, fire, and other emergency agencies are vital community resources not only for emergency response but for implementation of mitigation actions.

Police

Houghton County is serviced by a number of police organizations, both state and local. Michigan State Police District 8, which covers the entire Upper Peninsula, has headquarters in Marquette County. Eighth District Post 87 is located along U.S. 41 in Calumet and covers both Houghton and Keweenaw Counties.

The Houghton County Sheriff's Department is located in Houghton and has a number of responsibilities. The office is responsible for patrolling Houghton County's 1,071 square miles, maintaining the jail facilities, patrolling 30 square miles of water with its marine patrol, operating the work camp, and performing civil process. Local police stations are located in Calumet Village, Laurium Village, Lake Linden Village, the City of Houghton, and the City of Hancock.

The Department of Public Safety is the unit or organization with primary responsibility for maintaining a safe and secure environment at Michigan Tech University. The Department of Public Safety is staffed by trained, certified State of Michigan Police Officers who have full law enforcement authority (including the power of arrest) throughout Houghton County. The Department is staffed and operates 24 hours per day, seven days per week.

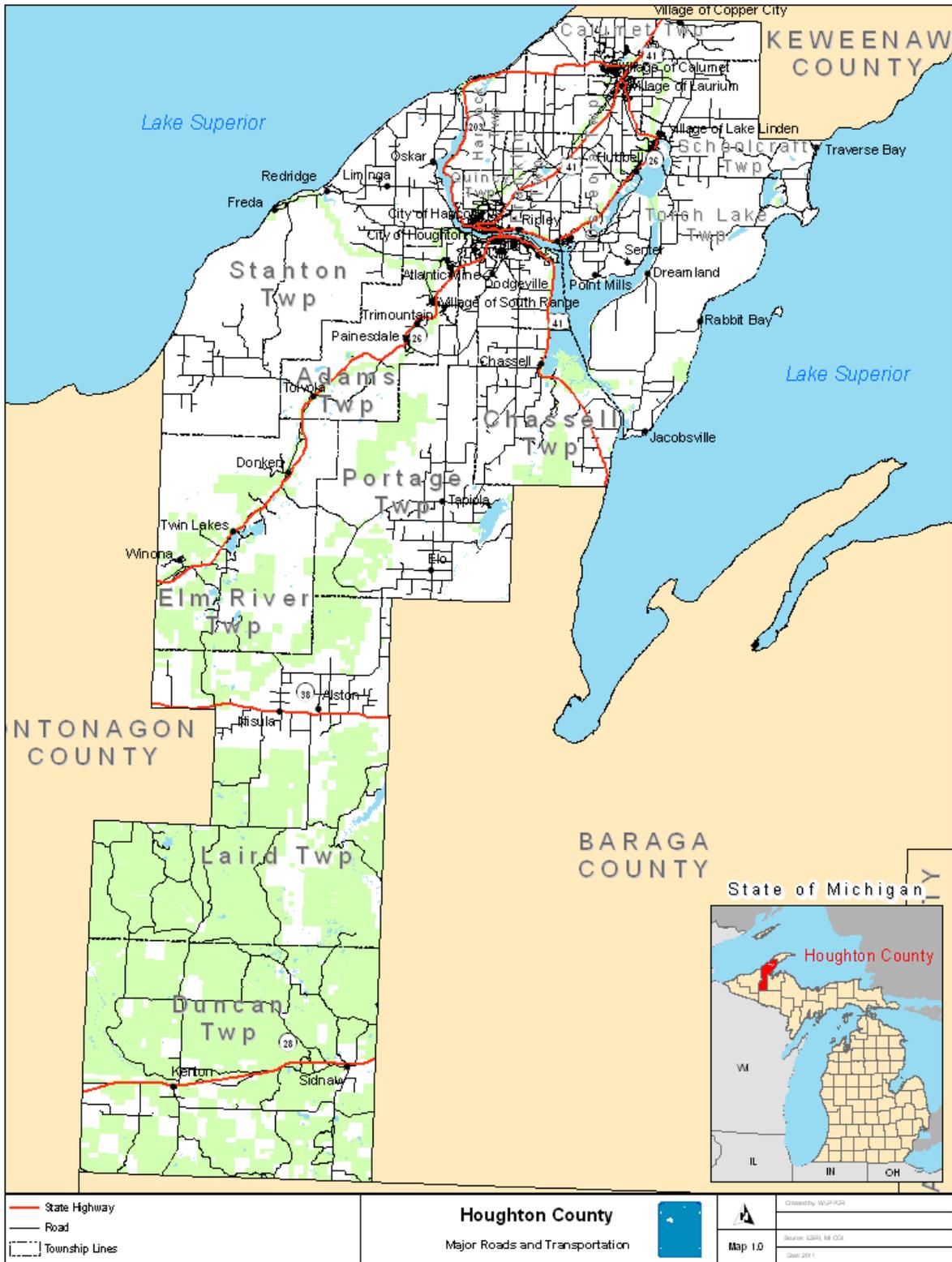


Figure 1-5: Major Roads and Transportation Map

Fire

There are 24 separate volunteer fire departments that serve Houghton County, as shown in **Table 1-5**:

Table 1-5: Fire Departments

Fire Department	Location	Service Area		Staff*
		Sq mi	Population	
Adams Township VFD	Atlantic Mine	40	3,500	26
Calumet Village VFD	Calumet	1	1,000	12
Calumet Charter Township Fire/Rescue	Calumet	40	8,350	20
Chassell VFD	Chassell	49	1,800	17
Copper City VFD	Copper City	9	5,000	13
Dollar Bay VFD	Dollar Bay	30	2,500	27
Hancock VFD	Hancock	2	4,550	18
Houghton VFD	Houghton	4	6,050	20
Hubbell VFD	Hubbell	36	3,000	20
Hurontown Fire/Rescue	Hurontown	119	2,270	15
Lake Linden VFD	Lake Linden	40	1,200	16
Laurium VFD	Laurium	1	2,250	14
Ripley VFD	Ripley	4	375	17
South Range VFD	South Range	4	727	15
Tamarack City VFD	Hubbell	11	520	16
Bootjack VFD	Lake Linden	70	700	20
Otter Lake VFD	Chassell	60	800	24
Quincy-Franklin VFD	Hancock	20	1,500	20
Boston VFD	Hancock	10	500	12
Laird VFD	Nisula	36	500	21
Twin Lakes-Elm River VFD	Twin Lakes	92	210	12
Toivola VFD	Toivola	75	350	21
Stanton Township VFD	Stanton	45	900	16
Duncan Township VFD	Sidnaw/Kenton	300	450	16

*Staff includes paid and part-time staff and volunteers

Medical

Two hospitals are located in Houghton County. The Portage Health System medical complex is a state-of-the-art, three-story, 165,000-square-foot facility located on Quincy Hill in Hancock. The Portage Health System complex includes an Emergency Department (Level III Trauma Center) and Walk-In Care Service offering 24 hour physician coverage, 30 inpatient beds, and a long-term care facility with 44 beds. Aspirus Keweenaw Hospital in Laurium offers surgery, radiology, physical

therapy, pediatrics, respiratory therapy, intensive care, coronary care, labor and delivery, laboratory services, and outpatient specialty clinics. The center has 49 beds.

Mercy Ambulance (a service of Marquette General Health System) covers most of Houghton County (except Duncan and Laird Townships) and all of Keweenaw County and helps when needed outside the area. Its advanced life support service employs 22 emergency medical technicians (EMTs) and paramedics — 11 full-time and 11 part-time. The agency operates six ambulances, one non-transporting response vehicle, and a snowmobile and rescue sled.

The Western U.P. District Health Department services Houghton County from its office in Hancock.

Coast Guard

The U.S. Coast Guard patrols the area waterways from its station in Dollar Bay. The station is a small boat station with Aids to Navigation team. Its primary missions are search and rescue, law enforcement, and maintaining local Aids to Navigation (such as buoys, markers, and lighthouses).

Office of Emergency Measures

The Houghton County Office of Emergency Measures located in the Houghton County courthouse promotes emergency and disaster education and awareness. The office serves as a dispatcher and ensures interagency coordination before, during, and after disasters or emergencies.

Siren Coverage

Houghton County is serviced by eight functional sirens in the County, all near population centers. The sirens are currently used for fire emergencies, not as public warning systems. **Table 1-6** shows the siren locations, range, and estimated population coverage.

Figure 1-6. Siren Locations

VFD / Community	Siren	Remote Activation	Range (radius) (miles)	Estimated Population Covered	Location
Adams Twp VFD	Y	N	2.0	2000	On top of Atlantic Mine Fire Hall
Chassell VFD	Y 3 phase	N	4.5	700	22115 7 th St., Chassell
Dollar Bay VFD	Y	N	2.0	350	48649 Main St., Dollar Bay
Houghton	Not functional		Citywide	6000	Roof of Dee Stadium
Hubbell VFD	Y	Y	2.0	600	On top of the Community Hall
Hurontown VFD	Y				On top of the Fire Station
Otter Lake VFD	Not functional				On top of the Fire Station
South Range VFD	Y		2.0	120	On top of the Fire Hall in South Range
Tamarack	Y	N	2.0	50	51733 Tamarack St., Tamarack City (old Fire Station)
Twin Lakes VFD	Y	N	3.0	100	23840 M-26, Twin Lakes

1.10 Critical Facilities

When dealing with hazards, some facilities are more important than others and can be considered "critical facilities." Critical facilities can be defined as buildings or infrastructure that when affected by a hazard can impact the well being of a large population. Facilities identified as critical generally fall into two categories:

1. Buildings or locations vital to public safety that can impact a disaster response and recovery effort – for example, police and fire stations and communications facilities.
2. Buildings or locations that, if damaged, could cause a secondary disaster, such as hazardous materials sites or nursing homes.

For this mitigation plan, critical facilities have been identified in the following categories, with examples:

Emergency response facilities: Police and fire stations, public works sites, and emergency management offices

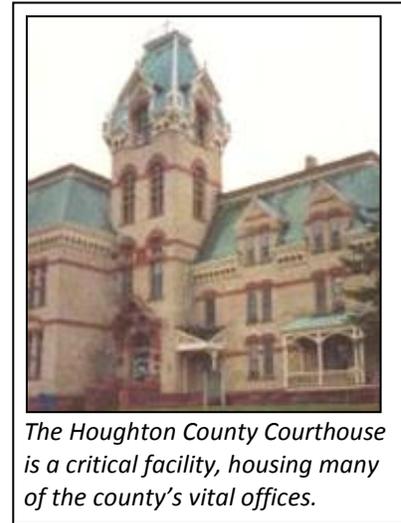
Utilities: Water and wastewater treatment plants and electrical substations

Other Vital infrastructure: Bridges and primary roads

Health facilities: Hospitals and nursing homes

Schools: Public and private

High Density Population Facilities: Housing facilities, shopping malls, and theaters



The Critical Facilities Maps (see **Figures 1-6, 1-7, and 1-8**) on the following pages show the distribution of identified critical facilities in Houghton County.

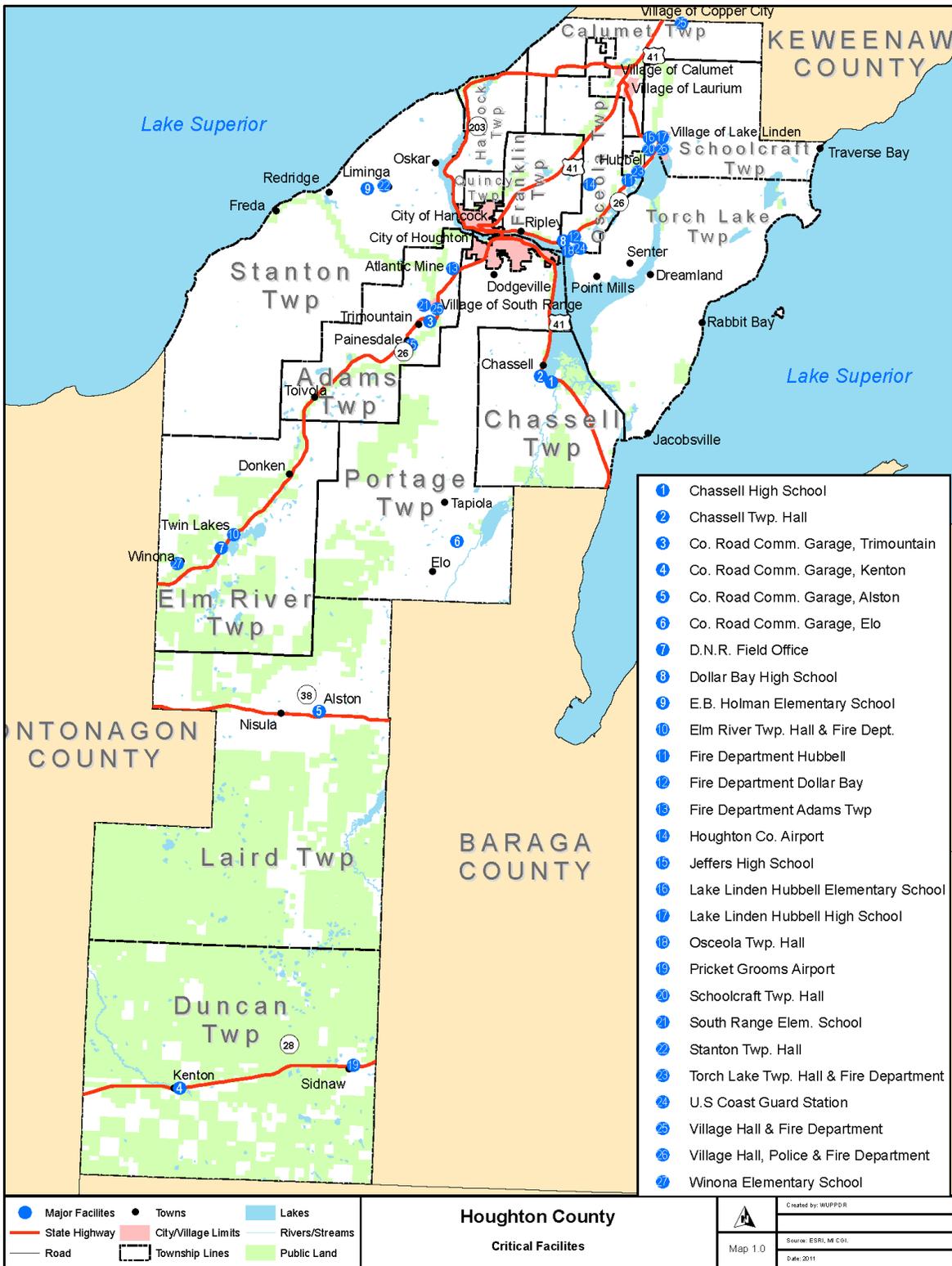


Figure 1-6: Houghton County Critical Facilities Map

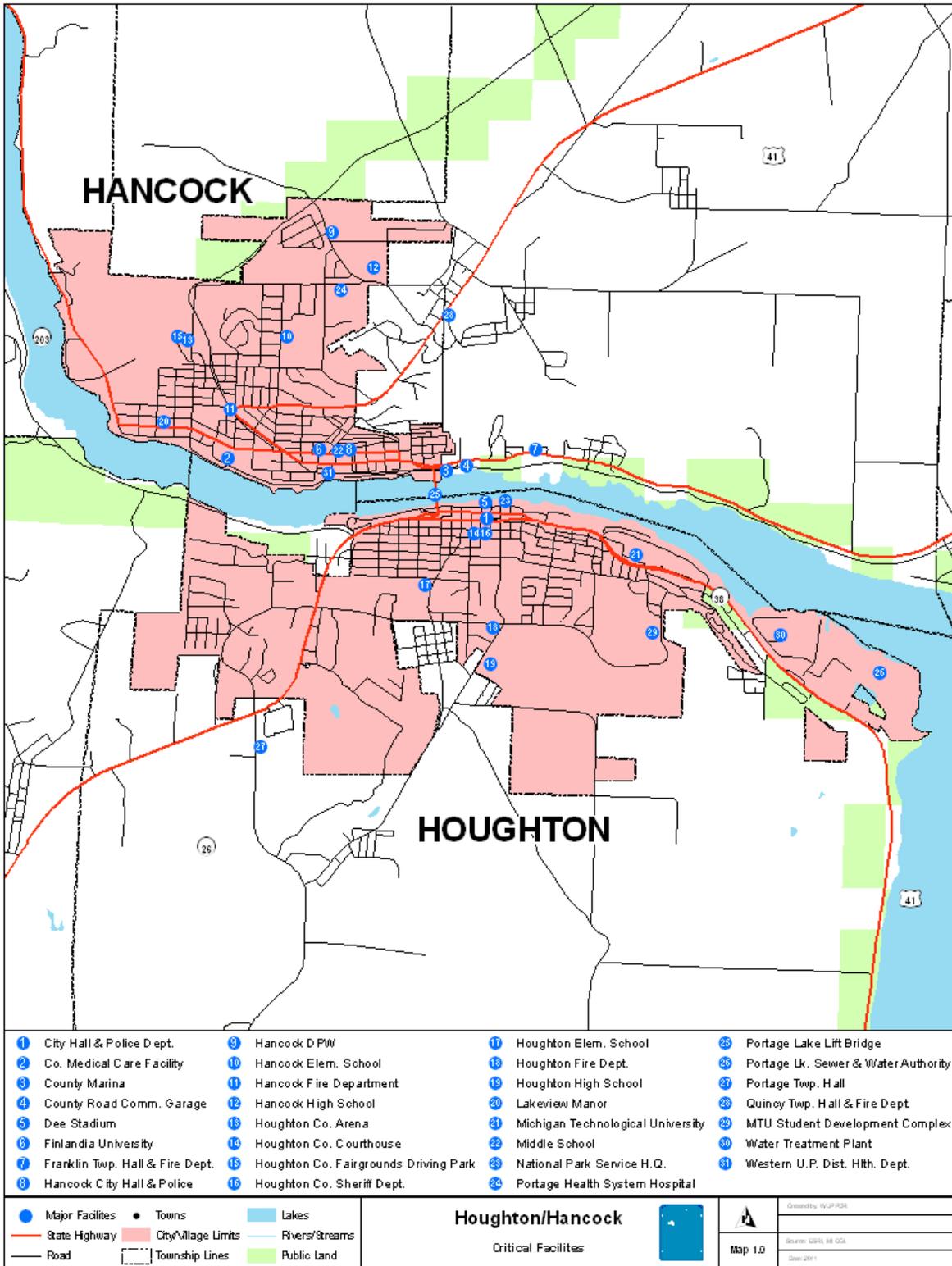


Figure 1-7: Cities of Houghton/Hancock Critical Facilities Map

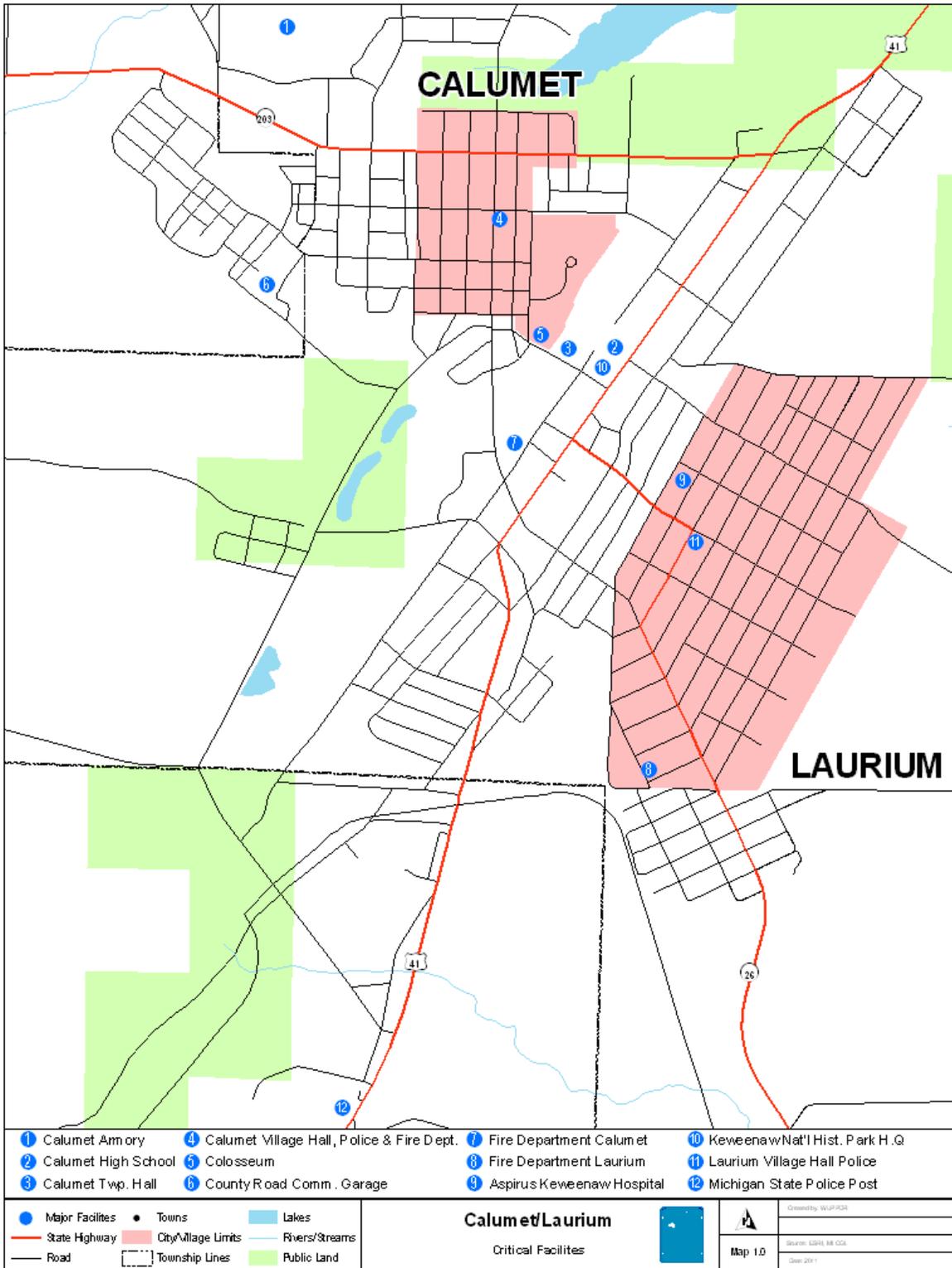


Figure 1-8: Villages of Calumet/Laurium Critical Facilities Map

Section 2: Hazard Profile

Overview of Hazards in Houghton County

There are three categories of hazards evaluated in this plan including natural, technological, and social/societal hazards. Natural hazard threats to Michigan include earthquakes, dam failure and flooding, fire, tornadoes, lightning, hail, severe winds, and severe winter weather. Technological hazard threats to Michigan include hazardous material incidents, transportation accidents, infrastructure failure, and petroleum and natural gas pipeline incidents. Social/societal hazard threats include public health, civil disturbances, and terrorism/sabotage.

