2025-2030

Multi-Hazard Mitigation Plan

UPDATED BY:
MICHIGAN TECHNOLOGICAL UNIVERSITY
FACILITIES MANAGEMENT

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Michigan Technological University

Multi-Hazard Mitigation Plan

October 2024

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Western Upper Peninsula Planning & Development Region, October 2008

Contents

SECTION 1: Introduction

This section is a general introduction to the 2025 Michigan Technological University Multi-Hazard Mitigation Plan. It consists of four sections:

- Background
- Purpose
- Scope Areas
- Authority

Background

Natural and human-caused disasters occur across the world and university campuses are impacted by injuries, property damage, and interruption of university services when hazard events occur. The time, money, and efforts to recover from these disasters exhaust resources, diverting attention from important University programs. Hazard mitigation is the process of taking action to reduce the risk to human life and property from future natural, technological, and human-caused hazards. Hazard mitigation is about acting proactively, and when successful, will lessen negative impacts to such a degree that future events could remain incidents instead of culminating into disasters.

The Federal Emergency Management Agency (FEMA) directs the hazard mitigation plan approval and regulation as well as providing disaster response funding and services. FEMA has created an extensive set of guidelines and methods for developing hazard mitigation plans and approving them. This is to ensure that every plan stays updated with relevant information and includes new issues as they arise. The hazards that affect one area may change in quantity or severity over time, especially as climate change and other factors impact aspects of our communities. It is thus important to consider human-caused and natural events as they occur by incorporating them into hazard mitigation plans.

Michigan Tech is a top research facility and deals with various hazardous materials to carry out research. In addition to the June 2018 flood event, the COVID pandemic in 2020 and the attempted bombing of the Forestry Building and the U.S. Forest Service Building in 2001 are prime examples of the necessity for a multi-hazard mitigation plan at Michigan Tech. Our eight (8) Colleges and Schools develop, apply, and communicate science, engineering, technology, computing, business, and mathematics in more than 120 undergraduate and graduate degree programs.

Historically, Michigan Tech and the surrounding area appear to be relatively safe from disasters, however, the threat always exists. The area is vulnerable to rapidly changing weather conditions and is not immune to serious disasters. A University community is unique in that it functions as a community within a community. It is a workplace and research facility for faculty and staff, a home and place of learning for students, a cultural hub for the cities of Houghton and Hancock, and a place of recreation and sport for locals and visitors. Founded in 1885, Michigan Technological University is a public research university, with a population of 7,430 students and over 1,600 faculty and staff, and the University has a major economic impact on the surrounding communities. In fact, Michigan Technological University is a significant economic component of the entire region. Keeping the University open and functioning is crucial.

Michigan Tech is nationally ranked in several areas and programs. Recent rankings include:

- US News: Michigan Tech ranked 40th for best engineering colleges in America (2023)
- MLive.com: Michigan Tech ranked 82nd nationally for best engineering schools (2023)
- Niche.com: Michigan Tech ranked 1st for best colleges with no application fee in Michigan (2022)
- Niche.com: Michigan Tech ranked 2nd for the best value colleges in Michigan (2022)
- US News & World Report: Graduate rankings: Environmental Engineering (38th), Mechanical Engineering (53rd), Biomedical Engineering (63rd), Electrical Engineering (92nd), and Computer Engineering (95th). (March 2019)
- SmartAsset: Michigan Tech ranked 1st in Michigan comparing the cost of a college education to graduates' average starting salaries (2018)

Total expenditures and other financial information for Michigan Tech for the year ending June 30, 2023, are listed below.

Total expenditures	$296,062,708
State appropriation	$96,816.078
Tuition and fees	$106,273,332
Grants and contracts	$69,269,326
Auxiliary and other revenues	$36,828,437
Gifts raised	$44,828,465
Endowment	$155,891,037

Purpose

Mitigation is essential in the emergency management process. The university and local community respond when disaster strikes, but often the response is focused on repairs and reconstruction to restore the damaged area to pre-disaster conditions as quickly as possible. These efforts expedite a return to "normalcy," yet replication of pre-disaster conditions leaves the university vulnerable to the same hazards, resulting in a cycle of damage, reconstruction, and damage again. The goal of hazard mitigation is to break this cycle by analyzing the damages before reconstruction takes place to produce a repair process that allows for sounder and less vulnerable conditions.