The following hazard profile for Houghton County includes a general description of potential hazards and background for each hazard within the County. Hazard potential within the County varies depending on geography, population, and infrastructure. The following hazard profile includes a general description of potential hazards and background for each hazard within the County. Hazard potential within Houghton County varies depending on geography, population, and infrastructure. In accordance with FEMA guidelines, in each discussion of risk and vulnerability subsequent to the descriptions and background information, ratings of severity (or extent, which is used interchangeably) and probability of occurrence are assigned.

Severity (extent) ratings are defined as follows:

Extreme- Facilities/infrastructure in the affected area are damaged or contaminated beyond habitable use. Critical services are damaged beyond 75 percent of capacity. Most items/assets are lost or damaged beyond repair.

High- Facilities/infrastructure in the affected area are partially damaged or contaminated. Critical services are damaged up to 50 percent of capacity. Some items/assets are damaged, but structures and infrastructure remain mostly intact.

Moderate- Facilities or infrastructure in the affected area are temporarily closed. A limited number of assets may be damaged, but the majority of assets are not affected. Critical services are damaged up to 25 percent of capacity.

Low- Facilities/infrastructure in the affected area experience less than a four-hour impact on operations, with no major assets lost.

Probability of future occurrences is estimated based on one or more of the following categories of previous events: 1) in Houghton County over the past 6 to 12 years (depending on available data), 2) in Michigan and/or the United States, and 3) as predicted based on local situation and/or factors recently changed or developed. Generally an "event" is an occurrence formally recorded/declared by an appropriate authority or documented by the media, but undeclared events of a lesser magnitude (e.g. snowstorms that have significant consequences but for which warnings or advisories are not issued) may also be taken into account. Probability ratings are defined as follows:

Very Low- Little possibility of occurrence

Low- At least one event in past 10 years OR foreseeable possibility of occurrence based on current local conditions

Moderate- Approximately one event per average year

High- 2 to 9 events in average year

Very High- 10 or more events in average year

Impact is the overall effect that a hazard has on a community and the extent to which a certain level of severity affects the human population, environment, and economy. Impact is closely connected to severity and is incorporated into the severity ratings above, but where specific damage estimates or damage costs from past events are available, these are stated in the hazard description. Furthermore, in cases where certain communities might experience disproportionately greater or lesser impacts than their severity levels would suggest, these are stated and described. Impact is perhaps the most important contributor to the detailed, multi-factor assessment of countywide hazard priority presented in the matrix following these profiles.

Risk and **vulnerability** are concepts that arise from the severity and probability ratings. Risk is mentioned in many of the hazard descriptions as shorthand for the overall degree of hazard concern based on a combination of severity and probability. Vulnerability is related to risk but also takes preparedness into account; i.e. a community that is ill-prepared for a high-risk disaster is highly vulnerable. Lack of preparedness for a low-risk disaster is less of a concern but still indicates some vulnerability, and this is pointed out where it may not be obvious. Vulnerability is a useful indicator for hazards which are most in need of mitigation.

2.1 Natural Disasters

Earthquakes

An earthquake is a sudden motion or trembling in the earth caused by an abrupt release of slowly accumulating strain resulting in ground shaking, surface faulting, or ground failures. Most areas of the country are subject to earthquakes, including parts of Michigan, and they occur thousands of times each year. Most earthquakes are minor tremors and result in little or no loss of life, property, or essential services. Earthquakes are dangerous because they can cause severe and sudden loss and devastation without warning. Deaths and injuries are caused indirectly through the collapse of structures. Earthquakes are measured by their magnitude (amount of energy released at the epicenter) and intensity (measure of damage done at one location; essentially the same as "severity" as classified throughout this plan). The Richter Magnitude Scale is commonly used to determine earthquake magnitude, and the Modified Mercalli Intensity Scale is used for intensity. A 5.0 on the Richter Scale is a moderate event, while an 8.0 is a catastrophic event. The Mercalli Intensity Scale describes 12 increasing levels from imperceptible to catastrophic.

Earthquake risks in Michigan are generally low, which means structures or utilities are not necessarily built to withstand even small seismic events. Due to low risk, Michigan may be more vulnerable to an earthquake because of poor preparation.

Background

Earthquake tremors have been felt in Michigan Territory with the earliest recorded in 1811. Up to nine tremors from the New Madrid earthquake series were reportedly felt in Detroit. There have been a number of incidents since 1811 with the only questionable activity in the Upper Peninsula occurring in the Keweenaw Peninsula in 1905, 1906, and 1908. While there were explosions and ground shaking felt as far away as Marquette, it is believed to have been from pillars collapsing in local mines.

Risk Assessment

There is very low – nearly zero – probability of an earthquake occurring anywhere in Houghton County. However, because of the Keweenaw Fault, which runs up the spine of the peninsula and past minor incidents resulting from mining, the possibility of an earthquake cannot be completely

ruled out – and vulnerability is of some concern due to a low level of community preparedness. Severity could vary widely.

Probability: very low; uniform throughout

Severity: cannot be predicted

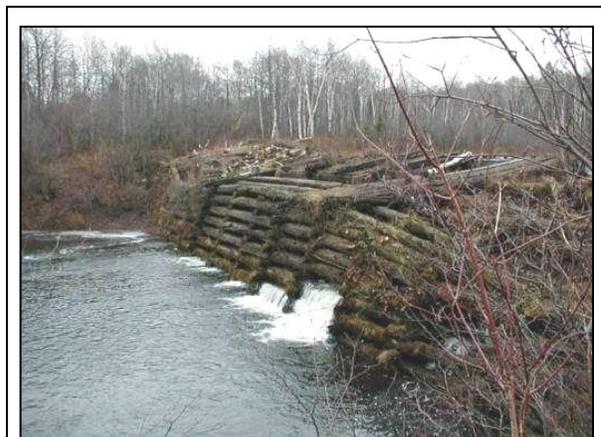
Dam Failure

Dam failure is a breach or collapse of an impoundment resulting in flooding downstream. Dam failure can result in extensive damage to property and natural resources miles downstream from the failure. Failure can occur during flood events which cause overflowing of the dam and also poor operation, lack of maintenance, and vandalism. Most failures are catastrophic because they are unexpected with little or no evacuation time. Michigan has had over 260 dam failures in its history.

Background

Houghton County has a number of dams within its boundaries that have been built over the years for various purposes from recreation to mining. The following documented dams are located in Houghton County: Boston Pond Dam, Calumet Dam, Gooseneck Creek Dam, Homestake Copper Dam, Huron Dam, Kissam Dam, Little Rice Lake Dam, Lower Dam, Nordine Dam, Otter Lake Dam, Otter Lake Diversion Dam, Pike Lake Dam, Redridge Dam, Sleepy Dam, and the Vitton Pond Dam. Many of the dams were built for use in mining operations that have long since ceased.

The Redridge Dam was labeled a "significant hazard" in 2001 because its failure could result in the failure of the downstream steel dam, placing the road and homes below the dam at risk. The upper portion (13 feet) of the timber crib was removed in fall 2004 in order to lower the reservoir to comply with a DEQ requirement. If additional efforts are required by the DEQ, outside financial assistance for Stanton Township will be needed.



The Redridge Dam before the upper timber crib portion was removed in response to DEQ orders

Risk Assessment

Probability of a dam failure is low but severity variable throughout Houghton County. Redridge Dam in Stanton Township, with its "significant hazard" designation, presents a slightly higher (though still low) probability of failure to that jurisdiction but could have a moderate-severity collateral impact. One home and one road – Freda Road – would be subject to damage downstream. Failure of the Prickett Dam on the Sturgeon River in Baraga County – a major power generation structure – has very low probability but could have moderate-severity impacts on downstream locations in Portage Charter and Chassell Townships. As required, evacuation plans are in place for those potentially affected, mitigating vulnerability somewhat. An unlikely failure of other dams in the County and a few dams outside of the County could affect river flows but would have little impact on life and property within the County – especially considering the limited development in most susceptible areas.

Probability: low, but highest in Chassell, Portage Charter, and Stanton Townships

Severity: moderate in Chassell, Portage Charter, and Stanton Townships; low elsewhere

Riverine and Urban Flooding

Riverine flooding is defined as periodic occurrence of overbank flows of streams and rivers resulting in inundation of the adjacent floodplain. Riverine floods are caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Such overbank flows are natural and may occur on a regular basis on river systems that drain large geographic areas and many river basins. Floods on large river systems may extend several days. Many areas of Michigan are subject to riverine flooding.

Flash floods are brief, heavy flows on small streams or normally dry creeks and differ from riverine floods in extent and duration. The cause of flash floods is normally locally intense thunderstorms with significant rainfall resulting in high velocity water often carrying large amounts of debris. These conditions can be exacerbated by secondary or cascading events such as beaver dam failure. Spring is the highest risk time of the year, when saturated or frozen ground with little infiltration capacity, along with quick rise in temperature, rapid snowmelt, and intense precipitation, can quickly overwhelm an area.

Urban flooding is the overflow of drainage systems, including storm sewers, and is usually caused by inadequate drainage following heavy rainfall or rapid snowmelt.

Background

A review of the storm incidents recorded by NOAA's National Climatic Data Center recorded the following Flood events in Houghton County between 7/31/2001 and 7/31/2011.

- 04/12/2002 – Spring runoff due to record temperatures resulted in flooding along Sturgeon River and other small creeks and streams. Local roads and structures were flooded. Estimated damage for the U.P. was \$18.5 million.
- 05/11/2003 – Flooding due to significant rainfall (2.6 inches in Hancock) resulted in the Sturgeon and Trap Rock Rivers flooding in Houghton County. Widespread flooding throughout the Western U.P resulted in \$2.0 million in damage.
- 4/18/2004 – Heavy rainfall caused some minor flooding of smaller streams and low-lying areas. The runoff from the precipitation and the melting of lingering snow over the higher terrain areas caused some flooding of the larger rivers over the west half of Upper Michigan that lingered for several days after the rain ended. Minor flooding was reported along the Sturgeon River from Alston to Chassell and along the Trap Rock River at Lake Linden.
- 07/16/2006 – Spotters measured nearly four inches of rain in Laurium with street and basement flooding reported. Almost three inches of rain was reported at the Houghton County Airport with a washout of M-203 in Calumet Charter Township. An upper air disturbance interacting with a very warm air mass and frontal boundary over southern Lake Superior helped set the stage for severe thunderstorms across portions of northern Upper Michigan during the late evening of the 15th into the morning hours of the 16th. The hardest hit area was over the northern half of Houghton County where numerous thunderstorms caused damaging winds, large hail and flash flooding from torrential downpours.
- 4/20/2008 – The Sturgeon River went above flood stage near Chassell on the 20th, and remained above flood stage into the afternoon of the 26th. Flooding was observed on

Sturgeon River and Aho and Rajala Roads during this time although no property damage was reported.

- 4/22/2008 – The Sturgeon River went above flood stage near Alston on the 22nd and remained above flood stage through April 25th. Portions of Usitalo, Halonen, and Tahtinen Roads flooded while the Alston gauge was above flood stage.
- Late April 2013 – Rapid melting of a heavy snowpack brought the Sturgeon River in Chassell Township (and in Baraga County) slightly above flood stage, and a flood warning was in place for several days. Governor Snyder issued a disaster declaration on May 7.

A number of areas in Houghton County are susceptible to riverine and urban flooding. Riverbanks and many areas with inadequate culverts and ditches become overburdened, thus experiencing certain degrees of flooding and washouts. Contributing to the problems in areas such as Houghton and Hancock are steep grades that increase the velocity of the runoff. To deal with these risks, storm sewer upgrades, ditch maintenance, and culvert replacement are ongoing activities.

Flood Insurance

In Houghton County, only Chassell and Osceola Townships participate in the FEMA National Flood Insurance Program (NFIP). Most other communities do not regularly experience severe flooding. Other communities in the County have not been affected by flooding to the extent that participation would be considered necessary, and participation is not a prerequisite for property owners to purchase flood insurance from private insurers. There are 20,000 communities nationwide that participate in the program. The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances (other compliance and implementation activities being encouraged as well). NFIP puts special focus on mediation of insured structures that have suffered more than one loss of at least \$1,000 within a rolling 10-year period since 1978; these are referred to as "repetitive loss properties." Houghton County has no such properties insured under NFIP.

During a flood hazard assessment, FEMA develops for NFIP a Flood Insurance Study and Flood Insurance Rate Map (FIRM). The FIRM is used by lenders to determine flood insurance requirements and by insurance agents to determine flood insurance premium rates for specific properties. The FIRM includes areas within the 100-year flood boundary, which are termed "Special Flood Hazard

Areas" (SFHAs). A 100-year flood does not refer to a flood that occurs every 100 years, but refers to a flood level with a one percent or greater chance of being equaled or exceeded in any given year. Chassell Township is the only jurisdiction in Houghton County with an identified SFHA. In Chassell, the Sturgeon River floods annually – some years worse than others. Osceola Township has no SFHAs. Nevertheless, Osceola is affected by flooding associated with drainage ditches in the community of Dollar Bay and is interested in improving capacity and flow to alleviate this problem.

Risk Assessment

Riverine and urban flooding of variable severity is a moderate risk within Houghton County. The greatest concern identified is in Portage Charter and Chassell Townships along the Sturgeon River where 19 homes are at risk and must be evacuated in times of emergency. Specific property values for the 19 homes along the Sturgeon River were unavailable, but using the average home value in Houghton County \$74,749 in 2009 suggests that roughly \$1.42 million in property remains at risk.

The Otter River in Portage Charter and Laird Townships and the Trap Rock River in Calumet Charter and Schoolcraft Townships are concerns for riverine flooding of moderate severity during times of high rain and rapid snowmelt. The Sturgeon and Trap Rock have gauges that monitor the rise of water levels. This decreases vulnerability by allowing emergency officials to monitor flood risk. Probability of low-severity flooding on all of these is moderate, but probability of a higher-severity event is low. Overall, most minimally developed areas in the County affected by seasonal flooding are accustomed to and prepared for it.

Urban areas are at a moderate-probability risk of low-severity flooding where drainage systems can be rapidly overwhelmed during melt-off and/or high rain. This can cause significant erosion, contamination, and flooding of buildings. Areas that have been affected in the past during spring melt off and heavy rain include Dollar Bay, Ripley, Lake Linden, Hubbell, Tamarack City, and Painesdale. Dollar Bay, located in Osceola Township, has a recognized problem of drainage ditches and culverts that are inadequate to accommodate normal spring flooding.

Probability: moderate riverine in Chassell, Franklin, Osceola, and Schoolcraft Townships; high urban in Cities of Hancock and Houghton; moderate urban in Osceola Township; low elsewhere

Severity: high riverine in Chassell Township; moderate riverine in Franklin, Osceola, and Schoolcraft Townships; low elsewhere

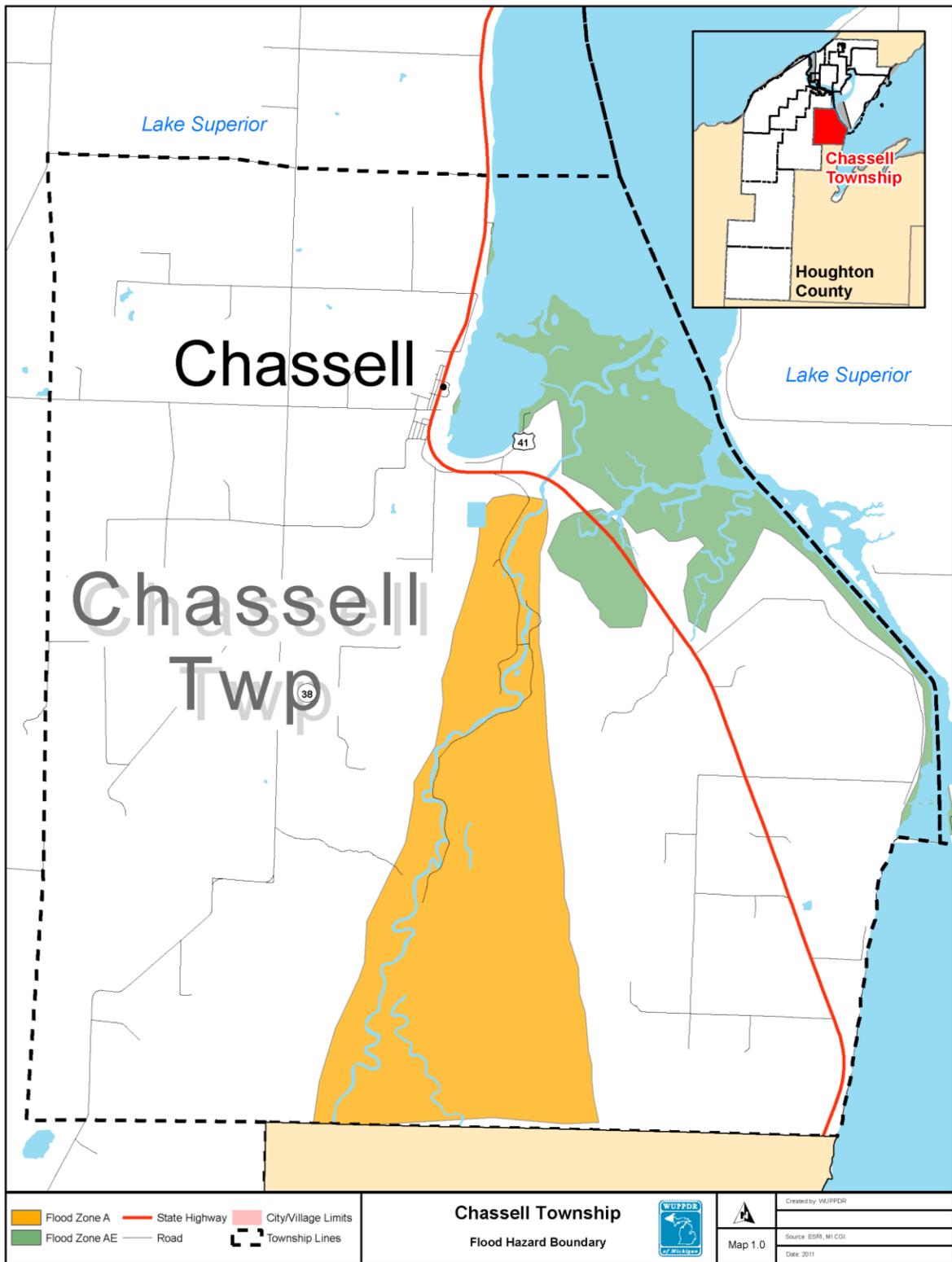


Figure 2-1: Chassell Flood Hazard Boundary Map

Communities within the County recognize the problems associated with their location and are taking steps to prevent loss by upgrading facilities to deal with the flooding risk and identifying evacuation areas.

Shoreline Flooding and Erosion

Flooding and erosion along the Lake Superior shoreline are typically a result of high water levels, storm surges, or high winds. These are natural processes that can occur at normal or even low water levels. However, during periods of high water, flooding and erosion are more frequent and serious, causing damage to homes, businesses, roads, water distribution and treatment facilities, and other structures in coastal communities. Storm surges that drive lake water inland over large areas occur when windstorms and differences in barometric pressure temporarily tilt the surface of a lake up at one end—in extreme cases by as much as eight feet.

Background

Lake Superior levels have fluctuated since prehistoric times. Accurate measurements of this fluctuation are available for the last 160 years. According to research conducted by the U.S. Geological Survey, the peaks of this fluctuation have been higher during this century than they were in the past. The modern range of fluctuation between periods of high and low water is 1.0 meter. Such episodes of higher and lower levels result from natural climate changes in the region and will continue. The impact of possible global warming on the magnitude and frequency of water-level changes remains uncertain.

In addition to climate change, changes in the surface of the earth affect lake levels. The land in the Great Lakes region is slowly recovering from the last glacial period when ice loaded and depressed the land surface. The land is rebounding from the weight of the former glaciers at different rates. The outlet channel to Lake Superior at Sault Ste. Marie is rising more rapidly than most other points along the U.S. shore, resulting in a tilting of the lake. The amount of inundation is greatest at Duluth, Minnesota where as much as 5.4 meters of inundation has occurred over the past 2,000 years. Maximum inundation over this period for the Michigan shore occurred near Ontonagon where as much as three meters is noted.

The current level of Lake Superior is 601.05 feet. This is nine inches below what is considered normal and only five inches above the lowest level recorded, which was measured in 1926.

Risk Assessment

Houghton County has a number of high-risk erosion areas identified by the DEQ (see **Figure 2-2**). These areas have mandatory and recommended setback regulations in place to mitigate losses due to erosion. Areas of ongoing concern include the following: property along Lakeshore Drive in Calumet Charter Township; McLain State Park and adjacent properties in Hancock Township; Grand Traverse Bay and Little Traverse Bay in Schoolcraft



Ongoing erosion problems at McLain State Park have created concerns as more of the waterfront is washed away by Lake Superior.

Township; and areas north and south of Rockhouse Point in Stanton Township. Probability of shoreline erosion in Houghton County is very high because it is an ongoing process. Severity is variable from moderate to high depending on the site impacted. Approximately two miles or four percent of the County's Lake Superior shoreline are officially designated high-risk areas, and miles of adjacent shoreline are also continually threatened by this hazard. Houghton County has no record of shoreline flooding, so probability is very low; potential severity is difficult to predict but is assumed to be low to moderate.

Probability: erosion very high in Calumet Charter, Hancock, Schoolcraft, Stanton, and Torch Lake Townships; moderate in Chassell, Franklin, Osceola, and Portage Charter Townships; low in Cities of Hancock and Houghton and Village of Lake Linden; none in others

Severity: erosion very high in Hancock Township; high in Calumet Charter, Schoolcraft, Stanton, and Torch Lake Townships; low to moderate in Chassell, Franklin, Osceola, and Portage Charter Townships; low in Cities of Hancock and Houghton and Village of Lake Linden; none in others

Scrap Tire Fires

A scrap tire fire is a large uncontrolled fire that burns scrap tires that are being stored for recycling or re-use. Michigan alone generates 7.5 to 9 million scrap tires annually. Tires end up at disposal sites, both legal and illegal, some of which store several hundred thousand tires. Scrap tire fires are

dangerous because they can require significant resources to control and extinguish, often beyond the capability of local government; the environmental consequences are significant; and the extreme heat from the fire converts a standard passenger vehicle tire into about two gallons of oily residue which can leach into soil or migrate to streams.

Background

There are no licensed scrap tire facilities in Houghton County. However, there are two registration non-compliant sites: Keweenaw Scrap Metal facilities in Calumet (Franklin Township) and Painesdale (Adams Township). The Painesdale site emerged as a prospective company collected scrap tires with the intention of recycling them into other products. When this operation failed to materialize, the tires remained onsite.

Risk Assessment

In addition to known scrap tire sites, a small risk from scrap tire fires may be presented by unknown unlicensed storage areas. Probability of an event is low throughout the county but slightly higher on known sites, most notably the Painesdale site. Severity over a broad area impacted by an event could be low to high. The risk presented by unknown sites makes the County more vulnerable to this than to most other low-probability disasters.

Probability: low throughout but highest in Adams and Franklin Townships

Severity: low to high throughout but highest in Adams and Franklin Townships

Structural Fires

A structural fire is any instance of uncontrolled burning resulting in structural damage to residential, commercial, industrial, institutional, or other properties in developed areas. In terms of average annual loss of life and property, structural fire is by far the biggest hazard facing most communities in Michigan and across the country. According to some sources, structural fires cause more loss of life and property than all types of natural disasters combined. It is estimated that 46.3 percent of accidental fires occur through neglect or carelessness with items such as candles, cigarettes, pipes, cigars, matches, lighters, and fireworks – especially when in the hands of children. Another major cause is improper use or maintenance of items such as clothes dryers, holiday decorations, and cooking equipment. Many structural fires can be prevented through awareness and education.

Background

According to FEMA – National Fire Data Center, residential fires account for 78 percent of all structural fires. In fact, the home, where most people feel safest, accounts for 80 percent of all fire fatalities nationwide. Statistics in Michigan mirror the national statistics where 40 percent of residential fires and 60% of fatalities are in homes without smoke detectors. In Houghton County, there were 94 structural fires in 2008, resulting in \$1,659,200 in property loss. Of the total fires, 19 percent were considered suspicious.

Michigan Tech and Finlandia University present additional challenges. Michigan Tech has three dormitories which house over 2,000 students, the Daniell Heights Apartments which house 570 persons including families, and Hillside Place Apartments that house 192 students. Finlandia has one dormitory that houses around 100 students. While past fire incidents at these schools have been minor, the potential for disaster remains, especially in light of the large population that would require evacuation in the event of a large-scale emergency.

Students live not only live on campus but in congregate housing facilities throughout Houghton, Hancock and other nearby communities. Many students live in large, older homes. An early 2000s fire resulting in the tragic death of one Michigan Tech student at the Phi Kappa Theta Fraternity House in Houghton underscored the importance of ensuring that these homes meet current fire codes and that evacuation procedures have been established for the upper levels of these homes. Partially as a result of that event, annual safety inspections are required for all rental dwellings within the City of Houghton.

Besides the schools, several other multi-unit housing complexes in the urban areas of the County are particular concerns. A notable recent example was found in the Harbor Manor senior housing complex in the City of Houghton, where a fire on August 17, 2012 required evacuation of the residents followed by long-term vacation of the facility, mainly due to water damage. The fire was believed to have started in a kitchen. Firefighting was exacerbated by lack of a sprinkler system. Luckily no injuries or deaths occurred, and the emergency response system worked as intended. The building has since been reconstructed and incorporates greater fire security including sprinklers.

Rural areas face similarly high risk of structure fires but for different reasons. In Elm River Township, for example, limited fire response resources are close at hand, but police and ambulance response times typically exceed 30 minutes. This distance of these support services and more extensive

firefighting capability (including modernized equipment with appropriate storage) exacerbates the severe nature of rural structure fires.

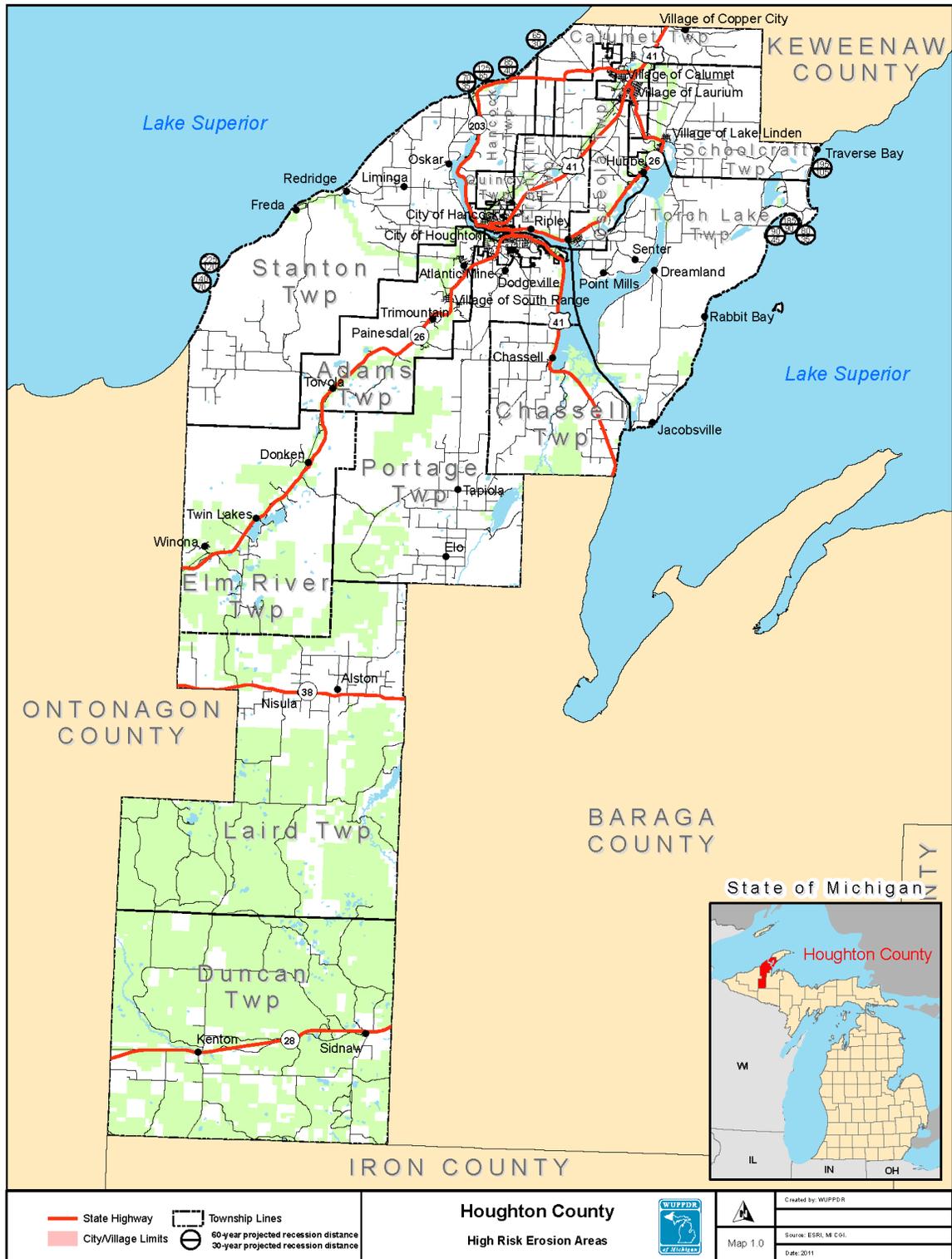


Figure 2-2: High-Risk Erosion Areas Map

Structural fires are of special concern in Houghton County because many of the buildings were built in the early 1900s or before. Many of these older homes, as well as numerous camps and cabins in the woods, are also heated by wood-burning stoves, placing them at additional risk. Homes also fall vacant and become dilapidated over time, decreasing maintenance and monitoring and increasing fire risk, which becomes an even greater problem with absentee property ownership.

Risk Assessment

Due to an older housing stock, compact development in downtown areas, and remote development, Houghton County is susceptible to fire. Probability is very high with potentially extreme severity throughout the County. Severity is highest in the cities and villages with large housing complexes. The County has multiple fire departments with mutual aid agreements in place to respond to structural fires. Education and operational fire detectors can often mitigate the loss from this type of hazard. Frequency of fires is 94 per year based on 2008 occurrences. Property loss in 2008 was over \$1.6 million.

Probability: Very high throughout

Severity: Low to extreme

Wildfires

A wildfire is an uncontrolled fire in grass, brush lands, or forested areas. The most immediate dangers from wildfires are the potential injury or death of persons who live or recreate in the affected area and the destruction of homes, timber, and wildlife. Long-term effects include scorched and barren land, soil erosion, landslides, water sedimentation, and loss of recreational opportunities.

Background

Forests cover approximately 80 percent of Houghton County (see **Figure 2-3**). This forest cover is an asset for both industry and recreation. However, it also leaves the county highly vulnerable to wildfires. Increased development in and around rural areas has changed the nature of the threat from wildfires. Not only can acres of valuable timber and wildlife habitat be lost, but also life and property.

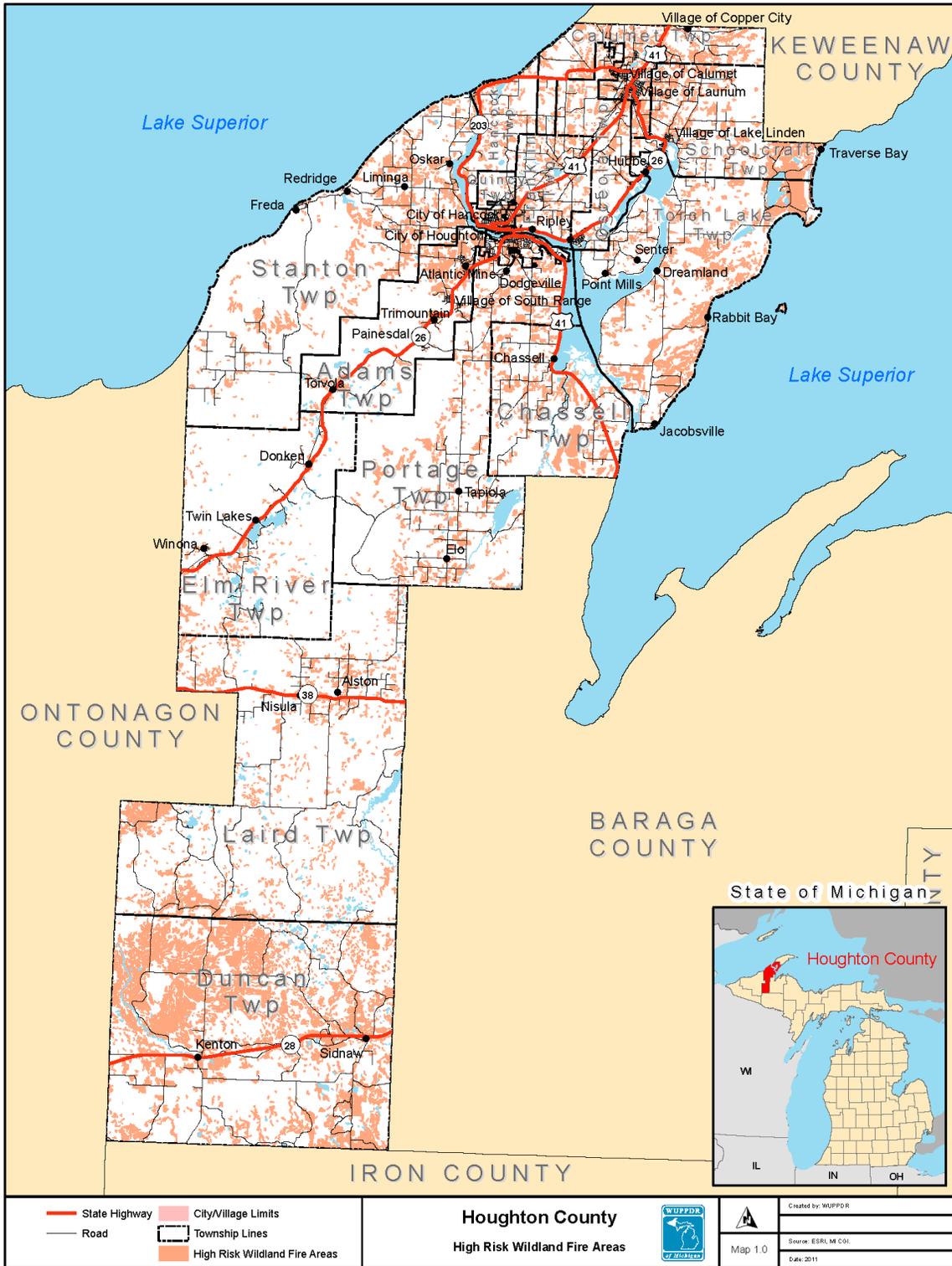


Figure 2-3: High Risk Wildland Fire Areas Map

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

1. Debris burning (32%)

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

The most significant recent event in Houghton County was on June 6, 2000 when a brush fire set on a blueberry farm near Rice Lake in Torch Lake Township got out of control and burned over 350 acres before being contained the following day. Firefighters from the MDNR and 15 local fire departments, plus two aerial water tankers, were called in to fight the blaze. Brisk winds pushed the fire to within one-quarter mile of homes along the shoreline of Lake Superior, forcing the evacuation of over 20 homes and cottages. Fortunately, in this incident no structures were lost and no injuries were reported. From 1981 to 2010, there were 181 fires (1,200 acres burned) in Houghton County under DNR jurisdiction.

Risk Assessment

Houghton County has an ongoing risk of wildfires due to the tremendous amount of forest cover but also increasing urban infringement upon rural areas. Development pressure in rural areas increases both the likelihood and the potential damage from wildfires. Probability is high on average but greater in undeveloped rural areas and lesser in highly urban areas. Potential severity is extreme, particularly in large expanses of forestland with few obstacles to stop the spread of a fire.

Ensuring that new development provides adequate emergency access and protective buffers may be one way to mitigate some of the risk. Referring to the Houghton County High Risk Wildland Fire Areas map it is apparent that Duncan, Stanton, Torch Lake, and Chassell Townships are at a slightly higher risk due to increased wildland-urban interface and high-risk ground cover. Houghton County could benefit from Firewise planning and education that the DNR is using to educate on a statewide basis. Frequency of forest fires in Houghton County is six per year, with an average of about 40 acres burned each year.

Probability: high except low to moderate in Cities of Hancock and Houghton and very high in Adams, Duncan, Elm River, Laird, and Stanton Townships

Severity: moderate to extreme

Subsidence (Ground Collapse)

Subsidence is defined as depressions, cracks, and sinkholes in the ground surface, which can threaten people and property. While the sudden collapse of the ground surface to form sinkholes poses an immediate threat to life and property, subsidence depressions normally occur over a period varying from many days to a few years. The ground movements continue until the walls stabilize. They may damage structures with low strain tolerances, such as dams and utility infrastructure. The population most at risk lives in areas where industrial or residential development has occurred above active or abandoned mines where underground cavities are present near the surface.

There are over 800 underground mines in Michigan with more than 2,300 shafts, or other openings to the surface. Many opened up in the 1840s, and even though many mine sites have been inspected by the county mine inspector, some are still unknown and/or unmarked. There are very limited records of the locations of shafts, and the extent of the mine voids and proximity to the surface may be unknown. Stopes, which are large caverns that are only slightly below ground level in some areas, are a particular concern. In urban areas such as the Cities of Hancock and Houghton, many mine shafts and tunnels are mapped, but stopes generally are not.

Surface subsidence is a potential danger near many of these abandoned underground mines. Strain from geological movements and additional loading on the surface can cause the ground above and around the old mines to sink or collapse. Vibrations from heavy equipment, truck traffic, and industrial machinery can destabilize areas underground. The roof of a hollow area may slowly erode, particularly when flowing water is present, causing the depth of the layer over the cavern to decrease. The roofs of the old mine tunnels were often supported by timbers or pillars, which may have deteriorated significantly over the course of 100 years, putting them at risk for structural failure. Lateral flow of subsurface materials, which can occur on the thick glacial clay deposits in the Great Lakes region, results in gradual lowering of the ground surface as load bearing walls slowly move away from one another.

Background

In the heyday of copper mining, Houghton County contained some of the largest and deepest mines in the world. The Quincy Mine was 9,600 feet deep with 93 levels, over 20 shafts and adits, and an underground mined area covering two square miles. The Red Jacket shaft near Calumet was more than 8,000 feet deep. Both Calumet and Laurium rest on top of an intricate system of shafts, tunnels, and drifts spanning hundreds of miles internally. A Michigan Abandoned Underground Mine Inventory was completed in late 1998. The inventory includes information on about 800 mine locations with nearly 2,000 openings to the surface. Copies of the reports were limited to the DNR and the County Mine Inspectors, or related agencies, for the counties containing the old mines. Distribution was limited to prevent the materials from becoming guides to potentially dangerous locations for adventurous people who may enter unsafe areas and be hurt or killed.

Subsidence can also occur over old foundations or lauders, rock pipes installed by mine companies to be used as storm drains. In late April of 2001, a small sinkhole about three feet deep developed near the corner of Red Jacket Road and U.S. 41 in Calumet. It formed presumably when the foundation of a church that once occupied the site collapsed. The Houghton County Mining Inspector reports that numerous ground failures occur each year, often due to inadequate capping techniques.

Risk Assessment

Subsidence will continue to pose some risk into the future because of both known and unknown potential hazards. Areas adjacent to the historic copper mines are susceptible to future subsidence, and awareness is important to mitigate hazard impact. A 1999 study identified over 130 shafts that were in need of immediate mitigation throughout the Western Upper Peninsula. Mines on State of Michigan land were addressed through a FEMA grant, but most shafts are on private lands and continue to pose a risk.

Probability of a significant subsidence event is low based on known past incidents but is highest in historic mining areas generally clustered around the population centers. The general area most likely to experience subsidence is a swath along the Highway U.S. 41 corridor from Quincy Mine in Quincy Township to Kearsarge location, where historic mining operations were most prevalent. Thus most of the townships in Houghton County north of the Portage Lake Lift Bridge are subject to this threat, as are the "Range Towns" clustered along M-26 in Adams Township to the south. The

possibility of unknown occurrences may mean probability is higher than expected. Severity ranges from moderate to extreme depending on the site affected.

Probability: low, but highest in Adams, Calumet Charter, Franklin, Osceola, Portage, Quincy, and Schoolcraft Townships; City of Hancock; and Villages of Calumet, Copper City, Laurium, and South Range

Severity: moderate to extreme

2.2 Weather Hazards

Because of its unique location, Houghton County sees low temperatures, harsh winds, and large quantities of winter snow. The average high temperature in winter is about 25°F, while the average low is about 15°F. Cold winds passing over the warmer waters of Lake Superior produce large quantities of lake-effect snow. Over the last 50 years the average annual snowfall in Houghton County has been 208 inches, much higher than is seen at locations further inland. For the most part, residents and businesses are accustomed to the climate.



Efficient removal equipment is necessary to keep Houghton County roads promptly and routinely cleared during regular snowfall events.

The Houghton County Road Commission has a fleet of snowplows charged with plowing and sanding some 850 miles of county roads. The Michigan Department of Transportation maintains about 90 miles of state trunkline. Despite the overall preparedness for harsh weather, occasionally ice storms, high winds, or rapid accumulation of snow result in utility outages and the closure of roads, businesses, and schools.

A review of the storm incidents recorded by NOAA's National Climatic Data Center shows that 224 events were reported in Houghton County between 7/31/01 and 7/31/11. During this 10-year period there were only a handful of events that caused recordable damage in Houghton County.

Examples of incidents include extreme cold, winter storms, flood, lightning, hail, thunderstorms, high winds, and flash floods.

Weather hazards in Houghton County vary greatly depending on season. Because Houghton County is prepared to handle severe winter weather, damage from this type of event is controlled by snow management. Collapsing roofs are a variable problem dependent on the age of buildings and building codes.