The general purpose of this Multi-Hazard Mitigation Plan is to:

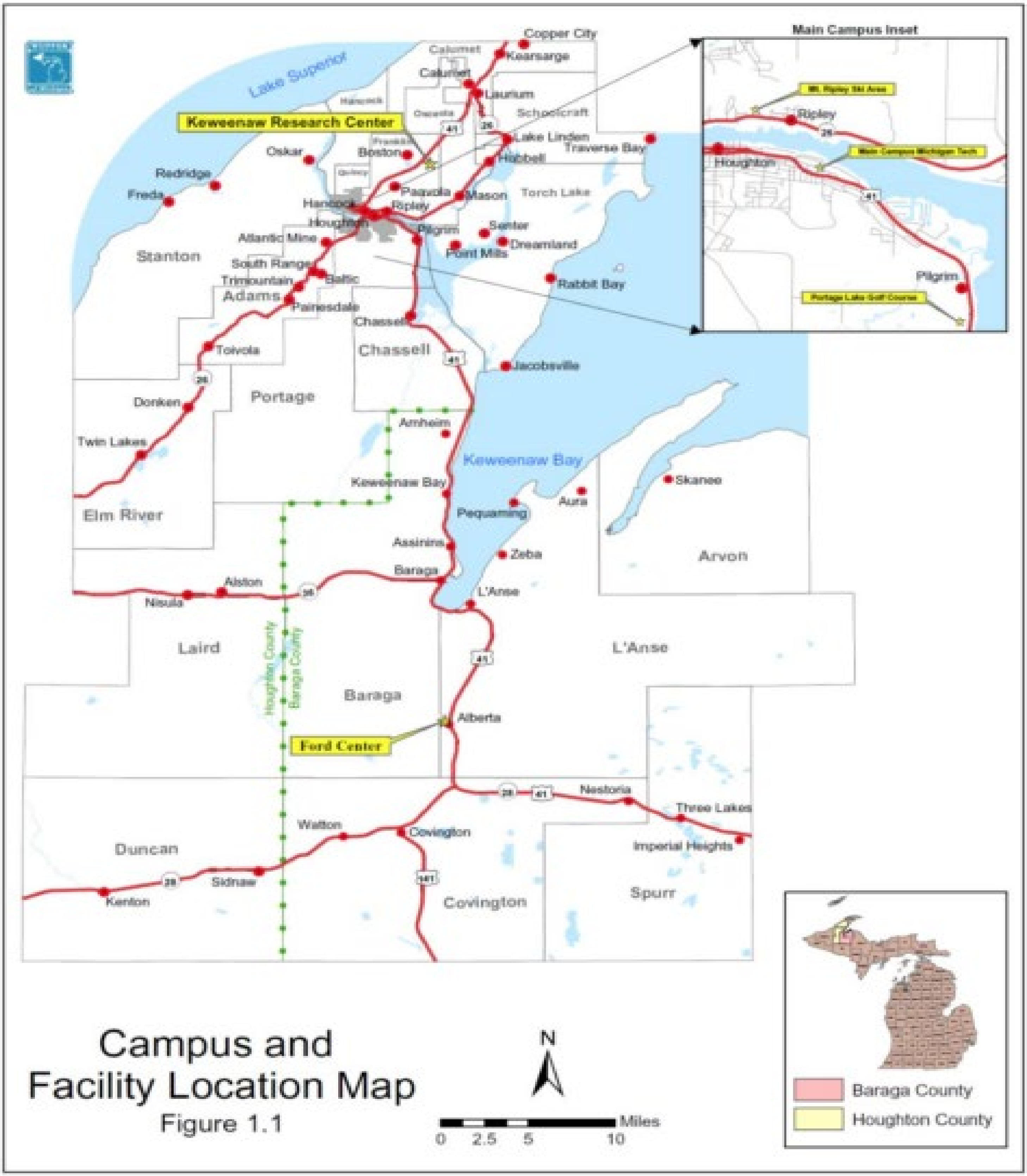
- Identify and mitigate natural hazard issues now, so the campus will be better prepared.
- Protect life and property by reducing the potential damages and economic losses that could result from future hazard events.
- Demonstrate a commitment to hazard mitigation principles.
- Qualify for Federal Emergency Management Agency (FEMA) grant funding.