Thunderstorms, hail, high winds, extreme temperatures, and flooding hazards are variable and depend on many factors. Due to the variability of these types of storm events, response plans are the best mitigation for these incidents. Flooding over the last few years has been an expected spring condition, and the capacity of storm systems to handle these conditions has been improving. Houghton County is covered by reliable NOAA weather radio (see **Figure 2-4**). Profiles of each specific weather hazard are provided below.

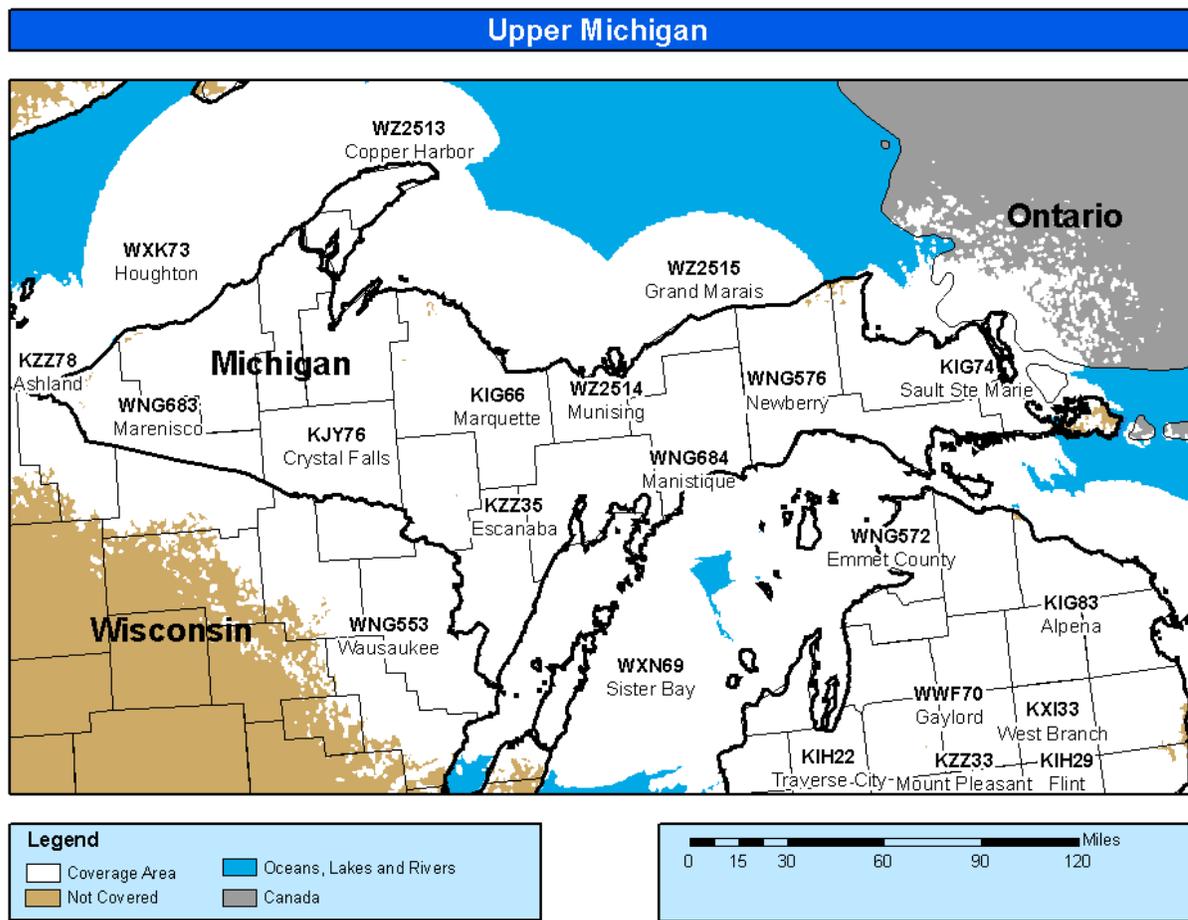


Figure 2-4: Upper Michigan NOAA Radio Coverage Map

Drought

A drought is an extended periods of decline in precipitation from levels normally experienced in an area. A drought is uniquely difficult to define among natural disasters in that it usually cannot be recognized until it is already underway and in that it has no clear starting and ending points. A drought may occur in four types based on its primary defining characteristic: meteorological (variation from normal precipitation climate), hydrological (regarding surface and groundwater levels), agricultural (regarding conditions for crop growth), and socioeconomic (resulting from human demand for water exceeding supply).

One of the greatest impacts of a drought is its effect on agricultural areas during key planting and growing seasons. Drought can also affect urban areas that are dependent on reservoirs for water, as decreased water levels due to low precipitation can result in use restrictions. Timing and length of droughts are difficult to predict. Increased pumping of groundwater and surface irrigation during drought periods can result in land subsidence problems in some areas of the country. Almost all areas of the country are impacted by drought. Some impacts include reduced agricultural outputs, reduced water supply, land subsidence, power outages caused by excessive energy use, increased wildfire risk, and reduced capacity for marine transportation. The arid southwest and Great Plains are the most vulnerable to drought.

Risk Assessment

Houghton County has not suffered any notable localized droughts but has been affected by regional droughts, which, based on a variety of media reports and weather recording organizations, the United States Midwest has experienced in at least four seasons since 1981. Meteorological conditions are the best indicator of drought in Houghton County, as its secondary vulnerabilities are few. Houghton County is not at risk of a drinking water shortage, as groundwater supplies local systems; agricultural operations are of small scale and are not a significant part of the economy; and supply limitations would be unlikely due to the abundance of sources in relation to the County's population.

Regardless of the obvious conditions commonly associated with droughts, climatic conditions always fluctuate over the long term between dry and less dry periods. In recent years the Upper Great Lakes Region has been experiencing a dry period as indicated most clearly by decreased water levels

and susceptibility to wildfires. The latter is the consequence that most clearly affects Houghton County. Even minor periods of dryness can significantly increase wildfire risk, which is a concern throughout the County because of a high percentage of forest cover. Seasonal dry conditions have been known to increase the frequency and severity of wildfires throughout the Upper Peninsula and will continue to do so during this dry climatic period. In consideration of these factors and impacts, Houghton County has a high probability of experiencing some degree of drought conditions in any given year, but severity is predicted as low to moderate. Any drought conditions occur uniformly throughout the County.

Probability: high

Severity: low to moderate

Extreme Temperatures

Extreme temperatures refer to prolonged periods of very low or very high temperatures, often exacerbated by conditions such as high humidity and lack of rain or by heavy snowfall and high winds. Extreme temperatures primarily affect the most vulnerable segments of the population including the elderly, children, impoverished and those in poor health. Threats from extreme heat include heat stroke, which is a medical emergency, and heat exhaustion. Extreme heat is more of a problem in urban areas where the high temperature and humidity can be more intense. Threats of extreme cold are hypothermia, which is a medical emergency, and frostbite. Another risk during winter months is freezing pipes due to limited snow cover insulation. Ten incidents of extreme cold were recorded between 2001 and 2011. There was one documented instance of extreme heat in July of 2006. Houghton County incurred no recorded damages during this ten year period.

Risk Assessment

All areas of Michigan, including Houghton County, are similarly subject to extreme high and/or low temperatures. The frequency of extreme temperatures is one per year, translating into moderate probability of an event in any given year. Severity is low countywide, as resident behaviors are effective in limiting damage to life and property. The County is somewhat more vulnerable to extreme heat than extreme cold, as residents are less accustomed to the former.

Probability: moderate throughout

Severity: low

Hail

Hail is a condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth. Hail is a product of strong thunderstorms and usually falls near the center of the storm along with the heaviest rain. At times strong winds at high altitudes in the thunderstorm blow the hail away from the storm center causing hazards in unexpected places. Hailstones can be the size of a pea to a golf ball but are sometimes larger than baseballs. Hailstones can damage crops, dent automobiles, and injure wildlife and people. Hail causes one billion dollars in damage nationwide annually.

Risk Assessment

Hail events have been recorded in Houghton County 19 times since 2001; therefore the frequency of hail in the County has been two events per year, indicating high probability. The only recorded damage was to a vehicle in the amount of \$10,000, and severity is low overall, producing damages minor and incurred by individual property owners. Severity and probability are both uniform throughout the County, though property impacts are more concentrated in population centers.

Probability: high throughout

Severity: low

Ice and Sleet Storms

Severe winter weather hazards can include sleet storms and ice storms. Sleet storms occur when frozen raindrops or ice pellets fall from the sky. Though sleet does not stick to tires, sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes upon contact with a cold surface, coating the ground, trees, buildings, and overhead wires with ice, at times causing extensive damage.

Risk Assessment

One ice storm was recorded in the last 10 years, on December 12, 2004, making for low probability of such an event in any given year. There was no damage recorded for the incident, and future incidents are expected to be of similar low to moderate severity. Vulnerability is high, however, due to lack of preparedness for an ice and sleet storm and its potential to impact critical utilities. Likelihood and severity of ice storms are uniform throughout the County.

Probability: low throughout

Severity: low to moderate

Lightning

The discharge of electricity from a thunderstorm is lightning. Lightning is often perceived as a minor hazard, but it damages many structures and kills and injures more people in the United States each year (on average) than tornadoes or hurricanes. Michigan ranks second in the nation in both lightning-related deaths and injuries. Many deaths and injuries could be avoided if people were educated about the threat of lightning.

Risk Assessment

There was one lightning incident in Houghton County, on May 11, 2011, in the most recent ten year period. The lightning caused \$20,000 in damage to the steeple tower of the Keweenaw Heritage Center at St. Anne's Church in Calumet. Probability of a future event causing recordable damage is low, but severity could range from low to extreme on-site and, in the event of a resulting wildfire, over a large area. Wildfires are more likely and severe in rural areas, whereas probability and severity of lightning itself is uniform countywide – except for lower severity in developed areas which have variable terrain and lightning rods to absorb strikes to high points of structures. Vulnerability to lightning is relatively high due to unpredictability and lack of preparedness mechanisms.

Probability: low throughout

Severity: low to extreme

Severe Winds

Winds 58 miles per hour or greater are classified as a windstorm by the National Weather Service and are a fairly common occurrence in many areas of Michigan. Along the Great Lakes shoreline, high winds occur regularly, and gusts of over 74 miles per hour (hurricane velocity) occasionally occur with a storm system. Severe winds cause damage to homes and businesses, power lines, trees, and agricultural crops. Power outages can result in a need to shelter persons left without power for extended times. Along with the Great Lakes shorelines, windstorms in Michigan occur most often in the central and southern parts of the Lower Peninsula.

Historically in Houghton County, windstorms are rarely a singular event but usually accompany other severe weather – particularly thunderstorms and the occasional blizzard. The largest wind gust recorded in Houghton County from 1950 to 2004 was 80 knots or 92 miles per hour. This event near Houghton on August 1, 2002 peeled the roof off a warehouse, overturned one truck, and downed numerous trees and power lines. No damage estimate was provided for this incident.

Risk Assessment

In 2001 to 2011, 13 high wind events were recorded in Houghton County. One of these was on July 11, 2011, when a Keweenaw National Historic Park facility had a roof torn off due to high wind during a thunderstorm. The frequency of high wind events is 1.3 per year; probability of a future event in any given year is moderate. Available damage estimates show \$158,000 in damage during the recording period; future damage severity potential is highly variable and site-specific but difficult to predict. Probability and severity are both highest along the Lake Superior shoreline on the northwest side of the County and in upland areas, especially those surrounding the Portage Waterway.

Probability: moderate except high in Calumet Charter, Hancock, and Stanton Townships

Severity: moderate except moderate to high in Calumet Charter, Hancock, and Stanton Townships

Snow Storms

Snowstorms are defined as periods of rapid accumulation of snow, which is often accompanied by high winds, cold temperatures, and low visibility. Blizzards are the most dramatic and perilous of all

snowstorms, as the snow is accompanied by low temperatures and strong winds. Blizzard snow is in the form of fine, powdery particles windblown in such great quantities that, at times, visibility is reduced to only a few feet. There was no recordable damage during the period from 2001-2011.

Risk Assessment

Residents of Houghton County are accustomed to major snow events, which occur regularly every winter. The County has experienced 77 recordable snow events from July 2001 to July 2011; therefore, with a frequency slightly higher than seven per year, probability is high based on the planning thresholds. However, as a practical matter, probability of a high-magnitude event in any given year is near 100 percent. Severity and impact, pertaining mainly to property damage and closure of events and facilities, are low to moderate. The heaviest snowfalls – "system snows" originating from a regional weather pattern rather than the effect of Lake Superior – occur most frequently and with greatest amounts in the uplands southwest of the City of Houghton, primarily in Adams and Elm River Townships along Highway M-26. The cost of a typical snowstorm is also difficult to estimate because a series of small events can have the financial impact of one large event.

Probability: high throughout

Severity: low to moderate; highest in Adams and Elm River Townships

Tornadoes

A tornado is a violently rotating column of air extending to the ground from a cumulonimbus cloud. The funnel associated with a tornado may have winds up to 300 miles per hour and interior air pressure that is 10 to 20 percent below that of the surrounding atmosphere. Wind speed is estimated based on the level of destruction caused, on a scale ranging from EF0 (weakest) to EF5 (most severe). The typical length of a tornado path is 16 miles, but tracks up to 200 miles have been reported. Widths of a path are typically less than a quarter mile but can be over a mile. Historically, tornadoes have resulted in a greater loss of life than any other natural hazard, with a national average death toll of 111 persons. Tornadoes cause property damage of hundreds of millions of dollars every year. The average annual number of tornadoes in Michigan is 18, with most occurring in the southern Lower Peninsula.

Risk Assessment

There has only been one tornado recorded in 50 years in Houghton County. The tornado was in July 1987 and was rated an EF0. A future tornado is a realistic possibility, especially since numerous Upper Peninsula counties have experienced several tornadoes in the past 50 years. Probability of a tornado is low, but potential severity is highly variable. The damage estimate for the 1987 tornado was only \$2,500, but this is not representative of potential future events. Despite the unlikelihood of a tornado, vulnerability is high due to lack of predictability and preparedness. Probability of a tornado is similar countywide. Severity is also uniform countywide, but total impact may be greatest in population centers.

Probability: low throughout

Severity: low to extreme

2.3 Technological Hazards

Hazardous Materials: Fixed Site Incident

A fixed site incident is an uncontrolled release of hazardous materials from a stationary location, 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 or substances pose a threat to life, health, property, and environment if released because of their chemical, physical, or biological nature. Hazardous materials are carefully regulated by the government in order to reduce risk, but accidental releases can occur during the manufacture, transport, storage, use, and disposal of the materials. Areas at highest risk are within a one- to five-mile radius of identified hazardous material sites. Many communities have detailed response plans in place to mitigate the harm to people, property, and the environment from hazardous materials.

Background

There are only a few facilities within Houghton County with supplies of Extremely Hazardous Substances that require reporting under the Superfund Amendments and Reauthorization Act (SARA) Title III. Title III identifies what steps facilities, the State, and local communities must take in

order to protect the public from hazardous materials accidents. Two facilities within Houghton County are required to report under Title III: Great Lakes Plastics and Peninsula Copper Industries. Furthermore, Osmose, a lumber treatment operation in Torch Lake Township, uses Ammonium Nitrate, a toxic gas that would present a health threat upon release. In late 2013 the company plans to implement a text messaging system to alert nearby residents of such an incident.

A Superfund site contaminated by stamp sands, a copper mining waste product, is located in Torch Lake Township. A former power plant site in the Township, south of the Village of Lake Linden, is also being remediated by the Environmental Protection Agency (EPA) due to presence of a variety of chemicals. These sites suffer from long-term contamination but do not present acute current threats. EPA is also investigating underground storage tanks whose files were never closed in the Village of Lake Linden. These tanks can leak over time, with released products presenting health threats. The Pedersen/Lahti landfill in Portage Charter Township is yet another historic contamination site in need of remediation.

On July 2, 2012, near a private residence on the Portage Canal in Chassell Township, two flasks of mercury totaling up to one-half liter were found in the water about 30 feet away from shore. One flask was missing a seal, resulting in mercury being spilled on the lakebed. Subsequently the Department of Environmental Quality, Environmental Protection Agency, and Western Upper Peninsula Health Department undertook inspection, testing, and remediation of the site. A beach in the Village of Lake Linden was also closed within the past few years due to United States Environmental Protection Agency discovery of mercury and lead in test bore drillings done in relation to the adjacent Superfund site. The substances were likely to have been dumped in an isolated incident some time before. The site was subsequently cleaned up to eliminate significant public health threat or environmental impact. However, the incident indicates the potential for hazardous materials incidents in situations not normally associated with fixed sites.

Risk Assessment

Chemicals that are being reported and smaller amounts used in Houghton County are isolated and present in relatively small quantities. When appropriate, measures can be taken to provide early warnings of incidents before they produce significant impacts. Currently there is no record of a fixed-site hazardous materials incident in the County. Contaminated and vulnerable sites present little current threat but one that remains a concern. Based on known types and quantities of stored

materials, likely severity of a future fixed-site incident would be low to moderate and probability uniformly low.

Probability: low throughout

Severity: low to moderate

Hazardous Materials: Transportation Incident

A transportation incident is the uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property, or environment. Highway, railroad, seaway, airway, and pipeline systems are carrying thousands of hazardous material shipments on a daily basis through local communities. A transportation incident with hazardous materials could cause a local emergency. Areas at risk are those within one to five miles from major transportation routes for hazardous materials. The U.S. Department of Transportation regulates the transport and shipping of over 18,000 different materials. All areas of Michigan are vulnerable to a hazardous materials transportation incident, while more urbanized and industrialized areas are at greater risk due to high population concentration and large number of transportation routes in these areas.

Background

Highway M-28 through Houghton County is a major transportation route for trucks traveling to and from Canada. The types and amounts of hazardous materials transported on trucks traveling this route are often unknown. While there are State and Federal restrictions on the transport of hazardous materials, this information is not required to be passed on to the local units of government potentially affected by a transportation accident. However, the County Emergency Manager receives notices for passage of anhydrous ammonia trucks passing through the county.

Houghton County has many miles of shoreline susceptible to shipping accidents on Lake Superior and along the Portage Canal. In October 2003, a Great Lakes freighter spilled fuel oil during an internal fuel transfer about 25 miles west of Eagle Harbor. About 1,300 gallons were lost with about 800 gallons of dime-sized tar balls washing up on shore about four miles south of the Portage Lake Canal north entry.

Risk Assessment

A hazardous materials transportation incident has occurred in Houghton County, and a future event has low probability but is certainly possible. The County is at moderate risk based on a high level of Canadian and American trucking traffic, especially along Highway M-28 through Duncan Township, and due to the County's proximity to shipping channels. Besides the M-28 corridor, areas in the County that are most susceptible are along other major roadways, including Highways U.S. 41, M-26, and M-38, and the immediate shorelines of Lake Superior and the Portage Canal. Damage estimates for the sole previous event were unavailable, but potential severity of an event could range from low to extreme.

Probability: low throughout

Severity: low to extreme

Infrastructure Failure and Secondary Technological Hazards

An infrastructure failure is a failure of critical public or private transportation or utility infrastructure resulting in temporary loss of essential functions and/or services. Public and private utilities provide essential services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of the utility systems fails due to a disaster or other cause (even for a short time) it can have devastating consequences. During power outages, people can die in their homes from extreme heat or cold. When water or wastewater treatment facilities are inoperable, serious health problems can arise and action must be taken immediately to prevent outbreaks of disease. If the infrastructure failure results from a natural hazard event, it is termed a secondary technological hazard.

Background

Though many of the hazards considered in this plan could result in secondary infrastructure failures, these failures are dangerous in and of themselves due to the harsh climate and remoteness of the county. The County is served by a number of systems, including power, water treatment, and phone, and loss of any or all of the systems can have a detrimental impact on the functioning of the County. A failure of infrastructure or utilities can include anything from loss of power to malfunctioning of the Portage Lake Lift Bridge, which would itself have substantial secondary impacts. The bridge became stuck in a raised position two days in a row in August 2010. Houghton County has been

affected by loss of power on many occasions. Michigan Tech has also been affected due to facility failure on campus. While power outages are usually of a short duration—up to a few hours—the implications of an extended outage could affect the health and safety of the community.

Risk Assessment

Houghton County electric service is supplied by Upper Peninsula Power Company in the north and We Energies in the south, and loss of power to the grid for the area can affect the entire region. Due to the rural nature of the County, trees can fall on power lines in remote locations causing a delay in restoration of service. Trimming trees adjacent to power lines is one way to decrease this risk. Water systems, wastewater systems, and phone service can also be affected by failure or secondary failure due to aging facilities or other causes. Creating redundant systems and outfitting systems with generators lessens the impact of such a failure. Frequency of power outages – the best single indicator of risk – is estimated at two per year based on previous incidents. Probability of loss of power is thus high, especially in rural areas with more dispersed networks of lines. Severity is generally low throughout the County. However, impact is highest in urbanized areas such as Calumet Charter Township, Cities of Hancock and Houghton, and Village of Laurium (location of Aspirus Keweenaw), where residents and institutions are most reliant on electricity. Residents in rural areas may be more self-sufficient.

Failure of the Portage Lift Bridge is the single biggest infrastructure threat to the County. An incident preventing passage over the bridge would separate people on the north side from the mainland and would leave those on the south side without access to medical services. Because of the large number of residents commuting to the opposite side of the bridge and a number of institutions conducting critical business on both sides, the impact of an incident would significantly affect daily life. A bridge "outage" could take considerable time to fully resolve depending on the nature of the incident. The impact of an outage would be considerable within all municipalities and townships north of Laird, with impact increasing closer to the bridge. Probability of such an event is low but severity extreme, necessitating deliberate contingency planning, which has been in progress through an established group of emergency officials that continues to meet regularly.

Probability: high, especially in rural areas of all townships (based on power outages)

Severity: extreme based on Portage Lift Bridge failure; otherwise low based on power outages

Transportation Accidents (Passenger)

A transportation accident is a crash or accident involving an air, land, or water-based commercial passenger carrier resulting in death or serious injury. The most vulnerable areas are communities near an airport with commercial passenger service, communities with railroad tracks and commercial rail passenger service, communities in which commercial marine passenger ferry service is provided, and communities with commercial intercity, local transit or school bus service.

Background

Michigan has approximately 19 airports with commercial passenger service, 130 certified intercity bus carriers serving 220 communities, 72 local bus transit systems serving 85 million passengers, 19 marine passenger ferry services, and three intercity rail passenger routes operating on 568 miles of track along three corridors serving 22 communities. A serious accident involving any of these modes of transportation could result in mass casualties, requiring immediate life-saving response, and a marine accident would require water rescue, possibly on dangerous Great Lakes conditions. As yet there is no history of a large passenger transportation accident in Houghton County.

Risk Assessment

The risk of a large-scale passenger transportation accident is limited by the types of services operating in Houghton County. There is a risk of accidents involving those limited services, but mitigating potential accidents is difficult due to unpredictability. Some methods that are feasible are general emergency response planning and promotion of awareness of hazard intersections, roadways, and driving conditions. The low volume of commercial passenger traffic indicates any potential incident is likely to be isolated and of a small-scale; therefore, probability is low and severity low to moderate. Both factors are mostly uniform throughout the County, but, with regard to over-the-road traffic, probability is higher along the same major roadways presenting an increased hazardous materials threat.

Probability: low, especially in Stanton Township

Severity: low to moderate

Petroleum and Natural Gas Incidents

These incidents result in the uncontrolled release of petroleum, natural gas, or hydrogen sulfide, a poisonous by-product. 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, or loss of life. In addition, if hydrogen sulfide is released, it is an extremely poisonous gas that is explosive when mixed with air at temperatures of 500 degrees Fahrenheit or above. Inhalation of minute amounts of this gas can be fatal. These dangers can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities, as well as in pipelines.

Oil and gas are produced from fields in over 60 counties in the Lower Peninsula with over 40,000 wells in these counties. Of that total, approximately 20,000 have produced oil or gas, and over 1.1 billion barrels of oil and 3.6 trillion cubic feet of gas have been withdrawn from these wells.

Background

Northern Natural Gas has a large natural gas pipeline that delivers natural gas to markets in Houghton County and surrounding areas. The pipeline runs in two locations in Houghton County: west to east across Duncan Township and north from Baraga County to Calumet. There are a number of propane storage facilities in Houghton County including Peninsular Gas in Calumet, Lagasco in Chassell, and Ferrellgas in Houghton.

Risk Assessment

There is risk of a natural gas pipeline incident in Houghton County due to aging transmission lines or sabotage. Natural gas transmission lines present the greatest risk due to their remoteness, which may allow a leak to go undetected for an extended period. Though it is not uncommon for minor pipeline leaks to occur, the probability of a significant incident is low, and the same is true for petroleum events. A single-tank petroleum explosion could happen on any site where one is located, but probability of either type of fuel event is otherwise very low in rural areas away from natural gas lines. Severity in most areas would be low to moderate. Consequences of a natural gas pipeline leak are mostly ecological or environmental, as pipelines are located underground and generally in sparsely developed areas, but evacuations are necessary for residents in the immediate surroundings due to the possibility of inhalation or an explosion.

Probability of a propane incident is low throughout but possible where storage facilities exist in Calumet Charter and Chassell Townships and in the City of Houghton; severity would generally be expected to be low to moderate.

Probability: high in Adams, Calumet Charter, Chassell, Franklin, Osceola, Portage, and Quincy Townships; Cities of Hancock and Houghton; and Villages of Calumet and Laurium; low elsewhere (both petroleum and natural gas)

Severity: low to moderate (both petroleum and natural gas)

2.4 Human-Related Hazards

Civil Disturbances

A civil disturbance is a public demonstration or gathering, or an uprising in a prison or other institution, resulting in some disruption of essential community functions, or in rioting, looting, arson, or other unlawful behavior. Large-scale disturbances, although rare, are typically the result of the labor disputes, controversial or high-profile judicial proceedings, governmental actions or implementation of controversial laws, resource shortages due to a catastrophic event, disagreements by special interest groups, or a perceived unjust injury or death of a person held in high regard by a segment of society. Places that may be subject to or impacted by this type of disturbance are government buildings, military bases, universities, businesses, nuclear power plants, and critical service facilities such as police and fire stations. Prison uprisings occur when inmates are upset over rules, operating procedures, and/or living conditions, or during altercations between rival groups or gangs within the facility.

Background

The Houghton-Hancock area is the regional center for government and education in at least a three-county (Baraga, Houghton, and Keweenaw) region in the northwestern Upper Peninsula. Risk of a civil disturbance exists in Houghton County primarily because of these institutions, including two universities (Michigan Technological University in Houghton and Finlandia University in Hancock), County office buildings (Houghton), and numerous state offices (Hancock). A county jail is located in Houghton with a work crew that operates throughout the County. Historically, there have been large-scale strikes during the mining days, but in recent years the only disturbances have been small-scale peaceful protests to war.

Risk Assessment

Probability of a civil disturbance is low in the Cities of Houghton and Hancock and very low elsewhere in the County. The small scale of recently recorded events suggests that the severity of a future event in the areas at risk would be low.

Probability: very low except low in Cities of Hancock and Houghton

Severity: low

Public Health Emergencies

A public health emergency is the result of a widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and well being of the public. Public health emergencies can take many forms: disease epidemics; large-scale food or water contamination; extended periods without adequate water or sewer services; harmful exposure to chemical, radiological, or biological agents; or large-scale infestations of disease-carrying insects or rodents.

A public health emergency may occur by itself or may be a secondary event caused by an event such as a flood or hazardous materials incident. Public health emergencies may be statewide, regional, or localized in scope and magnitude, but the common characteristic is that they adversely impact or have potential to impact a large number of people. An additional effect of public health emergencies is the tendency of "worried well" persons to overwhelm the system by seeking unnecessary treatment.

Background

There is no recent history of a widespread public health emergency. Influenza-type illness is by far the most common communicable disease, and the average mortality rate of 8.3 per 100,000 residents from 2007 to 2009 in Houghton County was significantly lower than Michigan's rate of 15.2. H1N1 (Swine) flu does present a newer, less understood threat, and a case in Houghton County has been reported to the Western Upper Peninsula Health Department. There is potential in Houghton County, as in all areas, for a larger disease outbreak as an isolated event or secondary to flooding or another type of incident. Portage Health and Aspirus Keweenaw hospitals each have an infection isolation room and a 24-hour emergency department. However, while awareness and

planning have been carefully taken into account, an epidemic of sufficient magnitude could overwhelm the facilities that are equipped to deal with this type of emergency.

Isolated incidents of hazardous materials contamination may also pose a localized public health threat as exemplified by the 2012 Chassell mercury spill detailed in the Hazardous Materials – Fixed Site section. This particular incident was determined to have had no significant public health impact. On the other hand, sites such as Osmose, a manufacturer mentioned in the Hazardous Materials – Fixed Site section, could release hazardous substances that may present an airborne public health threat. EPA Superfund and other remediation sites, including those detailed in the Hazardous Materials – Fixed Site section, are being addressed as potential public health contamination threats.

Another less urgent issue is that of dilapidated buildings, which are abundant in many jurisdictions in Houghton County. These structures are often associated with asbestos, a component of past insulation materials which has been found to cause health problems, and with other hazards. Mitigation of dilapidated buildings can be problematic due to cost.

Risk Assessment

The Emergency Measures Coordinator and the Director of the Western Upper Peninsula Health Department have collectively determined that the greatest public health threat faced by Houghton County is contamination of the food supply – either accidental or intentional – or an outbreak of pandemic or widespread flu. More gradual health impacts may be associated with the many historic contamination sites in the County.

Houghton County has been designated a Health Professionals Shortage Area (HPSA) by Michigan’s Department of Community Health, based on the county’s population-to-physician ratio and certain other health and income statistics. The remoteness of the County could also be a factor during a large-scale emergency. However, Houghton County is aware of and generally prepared to deal with risks associated with public health emergencies. Probability of an incident beyond a minor outbreak of influenza or other communicable disease is low. If such an event does occur, severity may be extreme through incapacitation of a large part of the population and escalating impacts on the economy and uninfected persons. Any other event with sudden onset and little predictability would likewise be extremely severe. Other isolated incidents posing secondary threats to public health generally do not rise to the level of an emergency and are improbable but also impossible to predict. Therefore, the County is vulnerable to both large-scale and isolated public health threats.

Probability: low throughout

Severity: moderate to extreme

Sabotage/Terrorism

Sabotage/terrorism is an intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives. Sabotage/terrorism can take many forms, including bombings; assassinations; organized extortion; use of nuclear, chemical and biological weapons; information warfare; ethnic/religious/gender intimidation (hate crimes); advocacy of overthrow of the U.S. Government; and disruption of legitimate scientific research or resource-related activities (eco-extremism.)

Because sabotage/terrorism objectives are widely varied, so too are the potential targets of such actions. Virtually any public facility or place of public assembly can be considered a potential target as well as businesses engaged in controversial activities. Large computer systems operated by government agencies, financial institutions, large businesses, healthcare facilities, and universities are currently the highest-profile targets and are at increasing risk.

Background

Although few sabotage/terrorism events have occurred in Houghton County, the area is not immune to this problem. Michigan Technological University is a premier science and engineering research university and is susceptible to attacks on its offices, labs and computer systems. An early 2000s bomb scare on campus was linked to eco-terrorism, but eco-terrorism is uncommon in the Upper Peninsula; however, the County's rich natural environment and resources make it susceptible to this threat.

Forestry Bombs - At 3:30 am on November 5, 2001, Michigan Tech public safety officers discovered two bombs on the Michigan Tech campus while they were on routine patrol. The bombs consisted of five-gallon containers, filled with a presumably flammable liquid, attached to ignition devices. One bomb was found outside of the U.J. Noblet Forestry Building, and one was outside of the adjacent U.S. Forest Service laboratory. Local law enforcement officials evacuated a four-block area and performed a thorough search of all other campus buildings. The Michigan State Police Bomb

Squad in Negaunee and agents from the FBI and the federal Alcohol, Tobacco, and Firearms agency in Marquette were called in, and the bombs were disarmed by 2:00 pm without incident.

Though no one has claimed responsibility for planting the devices, members of eco-terrorism groups are suspected. One of the forestry buildings was home to genetic research intended to make trees more productive for forest products industries. Self-identified members of the Earth Liberation Front had sent threatening e-mails to the university earlier in the year after it was announced that Michigan Tech had received a two million-dollar grant for research that included genetic manipulation of trees. The Earth Liberation Front and its sister organization, the Animal Liberation Front, have used similar methods to damage or destroy genetic research projects at other educational institutions around the country, including Michigan State University's Agriculture Hall where \$900,000 in fire and water damage was caused by arsonists in 1999.

Bank Robbery – On January 18, 1996, John Segreto, 25, a former Michigan Tech student with a history of paranoia and schizophrenia, robbed the MFC First National Bank in downtown Houghton at about 3:00 pm. Segreto shot one bank employee who has since lost an arm to that injury. He took another employee hostage and held her for 17 hours in a car he commandeered. Police shot out the tires on the car, which left it stuck in a foot of snow along U.S. 41 downtown. He held the hostage in the back seat and placed a homemade bomb around her neck. When negotiations failed to progress, Michigan State Police sharpshooters took advantage of an opening around 8:00 am the following day and shot Segreto dead. The hostage was safe, and the State Police Bomb Squad from Negaunee dismantled the explosive device. Although this was an isolated incident organized and carried out by one individual with a history of mental illness, it illustrates that even an area as remote as Houghton County is vulnerable.

Risk Assessment

Houghton County has experienced sabotage/terrorist events and remains susceptible as a center for governmental and educational activities. While Michigan Tech has responded to threats at its facilities by installing security cameras, much of the campus and the County are not under constant surveillance, resulting in some continuing risk. Furthermore, the Portage Lake Lift Bridge, as a critical structure and high-value target, is recognized as at special risk of sabotage. Probability of sabotage/terrorism is low based on past events, but severity is case-specific and impossible to

predict, though any event resulting in closure of the Lift Bridge would have severe and wide-ranging consequences.

Probability: low throughout

Severity: cannot be predicted

2.5 Houghton County Hazard Risk Assessment

Currently, there is no reliable way to accurately estimate costs associated with many hazards that affect Houghton County. Numerous variables can affect the vulnerability of the County to hazards, including location, scale, and time of day. Time of year also affects vulnerability. The population in many jurisdictions varies by season, and response capabilities are often compromised in winter.

Although Houghton County is susceptible to many types of hazards, each jurisdiction varies in its level of vulnerability to certain hazards. Vulnerability to most fire hazards, weather hazards, flooding due to spring runoff, and all technological and societal hazards have been determined to be similar for all of Houghton County. Subsidence is of note because it can occur in most jurisdictions, but the most at-risk areas are in scattered locations. **Table 2-1** provides a summary of hazards within the County and notes especially high vulnerabilities for each jurisdiction. Countywide hazards and others that affect most but not all jurisdictions equally, such as subsidence and petroleum/natural gas incidents, are generally not noted for specific jurisdictions.

Table 2-1: Differential Vulnerabilities

Jurisdiction (Population)	Vulnerability Summary
Houghton County (36,016)	<p><i>Hazards of similar threat to all of Houghton County include:</i></p> <ul style="list-style-type: none"> • Earthquake • Fire (all types) • Weather (all types) • Technological hazards • Sabotage/terrorism • Public health emergency
Adams Township (2,573)	<ul style="list-style-type: none"> • Scrap tire fires – non-complying site
<i>South Range Village (758)</i>	<ul style="list-style-type: none"> • No Village-specific vulnerabilities identified
Calumet Charter Township (6,489)	<ul style="list-style-type: none"> • Lake Superior shoreline erosion • Subsidence – historic mining areas • Severe winds – Lake Superior shoreline • Propane Incident (storage location)

Jurisdiction (Population)	Vulnerability Summary
<i>Calumet Village (726)</i>	<ul style="list-style-type: none"> No Village-specific vulnerabilities identified
<i>Copper City Village (190)</i>	<ul style="list-style-type: none"> No Village-specific vulnerabilities identified
<i>Laurium Village (1,977)</i>	<ul style="list-style-type: none"> No Village-specific vulnerabilities identified
Chassell Township (1,812)	<ul style="list-style-type: none"> Dam failure – Prickett Dam Flooding – Sturgeon River (spring risk to 19 homes and contributor to bank erosion) Propane incident (at storage location)
Duncan Township (236)	<ul style="list-style-type: none"> No Township-specific vulnerabilities identified
Elm River Township (177)	<ul style="list-style-type: none"> No Township-specific vulnerabilities identified
Franklin Township (1,466)	<ul style="list-style-type: none"> Flooding – Ripley area (spring runoff) Scrap tire fires – non-complying site
Hancock Township (461)	<ul style="list-style-type: none"> Lake Superior shoreline erosion – McLain State Park Severe winds – Lake Superior shoreline
Laird Township (555)	<ul style="list-style-type: none"> No Township-specific vulnerabilities identified
Osceola Township (1,888)	<ul style="list-style-type: none"> Flooding – Dollar Bay, Mason, and Hubbell areas (spring runoff)
Portage Charter Township(3,221)	<ul style="list-style-type: none"> Dam failure – Prickett Dam
Quincy Township (270)	<ul style="list-style-type: none"> No Township-specific vulnerabilities identified
Schoolcraft Township (1,839)	<ul style="list-style-type: none"> Flooding – Trap Rock River (affects some road access) Lake Superior shoreline erosion
<i>Lake Linden Village (1,007)</i>	<ul style="list-style-type: none"> No Village-specific vulnerabilities identified
Stanton Township (1,419)	<ul style="list-style-type: none"> Dam failure – Redridge Dam Lake Superior Shoreline Erosion Severe winds – Lake Superior shoreline
Torch Lake Township (1,880)	<ul style="list-style-type: none"> Lake Superior shoreline erosion
City of Hancock (4,634)	<ul style="list-style-type: none"> Flooding (steep slopes) Subsidence
City of Houghton (7,708)	<ul style="list-style-type: none"> Flooding (steep slopes)

Technical expertise is necessary to estimate the costs of each potential hazard. The value of property in Houghton County and its communities can, at a minimum, provide an overview of property that can be affected by hazards. **Table 2-2** shows the State Equalized Value (SEV) of properties in Houghton County by location and class. Vulnerability estimates that are provided in this plan were based on a most likely scenario.

2.6 Hazard Priority Ranking

Mitigation activities for Houghton County are prioritized by hazard ranking based on the following criteria: historical occurrence, affected area, speed of onset, impact, economic effects, duration, seasonal pattern, predictability, collateral damage, availability of warnings, and mitigation potential. A score of 1 (least risk) to 10 (greatest risk) was assigned for each of the risk factors for all hazards in Houghton County in order to develop an overall score and ranking. The scoring for each hazard was based on the following:

Historical Occurrence: Low Occurrence (1 point) – Excessive Occurrence (10 points)

Affected Areas: Single Site (1 point) – Large Area (10 points)

Speed of Onset: Greater than 24 hrs (1 point) – Minimal/No Warning (10 points)

Population Impact: No Impact (1 point) – High Impact (10 points)

Economic Effects: Minimal Effects (1 point) – Significant Effects (10 points)

Duration: Minimal Duration (1 point) – Long Duration (10 points)

Seasonal Pattern: One Season (1 point) – Year-Round (10 points)

Predictability: Highly Predictable (1 point) – Unpredictable (10 points)

Collateral Damage: No Possibility (1 point) – High Possibility (10 points)

Availability of Warnings: Warnings Available (1 point) – Not Available (10 points)

Mitigative Potential: Easy to Mitigate (1 point) – Impossible to Mitigate (10 points)

Table 2-2: State-Equalized Value for Houghton County, 2010

Township/ City **	*****Real (\$)*****					Total Real (\$)	Personal (\$)	Total Real & Personal (\$)
	Agriculture	Commercial	Industrial	Residential	Timber- Cutover			
Adams	0	4,769,400	3,204,810	32,800,070	563,280	41,337,560	7,374,503	48,712,063
Calumet	45,253	18,813,748	2,452,950	86,889,757	1,378,120	109,579,828	8,729,013	118,308,841
Chassell	2,837,595	2,912,048	0	62,283,000	2,246,801	70,279,444	1,164,465	71,443,909
Duncan	707,305	565,951	100	12,912,956	3,020,146	17,206,458	1,683,061	18,889,519
Elm River	0	1,817,359	328,313	27,349,056	1,304,228	30,798,956	1,910,503	32,709,459
Franklin	1,080,905	6,240,499	2,108,470	25,058,326	845,470	35,333,670	3,048,334	38,382,004
Hancock	31,250	235,210	0	24,005,998	0	24,272,458	692,693	24,965,151
Laird	3,953,924	298,802	3,020	16,865,298	4,617,539	25,738,583	405,578	26,144,161
Osceola	233,380	2,998,643	550,425	35,405,944	769,277	39,957,669	2,282,792	42,240,461
Portage	5,646,450	17,610,960	605,860	83,873,860	5,634,280	113,371,410	4,188,732	117,560,142
Quincy	71,517	260,036	0	6,132,545	287,929	6,752,027	673,513	7,425,540
Schoolcraft	1,201,996	2,997,937	0	39,200,495	3,444,153	46,844,581	1,048,452	47,893,033
Stanton	1,052,200	448,400	212,900	69,707,700	335,800	*72,230,300	1,001,500	73,231,800
Torch Lake	640,900	3,689,300	781,600	138,092,702	4,743,700	*150,265,102	2,610,557	152,875,659

*****Real (\$)*****						Total Real (\$)	Personal (\$)	Total Real & Personal (\$)
Township/ City **	Agriculture	Commercial	Industrial	Residential	Timber- Cutover			
City of Hancock	0	17,313,593	5,743	77,169,378	0	*94,488,714	4,778,334	99,267,048
City of Houghton	0	47,777,412	296,387	82,100,564	0	132,042,243	8,762,755	140,804,998
County Total Real and Personal							\$1,060,853,788	

* Stanton includes Developmental Property of \$473,300, Torch Lake includes Developmental Property of \$2,316,900, and City of Houghton includes Development Property of \$1,867,880

** Townships include all villages within

The following total scores represent results of the hazard priority ranking completed by the Houghton County Hazard Mitigation Committee. Earthquakes, Nuclear Power Plant Accidents, and Scrap Tire Fires were not included in the hazard evaluation because of their unlikelihood.

- Infrastructure Failure/Secondary Technological Hazard (71 points)
- Sabotage/Terrorism (71)
- Structural Fires (68)
- Subsidence (62)
- Hazardous Materials – Transportation Accidents (62)
- Petroleum/Natural Gas Incidents (62)
- Hazardous Materials – Fixed Site Incidents (59)
- Public Health Epidemic (59)
- Transportation Accident (59)
- Wildfires (59)
- Severe Winds (56)
- Snowstorms (53)
- Shoreline Erosion & Flooding (47)
- Civil Disturbance (47)
- Extreme Temperatures (44)
- Ice and Sleet Storms (44)
- Tornadoes (44)
- Riverine and Urban Flooding (41)
- Hail (41)
- Lightning (38)
- Dam Failure (32)
- Drought (32)

Table 2-3 shows the complete hazard priority ranking.

Table 2-3: HOUGHTON COUNTY HAZARD PROFILE AND EVALUATION

Hazard	Historical Occurrence	Affected Area	Speed of Onset	Popul. Impact (casualties)	Economic Effects	Duration	Seasonal Pattern	Predictability	Collateral Damage	Availability of Warnings	Mitigative Potential	Score
Dam Failure	1	4	1	1	1	7	4	4	4	1	4	32
Riverine & Urban Flooding	7	4	4	1	4	7	1	4	4	1	4	41
Shore. Erosion & Flooding	4	4	7	1	1	7	7	4	1	4	7	47
Structural Fires	7	7	10	1	1	4	10	10	4	10	4	68
Wildfires	4	7	10	1	1	7	4	7	7	4	7	59
Subsidence	1	7	10	1	1	4	10	10	4	10	4	62
Drought	1	4	1	1	1	7	1	4	4	1	7	32
Extreme Temperatures	4	10	1	4	1	7	4	1	4	1	7	44
Hail	4	7	4	1	1	4	4	4	1	4	7	41
Ice and Sleet Storms	4	7	4	1	1	4	7	4	4	1	7	44
Lightning	4	7	4	1	1	4	4	1	4	1	7	38
Severe Winds	7	7	4	1	4	4	10	4	7	1	7	56
Snowstorms	10	10	1	1	4	10	4	1	4	1	7	53
Tornadoes	1	4	7	1	4	1	4	7	7	1	7	44
Haz-material, Fix. Site Includ. Haz-material,	1	1	10	4	4	4	10	10	4	7	4	59
Transp.Accds. Infra.Failure/	4	1	10	1	1	4	10	10	4	10	7	62
Secnd. TechHaz Petroleum/Nat	7	7	10	1	7	7	10	7	4	7	4	71
Gas Accident	1	4	10	1	1	4	10	10	4	10	7	62
Transp. Accid. (Passenger)	1	4	10	1	1	1	10	10	4	10	7	59
Civil												
Disturbance	1	4	7	4	1	1	4	7	4	7	7	47
Public Health												
Epidemic	1	10	1	7	7	7	7	7	4	4	4	59
Sabotage/ Terrorism	4	4	10	4	7	4	10	10	4	10	4	71

2.7 Hazard Summary

Although many of the hazards identified can and do occur throughout Houghton County, the highest priority hazards include:

Infrastructure Failure/Secondary Technological Hazard

Sabotage/Terrorism

Structural Fires

Subsidence

Hazardous Material – Transportation Accidents

Petroleum/Natural Gas Incidents

Hazard mitigation activities will focus on mitigating loss due to these priority hazards in Houghton County while also considering activities that may mitigate loss due to lower ranking hazards.

Section 3: Hazard Mitigation

Mitigating Hazards in Houghton County

Goals for the Houghton County Hazard Mitigation Plan were established to address the highest priority hazards identified in Section 2 of this plan (Infrastructure Failure/Secondary Technological Hazard, Sabotage/Terrorism, Structural Fires, Subsidence, Hazardous Materials – Transportation Accidents, and Petroleum/Natural Gas Incidents) while also considering efforts that could assist with lower ranking or unknown hazards that may affect the County. Four general goals were established to guide mitigation efforts. The goals are considered comprehensive and give guidance to identifying mitigation activities in Houghton County.

Goal 1: Protect lives and property within Houghton County from all known hazards while focusing on priority hazards.

Goal 2: Identify feasible projects throughout the County that will help mitigate future problems.

Goal 3: Be proactive in protecting public facilities and critical facilities with up-to-date response plans and through upgrades as needed.

Goal 4: Educate citizens in order to encourage self-help and the mitigation of hazards on private property.

Mitigation activities can fall into a number of categories, including **preventive measures, property protection, emergency services, structural projects, natural resource protection** and **public information**. The following is an overview of potential activities by category and general recommendations within each activity category for Houghton County.

3.1 Preventive Measures

The purpose of preventive measures is to protect new development from hazards and ensure that potential loss is not increased. Preventive measures are typically guided through planning activities and enforced through zoning and building codes at the local level. A number of activities in the preventive measures category can be implemented at the local level, including:

- Building Codes
- Planning & Zoning
- Subdivision Regulations
- Open Space Preservation
- Storm Water Management

Building Codes: Building codes are an effective way to address many hazards identified in this plan. Through building code enforcement all new and improved buildings can be built or rehabilitated to withstand the impacts of certain hazards such as snow load, high winds, extreme temperatures and flooding.

In 1999 the State of Michigan amended the process of code adoption under the State Construction Code Act (Act 230). This Act now requires municipalities to administer and enforce the statewide codes, including the Michigan Building Code 2003, Michigan Plumbing Code 2003, Michigan Mechanical Code 2003, and Michigan Residential Building Code 2003, all developed by the International Code Council (ICC); and the National Electrical Code 2002, published by the National Fire Protection Association. The language does not permit local communities to modify the State codes. In Houghton County, the County itself is responsible for all electrical, mechanical, and plumbing code enforcement and for building code enforcement in all jurisdictions except the Cities of Hancock and Houghton, Portage Charter Township, and Stanton Township, which maintain local control of building codes. Thorough inspection of property during and after construction ensures that builders are incorporating all the current standards and requirements in effect.

Planning and Zoning

Planning and zoning guides where development should occur based on suitability and compatibility, keeping development away from sensitive areas such as floodplains and wetlands and thereby protecting property from certain types of natural hazards.

Master plans are a primary way for a local unit of government to guide future development within their community. Through a planning process that reviews a community's background, current land use, and projected needs, guidance can be given to future development. Master plans serve only as a guide and do not regulate land use.

Zoning regulations are the primary tool to implement comprehensive plans and control land use. By identifying different zones or districts a community can guide development within its boundaries. Zoning puts restrictions on use, lot size, setbacks, etc. but can be combined with more creative regulations such as a planned unit development option that allows more flexibility in the development process. Zoning is enforced by the local unit of government and should be based on a comprehensive plan for the community. Of 21 local jurisdictions in Houghton County, only 9 are zoned, and fewer than that have up-to-date master plans. Houghton County completed a new Master Plan in 2012, but it has no direct impact on land use. The City of Houghton is in the late stages of developing a new Master Plan, and Portage Township has recently explored creating a new plan.

Land Division (Subdivision) Regulations

In Michigan, the Land Division Act (Public Act 288, 1967 amended by Public Act 591 of 1996 and Public Act 87 of 1997) calls for all divisions of property to be approved by the local unit of government. The act regulates the division of land in order to promote the public health, safety and general welfare, further the orderly layout and use of land, to require the land be suitable for building sites and public improvements, etc. The new law authorizes municipal approval with basic, objective rules, including lot shape, minimum width and size standards, an adequate description, and safe access; it sets a 45-day time limit on municipal approval.

Open Space Preservation

Open space preservation is a way to keep hazardous areas free from development and is especially effective in floodplain areas. Prohibiting new development in hazard-prone areas is the best way to mitigate future problems. An additional benefit to open space preservation is the maintenance of agricultural areas and green space/parks. Comprehensive plans can help identify suitable areas to preserve through any number of means including acquisition, donation by developers, easement or regulated setbacks/buffers where development is restricted.

Storm Water Management

Storm water management is a way to control flooding, both urban and riverine. While natural groundcover serves to absorb water, development such as paving can increase runoff in a

watershed. Increased runoff can cause flooding, overloaded drainage systems, erosion, and impaired water quality. An effective method of storm water management is to regulate all development, particularly in floodplains, to manage runoff.

Under NFIP, participating communities have minimum development and height requirements in a floodplain in order to mitigate future losses. Development regulations can also require that storm water does not leave a new development at a higher rate than pre-development conditions. Storm water can be managed through natural vegetation, buffers, and retention basins. storm water runoff impacts an entire watershed, and a coordinated effort amongst affected municipalities is the most effective way to address the larger problem.

Houghton County Project Recommendations

Houghton County is guided by a number of current plans and regulations currently in place but has numerous communities without planning and zoning. Local planning and zoning officials should place a priority on updating plans and ordinances to reflect changing land use patterns and address hazard mitigation. Planning and zoning should also be considered in communities that currently have no local regulations: Village of Laurium, Village of Lake Linden, Village of Copper City, Adams Township, Elm River Township, Franklin Township, Hancock Township, Laird Township, Osceola Township, Quincy Township, Schoolcraft Township, Stanton Township, and Torch Lake Township. In 2012 the Houghton County Planning Commission developed a Master Plan as an update to its 2006 Land Use Plan.

Storm water management in all of Houghton County's communities can be studied to determine whether development has contributed to flooding hazards in the County. If studies determine there are existing problems, new storm water management requirements can be built into local regulations in order to mitigate increased problems.

3.2 Property Protection

The purpose of property protection measures is to prevent a hazard from damaging a building. Property protection measures are typically implemented by homeowners, but government can often provide technical and sometimes financial assistance. There are four general activities that can be classified as property protection:

- Keep Hazards Away
- Retrofitting
- Insurance Coverage
- Demolition

Property protection is typically the responsibility of the property owner but can be mandated if information and incentives do not encourage property owners to take action. The Federal Government requires public facilities to be insured as a condition of receiving federal disaster assistance. Local government is expected to protect critical facilities including fire stations, water treatment plants, etc. Protecting these facilities through retrofitting and sufficient, comprehensive insurance should be a priority.

Financial assistance can also sometimes be provided to property owners by communities in order to assist with protective measures, including grants and low interest or forgivable loans. Often with a little incentive, homeowners will take the initiative to build upon the opportunity with additional work on protective measures.

Outside financial assistance for pre-disaster preventive measures can include:

- FEMA Pre-Disaster Mitigation (PDM) grants
- FEMA Flood Mitigation Assistance (FMA) grants
- FEMA Hazard Mitigation Grant Program
- Community Development Block Grants

Post-disaster financial assistance can include insurance claims, FEMA disaster assistance, Small Business Administration disaster loans (non-governmental properties), FEMA Hazard Mitigation Grant Program, and Federal Highway Administration (FHWA) Emergency Relief Program and FHWA Emergency Relief for Federal Roads (ERFO).

The government should also take a role as an educator by providing basic information to citizens on property protection measures.

Keep Hazards Away

Hazard impact is typically measured by the amount of damage to people and property. There are a number of ways to keep hazards away from property and depending on the hazard can include erecting a barrier, moving a building from a hazard prone area, elevating buildings above flood elevation, keeping hazardous materials such as fire-prone vegetation away from structures, and the purchase of open space.

Barriers can be erected that keep hazards from reaching structures. Sea walls can restrict shoreline erosion and flooding, whereas berms can protect against shallow flooding. Because barriers are so susceptible to changing environmental conditions, proper design and maintenance are needed for structures to be effective.

Relocating structures is often the best way to prevent future loss. Many flood-prone areas are not proper locations for any type of structure. If feasible, relocation to safer areas can be the best way to protect structures currently in hazard-prone areas. Relocation can include moving a structure elsewhere on a lot or completely off site.

Elevating structures is another method to keep structures out of harm's way. Often a base flood elevation has been determined and raising a structure above this level prevents the hazard from affecting the property. Elevation can be done during new construction or by raising existing structures and can be more cost-effective than relocation.

Structures that are permanently or regularly damaged by hazards can be addressed through demolition. It is often cheaper to relocate and build anew than to protect an existing structure that is heavily damaged or regularly affected by hazards such as flooding. Demolition is most effective on properties that are difficult to relocate or dilapidated structures with no salvage value.

Retrofitting

An alternative to keeping a hazard away from a property is modifying or "retrofitting" the building or site to withstand hazard impact. Methods of retrofitting a structure for flooding can include dry flood-proofing (waterproof coating and sealing) or wet flood-proofing (elevation of everything that can be damaged and use of water resistant materials). Other methods of protecting a home from flooding include adequate floor drains, installation of sump pumps, and backflow protection valves.

Retrofitting can also protect homes from high winds, thunderstorms, hail storms, and winter storms. Effective improvements include tie downs, stronger windows and doors, buried utility lines, storm shutters, lightning rods, stronger roofing materials, improved insulation, relocating water lines inside, improved sealing, and storm windows.

Insurance Coverage

Although insurance does not mitigate hazards it does help property owners to rebuild, repair, and hopefully improve their property. Most homeowner's policies will cover property for damage due to tornado, wind, hail, and winter storms. Some insurance companies also offer sump pump failure and sewer backup coverage that can be added to an existing policy. However, separate coverage is needed from the National Flood Insurance Program for flooding.

Demolition

The removal through demolition of unsound or susceptible buildings is one way to mitigate loss. In the case of a structure regularly flooded, demolition is a way to prevent further loss, specifically when relocation would be too costly and the structure is of no historical value.

Houghton County Project Recommendations

Houghton County has not been severely affected by repetitive loss due to natural hazards. Periodic flooding does affect a small number of properties along Houghton County's rivers—specifically the Sturgeon and Otter—but most people are prepared for evacuation in these areas. The best proactive measures for residents, business, and government in Houghton County would be to participate in the National Flood Insurance Program and maintain insurance if susceptible to flooding.

Houghton County communities have had numerous problems with frozen pipes, and insulation can help to protect the susceptible public and private pipes and utilities. Retrofitting existing structures and insulating new infrastructure will prevent future problems.

3.3 Resource Protection

Resource Protection mitigation activities are a way to enable land to function in a natural way. There are many benefits to naturally functioning watersheds, floodplains and wetlands, which can include:

- Reduction in runoff from rainwater and snowmelt
- Infiltration and velocity control during overland flow
- Filtering of excess nutrients, pollutants and sediments
- Floodwater storage
- Water quality improvement
- Groundwater recharge
- Habitat availability
- Recreation and aesthetic qualities

Because many natural areas have been affected by development and will be affected by development in the future, there are a number of ways to protect and restore the environment.

Resource protection activities can include:

- Wetland protection
- Erosion and sedimentation control
- River restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

Wetlands

Wetlands are a valuable resource that provides a number of mitigation functions including storage of floodwaters and filtration, as well as habitat for fish, wildlife, and plants. Wetlands are regulated in Michigan by Part 303, Wetland Protection, of the Natural Resources and Environmental Protection Act (Act 451 of 1995). The Michigan Department of Environmental Quality administers the permit program. In Michigan a permit is required to: deposit fill material in a wetland; dredge or remove soil or minerals from a wetland; construct, operate, or maintain any use or development in

a wetland; or drain surface water from a wetland. Wetlands are specifically defined under the Act, and certain activities are exempted under the Act.

Local units of government can play a role in wetland protection and should serve as stewards over their water resources. Wetland protection measures can be implemented on a local level, and public education is a key to protecting this valuable resource.

Erosion and Sedimentation Control

Surface water can easily erode soil in large exposed areas including farmlands, construction sites, and forested areas. In addition to exposed areas, erosion often occurs along stream banks and shorelines with high velocity currents and wave action. The erosion carries sediments and deposits them downstream where they can cause problems to storm sewers, culverts and ditches by reducing the capacity of the systems. Erosion also results in sediment in the water which reduces light and oxygen in the water. Heavy metals and other contaminants are the reason that sediment is identified as the number one nonpoint source pollutant for aquatic life.

Erosion and sedimentation can be controlled through phased construction, minimization of clearing, and stabilization of bare ground with vegetation, and other means. Sediment can be captured on-site with traps and filters, and water velocity can be slowed by terraces, temporary cover, constructed wetlands, and impoundment.

Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act (NREPA), PA 451 of 1994, as amended, regulates only earth change activity (primarily construction projects disturbing one or more acres of land or that which is within 500 feet of the water's edge of a lake or stream). Part 31, Water Resources Protection Act, of NREPA addresses most other sources of sediment. In Houghton County, the Houghton County Drain Commissioner is the enforcing official. Locally, municipalities may adopt additional protection measures dependent on state laws via the NREPA or Planning and Zoning Enabling Acts.

River Restoration

History has proven that returning streams and adjacent land to a natural condition reduces erosion. The restoration of vegetation along stream banks protects the water by:

- Reducing the amount of sediment (and pollutants) entering the water
- Provides habitat for wildlife
- Slows the velocity of water, thus reducing flood damage and erosion
- Provides recreational opportunities and aesthetic value
- Reduces long-term maintenance costs

Best Management Practices

Non-point source pollutants including fertilizers, pesticides, animal wastes, chemicals, and sediment are washed away by storm water and distributed in storm sewers, ditches, and streams. The term best management practices (BMPs) refers to the design, construction and maintenance practices and criteria that minimize the impact of storm water runoff.

Dumping Regulations

Dumping regulations attempt to regulate the disposal of solid matter that can end up in streams and wetlands. Solid waste can pollute water, obstruct water flow, and reduce the ability of the stream or wetland to clean storm water. The dumping of waste materials such as garbage and other materials is illegal, but the dumping of yard waste, such as leaves and branches, can also affect a watercourse. People often don't realize the impact of obstructing a watercourse. Public information should be a central focus of a dumping enforcement program.

Urban Forestry

Damage caused by wind, ice, and snow storms is often due to their impact on trees. Downed trees and branches can upset power lines, damage buildings, and harm property under them. An urban forestry program can reduce the damage potential of trees through maintenance and monitoring. Through better tree selection, proper pruning and evaluation, communities can also mitigate damage caused by downed trees.

Farmland Protection

Farmland protection's purpose is to provide ways to keep prime, unique or important agricultural land intact. Farmland is being converted to nonagricultural uses at an alarming rate which results in

residential development that needs more infrastructure and results in increased runoff and emergency management difficulties. Farmland protection parallels open space protection in that it keeps the land open for future generations but also helps with storm water runoff, ecosystem maintenance, and scenic enhancement.

Houghton County Project Recommendations

Houghton County can mitigate the impact of flooding through a number of resource protection measures including wetland protection, erosion control, and best management practices. By monitoring the rivers, the County can react to problems that may surface due to land management practices. With proactive best management practices, erosion and sedimentation control, and other resource protection measures, the County can ensure protection of natural functions.

Areas of the Torch Lake Superfund site have been covered with natural vegetation in the hopes that the sites will return to a natural function. The cover work that has been done has stopped ongoing wind and water erosion of the sands.

3.4 Emergency Services

Local emergency services authorities, resources, and facilities throughout Houghton County are documented in Section 1 of this plan. Although all authorities are effective in conducting their internal and incident response activities, there is an opportunity to further educate the public about their operations – for example, through dissemination of hazard-related materials. Furthermore, several agencies lack necessary equipment to meet their responsibilities in areas of local government operations such as public works and planning. Inadequate funding sources will make this a continuing problem.

Emergency services provide protection for people both during and after a disaster. A thorough emergency services program addresses all hazards and involves all response departments and facilities. In Michigan, emergency services are supervised by the Michigan State Police and coordinated through county emergency management offices. A number of components pertain to emergency services, including:

- Threat Recognition
- Warning
- Response
- Critical Facilities Protection
- Post-Disaster Recovery and Mitigation

Threat Recognition

The first step in responding to a hazard is being aware that there is potential for an event to occur. With a threat recognition system, adequate warnings can be disseminated and other response actions can be undertaken. Flood threats can be evaluated by measuring rainfall, soil moisture, and stream flows upstream and then calculating flood levels for downstream locations. Discerning the time and height of a potential flood crest will allow more efficient evacuations. Some rivers have gauges that establish threat levels. Under threat conditions, the National Weather Service (NWS) may issue flash flood watches for affected areas. The NWS is the agency that predicts meteorological threats and is able to issue public warnings.

Warning

After a threat is identified, the Office of Emergency Management (OEM) notifies municipalities and other agencies that an event is possible or occurring. Early notification is key in order to distribute information to all affected parties. The NWS notifies the public using two levels: Watch and Warning.

Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.

Warning: a flood, tornado, etc. has started or has been observed.

A more specific warning may be disseminated in a number of ways, including:

Warning sirens (outdoor and on public safety vehicles)

Via commercial radio or TV (news and weather channels)

NOAA Weather Radio (where available)

Mass telephone notification

Tone activated receivers in key facilities

Door to door contact
Mobile public address systems
Internet/e-mail notification

All of the systems have their limitations because they reach only certain audiences. TV and radio can provide information, but this method of notification is only effective if people have them on. NOAA radio will only reach those with access to a weather radio. Outdoor warnings can indicate to tune into another information source such as TV or radio, but this type of warning has limited reach and may not be heard by people indoors or in noisy environments. Door-to-door contact is time consuming but preferred when there is sufficient lead time for an incident. The best warning system is a redundant system that provides notification via numerous methods in order to reach as much of the population as necessary.

The warning system should also include information as to the response action to take, such as staying indoors during a tornado warning or staying off roads in the event of a severe winter storm.

Response

Effective response, in combination with threat recognition and warnings, is another way for a community to mitigate hazard impact. A community typically coordinates an incident response through an emergency operations center that directs activities based on an emergency action plan. An emergency action plan ensures that the community responds efficiently and appropriately to a threat. Emergency action plans need to be regularly updated in order to keep names and contact information current.

Response activities may include a variety of agencies and offices and measures such as closing streets and bridges, shutting off power to threatened areas, ordering an evacuation and opening evacuation centers, monitoring water levels, and implementing security measures.

Critical Facilities Protection

Critical facilities are the vital facilities that keep a community functioning as identified in Chapter 1. Critical facilities must be prepared to respond during an emergency. Most critical facilities will have their own response plan in place, and the facilities are also included in municipal emergency action

plans. The best protections are early warning, response planning, and coordination in the event of an emergency.

Post-Disaster Recovery and Mitigation

Communities must be prepared for recovery and mitigation of future problems after an incident. While the main focus is on recovery, it is also important to recognize mitigation methods to prevent the incident from reoccurring at the same magnitude.

During recovery a number of actions take place including patrolling, cleanup, providing services, monitoring impact, and regulating reconstruction. During this recovery time, mitigation activities can include undertaking public information efforts aimed at educating residents on how to protect themselves in the future, evaluating reconstruction methods including mitigation measures, and seeking funding for recovery efforts.

Houghton County Project Recommendations

Emergency services are of primary importance in mitigating hazards in Houghton County. Houghton County should focus on increasing its ability of the County to respond to threats through coordinated response activities. Employing well-trained responders and an efficient public notification system lessens the impact of hazards on a community. Areas to focus on include improved public notification through mechanisms such as public service announcements, social media, community warning systems, NOAA, and redundant emergency notification; facility protection; law enforcement; rural area communications (Laird and Duncan Townships); response and backup equipment; mutual aid agreements; and availability of adequate medical supplies and shelter facilities.

Contingency plans for hazards are important in the event of infrastructure failure. Backup systems for water, sewer, phones, and electricity should be in place or identified. In Houghton County, failure of the Portage Lake Lift Bridge could be detrimental to the safety of the communities, especially since all medical facilities in the county are located north of the bridge, so backup cross-canal transit or floating bridge should be considered.

3.5 Structural Projects

Structural projects are intended to protect people and infrastructure from damage due to natural hazards. Structural projects are typically used to manage and control flood waters. The complexity and cost of structural projects can vary greatly and are dependent on individual circumstances. Structural projects are undertaken where non-structural measures would not be effective. Structural projects may include:

- Reservoirs and Detention Areas
- Roadway and Crossing Improvements
- Levees/Floodwalls/Seawalls
- Drainage and Storm Water Improvements/Maintenance
- Channel improvements

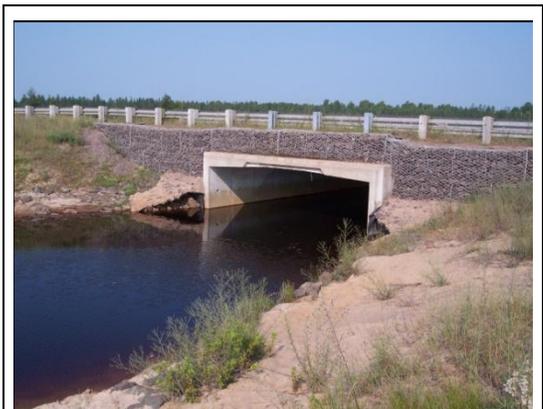
Because of the construction costs, maintenance and impacts of structural projects, they are often undertaken and funded by larger agencies with coordination at the local level. Agencies including the Michigan Department of Natural Resources, U.S. Army Corps of Engineers, and the USDA Natural Resources Conservation Service are often involved in structural projects.

Reservoirs and Detention

Reservoirs are intended to protect development downstream by temporarily storing flood waters. The reservoirs hold water behind dams or in storage/detention basins until flood waters subside. The detained water is then released downstream at a rate the river or stream can accommodate. Reservoirs are built to address existing problems or may be built to handle increased runoff from new development.

Roadway and Road Crossings Improvements

Flooding can often affect accessibility by inundating roadways, culverts, bridges, driveways, and other transportation infrastructure. There are a number of things that can be done to maintain access when



Upgraded culverts can mitigate flooding problems by increasing the flow capacity of streams as they pass under roadways.

alternative access is not available. A number of measures can improve conditions at roadways and crossings, including elevating the road bed, enlarging culverts to increase channel capacity, or replacing culverts with bridges. A concern when undertaking these types of improvements is the impact to downstream locations from increased capacity of the water system when it is no longer constricted up stream.

Levees, Floodwalls and Seawalls

One of the most popular flood control measures is the construction of an earth levee or concrete floodwall to protect property. The purpose of these structures is to keep a stream within its channel by providing higher "banks." Levees require extensive design in order to address large floods, erosion, river access and views, and cost of construction and maintenance.

Seawalls are often used to protect from erosion due to storm surges along Lake Superior's edge. Seawalls are built along a property edge and are designed to protect a property from the storm surges. Along the Great Lakes they can be significantly impacted by ice movement during the winter months and often have difficulty resisting lake forces.

Drainage and Storm Water Improvements/Maintenance

Man-made ditches and storm sewers assist in guiding runoff where surface drainage is inadequate. These systems allow water to be conveyed quickly to other locations; thus, they are most appropriate where the receiving location has adequate capacity. Storm sewer improvements may include installing new sewers, enlarging pipes, and preventing back flows. Other improvements in combination with drainage enhancements may include wetland detention, vegetated trenches, and practices that reduce the quantity and velocity of runoff.

It is also important to maintain storm water and drainage systems. This involves keeping channels, ditches, and culverts cleared of debris; maintaining overgrowth; and remediating stream bank erosion sites. Debris can be any number of things, from tree limbs and branches to illegally dumped trash. Maintenance of public drainage systems is the responsibility of government agencies.

Channel Improvements

Channel improvements are another method of increasing the capacity of streams, thereby allowing more water to travel at a faster rate. Improvements can be made through dredging, "channelization," or diversion. Dredging increases the capacity of a stream by removing material at the bottom. Channelization refers to the straightening, widening, and/or deepening of a stream. Diversion is the practice of creating a new channel to send floodwaters to an alternative location.

Houghton County Project Recommendations

Primary structural projects in Houghton County have focused on improvements to the current drainage system. The Houghton County Road Commission maintains a future project list and continues to identify and upgrade inadequate culverts and problem roadways as needed. The communities of Houghton, Hancock, Lake Linden, Hubbell, Ripley, Dollar Bay, and Painesdale regularly experience high runoff related to steep topography and should continue upgrades that assist in management of these conditions.

The County should request updated shoreline erosion maps in order to review problem areas such as McLain State Park. Structural projects should be considered as necessary in addition to preventive measures to address persistent problems.

Potential failure of the Redridge Dam must be evaluated and risk alleviated by either repair or removal. Stanton Township should review options and proceed with addressing this known problem.

3.6 Public Information

Public information is a mitigation strategy that has broad reaching impact across both the public and private sectors. Activities that provide local officials, property owners, renters, businesses, and other parties with information about how to protect themselves and others from potential hazards may have the greatest impact of all mitigation strategies. Information empowers people to protect their own property and lives.

There are many ways to get information out to the public affected by hazards through community outreach. Community outreach is informing the public through news media, community

newsletters, direct mailings, presentations, displays, signs, the internet, brochures, technical assistance, and other outlets. Because methods are diverse, it is best to analyze each community to find out how people obtain information and use that knowledge to build an outreach plan. While in some communities a local newsletter is distributed, other communities may rely on a newspaper to get information.

While public information on hazards is important, it is also vital to provide people with methods to address the hazard. Outreach projects should include information on hazards, safety, health, and property protection measures at the local level. Community offices and libraries are good places to distribute printed information (books and pamphlets), and increasing internet use indicates web distribution is also an effective way to disseminate information. Information on a website can easily be linked to an infinite number of available resources.

Technical assistance can further assist people in protecting their property. Assistance can be in the form of hazard identification assistance or property protection assistance. Resources for technical assistance may include direction from building department staff or FEMA Flood Map clarification with assistance from community staff.

Houghton County Project Recommendations

In Houghton County and all of its jurisdictions, education is the key to an informed citizenry. By providing the information and tools necessary, much can be done to further mitigation efforts in Houghton County. An ongoing education program and availability of limited technical assistance can provide the public with the ability to protect themselves. Houghton County should institute additional education programs within the County for its citizens, businesses, and others that build upon current initiatives.

Section 4: Action Plan

Action Plan for Houghton County

The final step in the mitigation process is to build upon the general recommendations for mitigation activities suggested in Section 3 and identify specific action items for Houghton County and its communities. All the activities identified in this section are consistent with the following mitigation goals identified in Section 3:

Goal 1: Protect lives and property within Houghton County from all known hazards while focusing on priority hazards.

Goal 2: Identify feasible projects throughout the County that will help mitigate future problems.

Goal 3: Be proactive in protecting public facilities and critical facilities through proper maintenance and upgrades.

Goal 4: Educate citizens in order to encourage self-help and mitigation of hazards on private property.

Projects vary from structural measures to education and are prioritized based on impact to persistent, known hazards and potential resources available to complete the project. Although projects are prioritized on a countywide basis, this does not limit the County's or a local community's ability to pursue identified projects as funding becomes available. A number of the projects are ongoing action activities that will be accomplished as time and resources permit. Identified action items include a short description of the activity, the responsible agency or agencies, timeline, projected costs if available, and ways that Houghton County and its citizens will benefit.

Cost-benefit consideration, both financial and otherwise, is a major factor in the prioritization of action items. As a result, action priorities are not entirely consistent with the rankings in the Hazard Profile. In addition, a particular potential event that is anomalous within its hazard category may warrant action regardless of the rank of that general hazard type. For example, Portage Lift Bridge is the highest-priority project even though infrastructure failure is not one of the most highly ranked hazards. This is the case because an outage of the Lift Bridge would have a much more extreme impact than a typical infrastructure failure because of the bridge's role in everyday life in the County.

Changes from Previous Plan

Some action items are carried over from the 2005 Hazard Mitigation Plan. Several of these are ongoing activities that will continue indefinitely. Three projects have been completed – most notably securing the Redridge Dam and developing a Hazard Mitigation Plan for Michigan Tech. The other items were and are dependent on funding that has not been available. Finally, items were added to improve preparedness for an outage of the Portage Lake Lift Bridge. No large-scale changes in land development have occurred in Houghton County since 2005. Most construction has been incremental within or adjacent to already-developed areas. Houghton County, the City of Houghton, and Portage Township have recently completed, are in progress of completing, or have explored, respectively, new master plans. None of these are expected to have a major effect on land use in the County.

4.1 Mitigation Resources

There are two types of resources: existing institutional establishments, such as government agencies and continuing programs, and funding sources to undertake specific projects. Many of the former are described in Section 1 of the plan. The following list is intended to provide examples of funding sources for both current and future mitigation projects and should not be considered comprehensive. Potential new sources for mitigation funding should be added as identified. Project-specific funding options are included in the respective Action Items identified in Section 5.3.

Federal

- FEMA: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Flood Mitigation Assistance Program, National Flood Insurance Program (NFIP), Assistance to Firefighters Grant Program, and Port Security Grant Program
- National Science Foundation (NSF)
- U.S. Department of Agriculture (USDA)
- U.S. Department of Commerce (DOC)
- U.S. Department of Defense: Army Corps of Engineers (USACE)
- U.S. Department of Energy
- U.S. Department of Health and Human Services (DHHS)

- U.S. Department of Homeland Security (DHS)
- U.S. Department of Housing and Urban Development (HUD)
- U.S. Department of the Interior (DOI)
- U.S. Department of Justice (DOJ)
- U.S. Department of Transportation (DOT)
- U.S. Environmental Protection Agency (EPA)
- U.S. Small Business Administration (SBA)

State

- Michigan Department of Environmental Quality (DEQ)
- Michigan Department of Natural Resources (DNR)
- Michigan Department of Transportation (MDOT)
- Michigan Economic Development Corporation (MEDC)
- Michigan State University (MSU) Extension

Other

- Local tax revenues (general fund and special millage/assessment)
- Foundation grants

4.2 Progress on Previous Mitigation Program Action Items

Table 4-1 illustrates the status of mitigation action items from the 2005 Hazard Mitigation Plan.

Table 4-1: Progress on Previous (2005) Mitigation Program Action Items

2005 Item	Status	Corresponding 2013 Item
1. Sturgeon River Road Bank Stabilization	Not Completed	2
2. Flood Mitigation—Storm Drainage Sewer Upgrades	Not Completed	3
3. Drainage Improvements and Maintenance	Not Completed	4
4. Mine Shaft Safety	Ongoing	5 (Modified)
5. Secure Redridge Dam	Completed	Deleted
6. Update Stormwater Management Plans and Flood Maps	Not Completed but now Ongoing	6 (Modified)
7. Development of a Multi-Hazard Mitigation Plan for Michigan Technological University	Completed	Deleted
8. Improved Emergency Response, Equipment and GIS System	Ongoing	8

2005 Item	Status	Corresponding 2013 Item
9. Bridge Approaches for Emergency (Temporary) Bridge	Not Completed	11
10. Portable Water Treatment System	Not Completed	11
11. Update Shoreline Erosion Map and Identify Future Mitigation Activities	Not Completed	12
12. Public Information/Education Program	Not Completed but now Ongoing	15
13. Review Plans and Development Regulations	Ongoing	17
14. Insurance	Ongoing	18

4.3 Mitigation Program Action Items

Action Item 1: Portage Lake Lift Bridge

The Portage Lake Lift Bridge spans the Portage Lake Canal between the cities of Houghton to the south and Hancock to the North. It handles approximately 25,000 vehicle crossings daily. That is more than the number of daily crossings over the Mackinac Bridge. Many of those crossings are related to emergency transport of patients to or from the two hospitals located north of the bridge, law enforcement responses, shipment of food and fuel to the Peninsula, transportation of children to and from school, and commuting to work. Of the 25,000 crossings, all are necessary in some way. With more than 20,000 people living on the island that is the Keweenaw Peninsula and 20,000 more in central and southern Houghton County who need to access health care that only exists on the island, the Portage Lake Lift Bridge is the only land conveyance to or from the island.

Nowhere in Michigan or in any surrounding state are over 20,000 people in two counties dependent on a single transportation access point for essential and non-essential traffic. While plans call for deployment of different *temporary* conveyances on, over, or across the Portage Lake Canal in the event the bridge fails, NONE of them will allow for anything near a return to normal. The Lift Bridge is well maintained by the Michigan Department of Transportation (MDOT) and has enjoyed limited problems for most of its over 50 years; however, it is an aging mechanical device that has long been exposed to the elements of nature that exist in the Copper Country—driving winds and eight months of snow, cold, and corrosion followed by heat and humidity.

"Normal" life, encompassing the area economy, schools, emergency service access, and other critical goods and service access, is completely dependent on this one mechanical conveyance. The

only way to fully mitigate this hazard is with the construction of another bridge across the Portage that is large enough to accommodate, at a minimum, the current volume of traffic. Another bridge will also mitigate, under normal conditions when both bridges are functioning, the attendant problems associated with traffic congestion that currently exist at and around the current bridge. Construction of another bridge is the most critical hazard mitigation project for both Houghton and Keweenaw Counties. Based on business and economic interests in the area, including medical service provision and emergency service mutual aid agreements that exist between response agencies in the Western Upper Peninsula, mitigating the hazard of the Portage Lake Lift Bridge would rate very high for surrounding counties as well.

Much progress has been made regarding Lift Bridge issues since the 2005 Hazard Mitigation Plan. Three separate MDOT-funded plans have been developed for different components of and stages following a bridge failure. Throughout this planning process, a group of emergency response officials and related supporting interests have met monthly to discuss and plan for bridge issues. However, continuing funding is necessary for the group to continue its formal planning work, such as to involve local agencies, businesses, and organizations at a deeper, more formal level.

Bridge approaches, which were included in the 2005 plan, have been addressed through memoranda of understanding among the communities with Portage Waterway frontage near the bridge as well as the National Park Service. Emergency officials and engineers have determined that there is no need for permanent approaches other than cleared open spaces accessible by land and water transport routes.

Responsible Agencies: MDOT, Houghton and Keweenaw County Road Commissions, County of Houghton, Houghton County Emergency Manager, United States Department of Transportation.

Deadline: Ongoing

Cost: Portage Lake Span Bridge: \$60 Million

Potential Funding Sources: FHWA funds and others unknown

Benefits: Another bridge would provide a second means of access to northern Houghton and Keweenaw Counties.

Action Item 2: Sturgeon River Road Bank Stabilization

The Houghton County Road Commission has an approximately four-mile segment of primary road adjacent to the Sturgeon River in Chassell Township that floods regularly in the spring. There are eight identified locations that need extensive erosion control measures to prevent washing out and loss of access for residents. This project was the top priority in the 2005 plan but lacked sufficient funding.

Responsible Agency: Houghton County Road Commission

Deadline: 2015

Cost: \$750,000

Potential Funding Sources: FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Grant Program, Army Corps of Engineers, and Road Commission

Benefits: The project will protect the roadway from erosion as well as the two center piers of the 180-foot span bridge that are being scoured during high discharges. Access to the 14 residences on the dead-end road will be secured under this project.

Action Item 3: Flood Mitigation – Storm Drainage Sewer Upgrades

Houghton County Townships have a number of severely deteriorated storm drainages within their built-up communities. These drainage systems enclose seasonal and permanent waterways and have been built haphazardly, many by residents who have filled in ditches with scrap material and undersized pipe materials over the past 100 years. These drainages are in need of upgrading that alleviates ongoing maintenance and flooding problems. Some of the most severe problems are in Chassell, Dollar Bay, Mason, Ripley, Houghton, Hubbell, and Lake Linden. This project was a high priority in the 2005 plan but lacked sufficient funding.

Responsible Agency: Houghton County Road Commission and municipal public works

Deadline: Ongoing

Cost: Unknown (varies by project); staff time

Potential Funding Sources: FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Grant Program, and organization/agency operating budgets

Benefits: Improvements will alleviate ongoing problems caused by improperly constructed storm systems exacerbated by heavy spring runoff conditions. Work will largely fix/replace or otherwise improve storm sewer carrying capacity and will address health concerns related to the location of system discharge.

Action Item 4: Drainage Improvements and Maintenance

As an ongoing project in the County, the Houghton County Road Commission has had an active role in upgrading roads and replacing inadequate culverts in response to previous problems and to mitigate future problems. Houghton County would upgrade up to 40 culverts (including ditching and road restoration) along county roads that are susceptible to flooding every three or four years during spring runoff. The County and municipalities should also continue to maintain and upgrade current systems as needed while monitoring beaver dam problems.

In addition to County Road projects, numerous areas along M26 north of the Portage Lake Lift Bridge (in and around Hancock, Ripley, Dollar Bay, Hubbell, Tamarack City, and Lake Linden) and south of the bridge (in and around South Range, Trimountain and Painesdale) are in need of drainage assessment, planning and improvements to deal with runoff problems. In Chassell on U.S. 41, a Hamar Creek culvert project is in progress for the same reason.

Funding has not been available to accomplish these actions since their inclusion in the 2005 plan.

Responsible Agency: Houghton County Road Commission and municipal public works

Deadline: Ongoing

Cost: Unknown (varies by project); Staff time and \$90,000 from Houghton County

Potential Funding Sources: FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Grant Program, and organization/agency operating budgets

Benefits: Inspection and maintenance of the existing drainage system will prevent flooding caused by plugged culverts, and upgrading of culverts will ensure mitigation of future problems in areas

where materials are washed into waterways regularly during spring flood conditions. Studies and improvements for the M26 corridor will address ongoing spring runoff problems.

Action Item 5: Mine Shaft & Stope Safety

An ongoing program of mine safety that includes capping and other measures should be implemented. As funding is available, the County will prioritize and address hazardous shafts and stopes. Shafts should be closed off at their openings (adits), whereas stopes should be identified and mitigated through internal supports and/or closure of overlying land. A Mine Shaft Safety item was included in the 2005 plan and is an ongoing process, but in this incarnation, the dollar amount needed for each cap has been significantly increased to allow for the full range of case-by-case projects. Cost of other mitigation components is unknown and also varies case by case.

Responsible Agency: Houghton County, including mine inspector; Cities of Hancock and Houghton

Deadline: Ongoing

Cost: \$20,000 minimum for protective measures and up to \$75,000 for capping per shaft/opening

Potential Funding Sources: FEMA Hazard Mitigation Grant Program and DOI Abandoned Mines Reclamation Program

Benefits: Action to address the numerous abandoned mines throughout the Copper Country is necessary to protect people and property. The long history of mining has led to a persistent problem with mine shaft openings, shafts that are reopening due to improper capping (with materials such as rotting logs and rusting cars), and unidentified stopes that needs to be addressed.

Action Item 6: Update Storm Water Management Plans

Due to changing land use and ongoing upgrades to storm systems in the County, storm water management plans should be updated to address changing conditions. Incorporate updated FEMA maps when available.

Responsible Agency: Houghton County and local jurisdictions

Deadline: Ongoing

Cost: Staff time

Potential Funding Sources: FEMA and organization/agency operating budgets

Benefits: The County and municipalities will benefit by being able to make informed decisions based on accurate storm water management plans that incorporate upgrades that are completed, underway, or planned.

Action Item 7: Retrofit Underground Pipes

Aging and un-insulated pipes should be identified and replaced or retrofitted as work is done on underground utilities. More urgent replacements should be done as separate projects as soon as possible. The latter is the case for a 1938 water line serving *Adams Township* and *Portage Charter Township*.

Responsible Agency: Municipal Departments of Public Works
Deadline: Ongoing
Cost: Variable
Potential Funding Sources: FEMA Pre-Disaster Mitigation Program, FEMA Hazard Mitigation Grant Program, USDA Rural Development, and local
Benefits: Residents and municipalities will benefit from prevention of infrastructure failure and from reduced flooding due to burst pipes.

Action Item 8: Improved Emergency Response, Equipment and GIS System

Conduct ongoing reviews of response plans and programs in order to keep emergency contacts up to date, ensure critical facility information is current, and to identify and incorporate new and improved methods of warning and response. Continue development and maintenance of County GIS system that is coordinated with 911 system (addressing and access road/parcel mapping have been undertaken since 2005) and all departments so resources and hazard evaluations can be comprehensively addressed. Adequacy of shelter facilities, response equipment, and training can be evaluated during ongoing reviews of response plans and updated as needed.

Responsible Agency: Houghton County Emergency Manager

Deadline: Ongoing – Incorporate into annual emergency plan revision process

Cost: Unknown; staff time

Potential Funding Sources: FEMA, DHS State Homeland Security Grant Program, Firefighter Assistance Grants, U.S. Department of Health and Human Services, and U.S. Department of the Interior

Benefits: Emergency plans that are up to date and incorporate all available methods of warning and response will be most effective in emergency situations thus mitigating loss from hazards. These plans serve as an effective tool in determining equipment needs on an annual basis while an integrated Geographic Information System will provide a comprehensive inventory of County assets for hazard and emergency management.

Action Item 9: Bridge Approaches for Emergency (Temporary) Bridge

Bridge approach preparation on the north and south side of the Portage Canal would ease installation of a portable, temporary bridge in the event of a Lift Bridge failure.

Responsible Agency: Houghton County Emergency Manager

Deadline: 2014

Cost: \$120,000

Potential Funding Sources: Congressional appropriation (Army Corps of Engineers), DHS State Homeland Security Grant Program, and FEMA Port Security Grant Program

Benefits: If the Portage Lift Bridge were to fail, both northern Houghton and Keweenaw County would be without land access. The two hospitals in the area are located on the north side of the bridge, leaving the south side without local emergency services until access was restored. If permanent approaches are ready in the event of a failure, a temporary/portable bridge can quickly be installed.

Action Item 10: Improved Firefighting Capability

Wildfires are one of the most serious hazard threats throughout the Western Upper Peninsula, and Houghton County is no exception. Rural fire departments often lack sufficient funding to respond

effectively to these incidents, and those departments are located in the areas where wildfire response needs are most urgent. Funding to support staff; sufficient, modern equipment; and storage facilities would help to alleviate this problem. This need was indicated specifically by *Elm River and Laird Townships*. Elm River, one of the many rural and heavily forested townships in the County, would benefit from a new, modernized and expanded fire station. Dry hydrants would also aid response to both wildfires and structure fires, as indicated specifically by *Portage Charter Township*.

Responsible Agency: Local jurisdictions and fire departments and Houghton County Emergency Manager

Deadline: Ongoing

Cost: Variable

Potential Funding Sources: FEMA (including Assistance to Firefighters Grant Program), USDA Rural Development, and local

Benefits: Funding for rural fire protection will prevent site-specific fires from becoming catastrophic events, protecting residents and natural resources in the process.

Action Item 11: Portable Water Treatment System

Public water systems throughout the County are subject to contamination from both natural and unnatural (sabotage) sources. Availability of an emergency treatment system is important, as fresh water is critical to the health and safety of a community. This project was included in the 2009 plan, and opportunities to acquire the system continue to be explored.

Responsible Agency: Houghton – Keweenaw County Emergency Manager

Deadline: Ongoing

Cost: \$65,000

Potential Funding Sources: FEMA, DHS State Homeland Security Grant Program, DOJ Office of Domestic Preparedness, Congressional Appropriation (Army Corps of Engineers)

Benefits: A portable water treatment system will provide security in the event of contaminated water supplies. By having a system ready and available, water emergencies in the County can be quickly addressed. The system could be shared with Keweenaw County.

Action Item 12: Update Shoreline Erosion Map and Identify Future Mitigation Activities

Shoreline erosion has been an ongoing problem along Lake Superior in Houghton County. Current Michigan DEQ (DNR) erosion studies are almost 35 years old, and new studies are needed to analyze the forces currently at work along Houghton County shoreline and to ensure that current setbacks are adequate for new developments. Potential mitigation activities can be determined with thorough evaluation of current erosion patterns. This work is dependent on direct state assistance which has not been available since the 2005 plan.

Responsible Agency: Houghton County and Michigan DEQ

Deadline: 2015

Cost: Staff time

Potential Funding Sources: State of Michigan-DEQ and others unknown

Benefits: Updated information will enable Houghton County and its residents to identify changing erosion patterns due to the forces of Lake Superior. Changing lake levels make this a priority concern; while levels are down, steps should be taken to identify methods to protect property if and when lake levels rise.

Action Item 13: Community Storm Shelter(s)

Residents of many areas of Houghton County do not have adequate shelter in the event of a severe weather event such as a snowstorm preventing return to residences. The City of Houghton, having a concentrated population, has the greatest need for such a facility, which would be equipped with supplies to sustain occupants for the duration of the event. A shelter could also house displaced residents during an outage of the Portage Lift Bridge. This purpose may be served as a secondary function of an existing facility. One jurisdiction, Calumet Charter Township, is in the process of equipping a shelter (at the Calumet Colosseum).

Responsible Agency: FEMA Hazard Mitigation Grant Program and City of Houghton

Deadline: 2018

Cost: Unknown

Potential Funding Sources: FEMA Hazard Mitigation Grant Program; City of Houghton

Benefits: A shelter will accommodate residents in a carefully controlled way to prevent chaos in the event of a disaster.

Action Item 14: Acquire and Distribute Sump Pumps for Residences

Over 100 residential basements in Calumet Charter Township are regularly affected by flooding. This is due to natural features and can be resolved most effectively through purchase of pumping equipment.

Responsible Agency: Calumet Charter Township

Deadline: 2017

Cost: \$20,000 @ \$200 for each of 100 pumps

Potential Funding Sources: FEMA and local

Benefits: Sump pumps will alleviate flooding concerns which impact residents through no fault of their own.

Action Item 15: Public Information/Education Program

Public information is the key to mitigating many of the potential hazards in Houghton County. A number of projects can help to educate the public on potential hazards and how to protect themselves from hazards. Recommended projects include preparing and gathering education materials on hazards affecting Houghton County and how people can help with mitigation. These materials should be organized and made available at government offices, schools and other easily accessible public facilities as well as on the internet. Topics to focus on include safe open burning (indicated as a concern in Hancock Township) and the implications of an outage of the Portage Lift Bridge (a concern throughout Central and Northern Houghton County).

Responsible Agency: Houghton County Emergency Manager, DNR, MSU Extension, Red Cross

Deadline: Ongoing

Cost: Unknown; staff time and cost of materials & printing

Potential Funding Sources: Organization/agency operating budgets, FEMA, DHS Homeland Security Grant Program, and other federal and state sources

Benefits: Organizing locally applicable materials and making them available to the public ensures that the message is getting out. Through use of newspapers and the internet, the public is easily informed, and the message can be made consistent. This action item helps inform the public and provides assistance to people who want to learn more about property protection and how to reduce their risk.

Action Item 16: Close and remediate Pedersen/Lahti Landfill

Though few designated hazardous materials sites have been identified in Houghton County, this one presents a quandary. The landfill is located in Portage Charter Township in the sensitive Pilgrim River watershed. Funds in escrow are insufficient to fully close and remediate the site, so public funding may be necessary.

Responsible Agency: Portage Charter Township, Houghton County, and DEQ

Deadline: 2015

Cost: Unknown

Potential Funding Sources: EPA Brownfields Program, DEQ, Houghton County/local

Benefits: Hazardous materials incidents and potential public health threats will be alleviated by reducing contamination.

Action Item 17: Review Plans and Development Regulations

Houghton County's Emergency Manager will work with the County Board and County Planning Commission to ensure hazard mitigation is included in ongoing county planning activities. During updates to County plans and regulations, the County will consider actions and recommendations that divert new development from identified hazards, include development standards that ensure

adequate fire and emergency access, require buried utility lines, and promote open space requirements that protect properties from flooding.

As local land use plans, comprehensive plans, zoning, building codes, and other plans and regulations become due for revision, appropriate hazard mitigation provisions will be considered and incorporated.

Responsible Agency: Houghton County Planning Commission and Emergency Manager

Deadline: Ongoing as plans and ordinances are reviewed

Cost: Staff and Commission time

Potential Funding Sources: Organization/agency operating budgets

Benefits: Citizens of Houghton County will benefit from plans that protect new development from known hazards and by awareness of methods of protecting their lands from known priority hazards.

Action Item 18: Insurance

Not all hazards can be mitigated prior to occurrence, but by maintaining insurance, property owners can protect themselves from loss due to hazards. Regular communication and education of the public is necessary to influence consumer behavior.

Responsible Agency: Municipalities, residents, business owners, others

Deadline: Ongoing

Cost: Unknown (specific to site)

Potential Funding Sources: FEMA NFIP, organization/agency operating budgets, and individual property owners

Benefits: All residents benefit by protecting themselves and their community facilities from loss. Conventional insurance policies will protect people from most hazards, while in municipalities participating in the NFIP, residents also have access to flood insurance. The County and municipalities can also educate their citizens on the importance of maintaining adequate property insurance.

4.4 Administrative Action

Action Item: Adopt Hazard Mitigation Plan and Update Regularly

By adopting the Houghton County Hazard Mitigation Plan, the County and its municipalities recognize the need to incorporate hazard mitigation activities into everyday decisions at the County and local level. The plan will be reviewed annually by the Emergency Manager in coordination with the Emergency Operations Plan update to determine whether revisions are needed.

The Hazard Mitigation Plan will be updated every five years in order to address changing priorities and remain eligible for FEMA mitigation funding programs. The Emergency Manager will convene a Hazard Mitigation Committee representing local agencies and concerned parties to evaluate progress and update the plan in accordance with FEMA regulations. The Committee will review the plan to determine the sections that need to be updated or modified based on changing conditions or alterations in State or Federal requirements. Goals, objectives, and strategies will also be reviewed to determine whether they thoroughly address new or changing conditions.

The Emergency Manager will work with Houghton County to update the plan based on Hazard Mitigation Committee and State Hazard Mitigation Officer recommendations. The public will be notified of any plan updates, and copies will be made available at all local government offices and online if feasible. The public will be provided with and notified of comment opportunities during all interim and five-year plan updates.

Responsible Agency: Emergency Manager

Potential Funding Sources: FEMA and organization/agency operating budgets

Benefits: The adoption of the Hazard Mitigation Plan commits Houghton County and its communities to working on mitigation efforts within its boundaries. Through implementation of mitigation strategies in the Plan, the County and municipalities will be actively working to prevent future problems within Houghton County.

Appendix A:
Letters of Intent to Participate

**HOUGHTON COUNTY
BOARD OF COMMISSIONERS**

401 E. Houghton Avenue, Houghton, Michigan 49931
Telephone: (906)482-8307 Fax: (906)482-7238

Chairperson
Paul Luoma
Vice Chairperson
Scott Ala

Commissioners
Dennis Burrelle
Edward Jenich
Anton Pintar

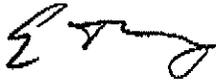
November 18, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern:

Houghton County intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Houghton County will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,



Eric Forsberg,
Houghton County Controller



OFFICERS
ANTHONY BAUSANO, *President*
DEBRA AUBIN, *Treasurer*
JOYCE BAUSANO, *Clerk*
JAMES TERCHA, *Attorney*

TRUSTEES
PAUL COON
DOUGLAS HARRER
JOSEPH MIHAL
JONATHAN PRESSEL
JANE VANEVERA
ABE M. VOELKER

Calumet, Michigan 49913
Phone (906) 337-1713 • Fax (906) 337-5964 • Email: villageofcalumet@pasty.com
SUSAN C. DANA, *Comptroller*

March 17, 2010

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To Whom It May Concern:

The Village of Calumet intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the county's 5-year Hazard Mitigation Plan. The Village of Calumet will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,
VILLAGE OF CALUMET

Anthony Bausano
President

Village of Laurium

March 17, 2010

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Village of Laurium intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Village of Laurium will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,



Edward M. Vertin

Village of Laurium

Village of Copper City
P.O. Box 88
Copper City, MI 49917

Phone: 906-337-4477
Fax: 906-337-4477 Phone First to Secure Fax Line
The Village of Copper City is an Equal
Opportunity Employer and Provider

November 18, 2009

**Re: Letter of Intent to Houghton County 5-year Hazard
Mitigation Plan Update**

To whom it may concern:

The VILLAGE OF COPPER CITY intends to work with the county
Emergency Manager and Western Upper Peninsula Planning and
Development Region to update the County's 5-year Hazard Mitigation
Plan. The VILLAGE OF COPPER CITY will participate in the update
process by reviewing materials and providing comments in the
planning process

Sincerely,



Diana Langdon
Village President
906-369-0986

Village of Lake Linden

401 Calumet Street Lake Linden, MI 49945 An equal opportunity employer

President: Edward R. Fisher
Clerk: Robert Poirier
Treasurer: Jill DuMonthier

March 23, 2010

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To Whom It May Concern,

The Village of Lake Linden intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. The Village of Lake Linden will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,



Edward R. Fisher, Ph. D., President
Village of Lake Linden



VILLAGE OF SOUTH RANGE

45 Trimountain Avenue • PO Box 129 • South Range, MI 49963-0129 • sorange@charterinternet.com
(906) 482-8833 • FAX (906) 482-5190 • TDD 800-433-8505

March 18, 2010

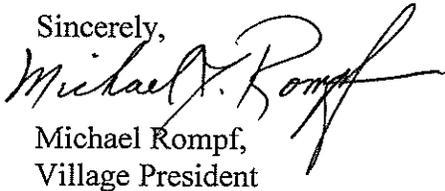
WUPPDR
PO Box 365
Houghton, MI 49931-0365

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

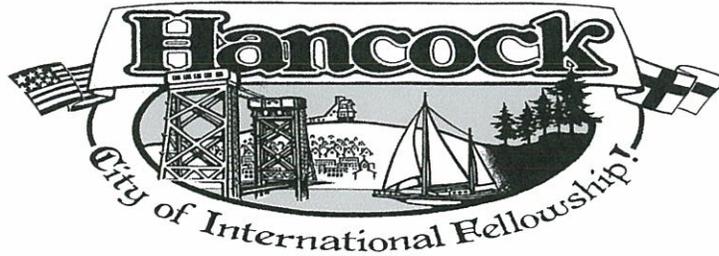
To whom it may concern:

The Village of South Range intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. The Village of South Range will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,



Michael Rompf,
Village President



399 Quincy Street, Hancock, MI 49930 phone: (906)482-2720 fax: (906)482-7910

November 20, 2009

Jim LaMuth
WUPPDR
P.O. Box 365
Houghton, MI 49931

RE: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update.

Dear Jim:

The City of Hancock intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. The City of Hancock will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

A handwritten signature in blue ink, appearing to read "Glenn Anderson", is written over the word "Sincerely,".

Glenn Anderson
City Manager

-The City of Hancock is an Equal Opportunity Provider & Employer-



CITY OF HOUGHTON

BIRTHPLACE OF PROFESSIONAL HOCKEY

City Center

616 Sheldon Avenue • P.O. Box 606

Houghton, Michigan 49931

(906) 482-1700

www.cityofhoughton.com

November 18, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

The City of Houghton intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. The City of Houghton will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

Scott MacInnes

City Manager

HOME OF MICHIGAN TECHNOLOGICAL UNIVERSITY

The City of Houghton is an Equal Opportunity Provider and Employer

TOWNSHIP OF ADAMS
HOUGHTON COUNTY

17104 FIRST STREET-BALTIC

PO BOX 520

SOUTH RANGE, MI 49963

PH: (906) 482-4420

SUPERVISOR: DENNY MULARI

FAX: (906) 482-1073

CLERK:

TDD: (800) 649-3777

TREASURER: NANCY IMMONEN

TRUSTEE: DAVID MATTILA

TRUSTEE: DEBBIE PINDRAL

March 18, 2010

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Adams Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Adams Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,



Denny Mulari

Supervisor



CHARTER TOWNSHIP OF CALUMET

HOUGHTON COUNTY

25880 RED JACKET ROAD • CALUMET, MICHIGAN 49913
906-337-2410

March 23, 2010

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To Whom It May Concern,

The Charter Township of Calumet intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. The Charter Township of Calumet will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

Paul Lehto

Supervisor

Charter Township of Calumet

The Charter Township of Calumet is an Equal Opportunity Employer
Complaints of discrimination should be sent to:
USDA, Director of Civil Rights Washington, D.C. 20250-9410

**Chassell Township
P.O. Box 438
Chassell, Michigan 49916**

November 25, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Chassell Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning Development Region to update the County's 5-year Hazard Mitigation Plan. Chassell Township will participate in the update process by reviewing materials and providing comments in the planning process.

Todd Van Kleeck, Supervisor
Chassell Township

ELM RIVER TOWNSHIP
32850 HWY M-26
TOIVOLA, MI 49965



Office Phone and Fax - 906-288-3323

March 18, 2010

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Elm River Township intends to work with the Houghton County Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Elm River Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Deborah A. Maki'.

Deborah A. Maki, Supervisor
For the Elm River Township Board



Franklin Township

48991 MAPLE STREET P.O. BOX 297 HANCOCK, MICHIGAN 49930
(906) 487-9073 PHONE AND FAX

*Glenn Ekdahl, Supervisor
Mary Brunet, Clerk
Judith Counts, Treasurer*

*John Laitinen, Trustee
Dan Meyers, Trustee*

November 18, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Franklin Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Franklin Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

A handwritten signature in black ink that reads "Glenn Ekdahl". The signature is written in a cursive, flowing style.

Glenn Ekdahl
Supervisor

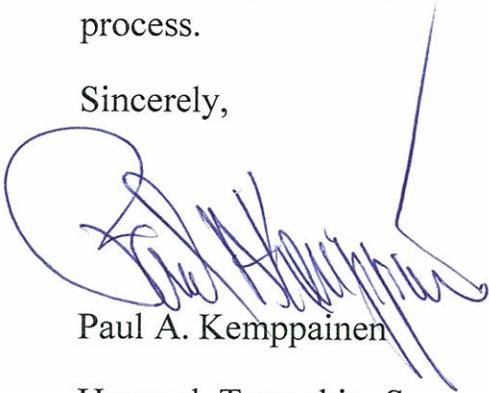
November 20, 2009

**Re: Letter of Intent to Houghton County 5-year Hazard Mitigation
Plan Update**

To whom it may concern:

Hancock Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Hancock Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,



Paul A. Kempainen

Hancock Township Supervisor

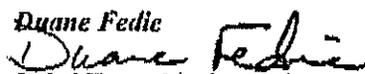
November 18, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Laird Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. **Laird Township** will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

Duane Fedie

Laird Township Supervisor

Steven Karpiak, Supervisor
Judy Odgers, Clerk
Mary Ringler, Treasurer
Bonnie Joyal, Trustee
Aaron Janke, Trustee



Box 437 • 48545 Main Street
Dollar Bay, MI 49922
Phone (906) 482-8578
Fax (906) 482-8596
TDD: (800) 649-3777

e-mail: otsecretary@charterinternet.com

December 14, 2009

**Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan
Update**

To Whom it may concern:

Osceola Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Osceola Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

A handwritten signature in black ink that reads "Steve J. Karpiak". The signature is written in a cursive style.

Steve Karpiak, Supervisor
Osceola Township

SK/djs

CHARTER TOWNSHIP OF PORTAGE

Houghton, Michigan

"Progress our Goal"

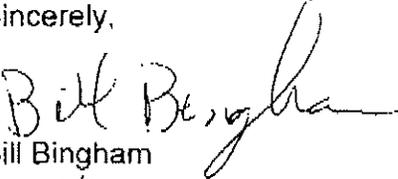
November 24, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To Whom It May Concern:

Portage Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Portage Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,



Bill Bingham
Supervisor

47240 Green Acres Road, Houghton, Michigan 49931

Phone: (906) 482-4310 • Fax: (906) 482-4942

TDD: (800) 649-3777 • Tax ID# 38-6006265

The Charter Township of Portage is an Equal Opportunity Provider and Employer

Jim LaMuth

From: Glenn North [gnorth@charter.net]
Sent: Thursday, November 19, 2009 10:25 AM
To: Jim LaMuth
Subject: Re: Requesting Letter of Intent for County Hazard Mitigation Plan Update

Quincy Township
Hancock, Michigan 49930

November 18, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Quincy Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan [Quincy Township] will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

Glenn P North

*Supervisor
Quincy Township*

SCHOOLCRAFT TOWNSHIP

Office: 226 Front Street – Lake Linden, Michigan 49945

Phone: 906-296-8721 – Fax 906-296-9106

CHARLES R. HEIDE, Clerk
DENNIS RACINE, Treasurer

OMER BROOKS, Supervisor

SUSAN C. MARCOTTE, Trustee
JOEL KERANEN, Trustee

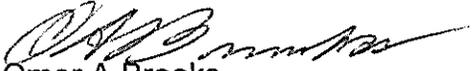
April 23 2010

Re; Letter of Intent to Houghton County 5-year Hazard
Mitigation Plan Update

To whom it may concern,

Schoolcraft Township intends to work with the county
Emergency Manager and Western Upper
Peninsula Planning and Development Region to update the
County 5 Year Hazard Mitigation
Plan. Schoolcraft Township will participate in the update
process by reviewing materials and
comments in the planning process.

Sincerely,



Omer A Brooks

Supervisor

Stanton Township
14010 Liminga Road
Atlantic Mine, MI 49905

November 18, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To whom it may concern,

Stanton Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan. Stanton Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

A handwritten signature in black ink, appearing to read "David Chard". The signature is fluid and cursive, with a large initial "D" and a long, sweeping underline.

David Chard

Stanton Township Supervisor

Brian Cadwell, Supervisor
 Karen Rovano, Clerk
 Diane Zurcher, Treasurer
 Lou Ambuehl, Trustee
 Denise Lepisto, Trustee



52235 Duncan Ave.
 P.O. Box 429
 Hubbell, MI 49934
 Phone: (906) 296-0214
 Fax: (906) 296-0214

November 19, 2009

Re: Letter of Intent to Houghton County 5-year Hazard Mitigation Plan Update

To Whom It May Concern:

Torch Lake Township intends to work with the county Emergency Manager and Western Upper Peninsula Planning and Development Region to update the County's 5-year Hazard Mitigation Plan.

Torch Lake Township will participate in the update process by reviewing materials and providing comments in the planning process.

Sincerely,

Brian Cadwell
 Torch Lake Township Supervisor