Additionally, hazard mitigation activities reduce the costs incurred when disaster strikes. Costs include, but are not limited to, human life and injury, property damage, compromise of valuable research, loss of instruction, student and teacher departures, increases in insurance premiums, and reduced community involvement. When a university closes and/or incurs costs due to disasters, the local community inevitably suffers as well. The university-community relationship is more important when the university is located in a small city in a rural isolated area. Hazard mitigation is accomplished through the coordination of resources, programs, and authorities.

Scope-Areas

Michigan Tech consists of multiple holdings located on the main campus and off. The main area of focus for this plan will be the main campus located at 1400 Townsend Drive, Houghton, MI 49931. Two other university facilities were considered for select hazards in the 2008 plan: Ford Center located in Alberta in Baraga County; and Keweenaw Research Center (KRC) located at 23620 Airpark Blvd., Calumet.

In the 2020 plan update, an additional university facility was considered for select hazards:
Mont Ripley Ski Area, located at 49051 Ski Hill Road in Hancock across the Portage Canal from the Main campus. These added sites will continue to be included and considered in the 2025 plan update. Additional sites have also been added, including Portage Lake Golf Course (PLGC) located at 46789 US-41 in Houghton, MI, and Advanced Power Systems Research Center (APSRC), which is adjacent to the Keweenaw Research Center (KRC), located at the at 23199 Airpark Blvd in Calumet, MI. These locations can be viewed in Figure 1.1 which shows the locations of Houghton and Baraga Counties in relation to the State of Michigan.



Campus and Facility Location Map
Figure 1.1

Authority

The Michigan Technological University Multi-Hazard Mitigation Plan was created in 2008 to protect the health and safety of students, faculty, staff, and visitors. It was created to reduce damages to property, research, instruction, and to minimize economic hardship for the university and the surrounding community by identifying the mitigation activities that can be undertaken both by the university and the local area. In 2020, the University updated its plan after it had lapsed for several years. Hazards on campus were reviewed and actions revised, based on current needs and available resources, which included new technologies. In 2024, the University updated its plan again in accordance with the plan maintenance schedule defined in Section 9 of the 2020 plan.

This document is intended to educate university officials about the hazards and vulnerabilities at Michigan Tech and to provide a comprehensive reference document for planning and mitigation activities. A FEMA-approved mitigation plan is a condition for receiving certain types of non-emergency disaster assistance, including post-disaster funding under the Hazard Mitigation Grant Program.

This Michigan Tech Multi-Hazard Mitigation Plan was created in accordance with current state and federal rules and regulations governing local hazard mitigation plans. This document shall be monitored as outlined in Section 8 of the plan and updated on a 5-year basis to maintain compliance as required by FEMA.

Michigan Technological University has adopted this Multi-Hazard Mitigation Plan in accordance with the authority and adoption powers granted to them by the State of Michigan Board of Education. The University will continue to strive to integrate hazard mitigation planning into its other University plans and processes where appropriate. Michigan Tech's Facilities Management Planning and Construction department has the overall responsibility for implementation and monitoring of this plan.

SECTION 2: Planning Process

This section of the Multi-Hazard Mitigation Plan describes the mitigation planning process completed by Michigan Technological University. It consists of the following categories:

- Overview of Hazard Mitigation Planning
- History of Hazard Mitigation Planning at Michigan Technological University
- Preparing the 2025 Plan
- The Planning Team
- Public Involvement
- Critical Vulnerability Assessment
- Plan Overview

Overview of Hazard Mitigation Planning

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-caused hazards. This is accomplished through the coordination of resources, programs, and authorities. When successful, mitigation will lessen the impacts of hazards to such a degree that future events will remain incidents rather than culminate into disaster.

Hazard mitigation planning is a process of organizing resources, developing goals for hazard mitigation at the university-level, identifying and assessing hazard risks, and determining how best to minimize/manage those risks. The process results in a hazard mitigation plan that identifies special mitigation actions that achieve both short- and long-term planning objectives. Plan maintenance procedures are established for routine monitoring of implementation progress, as well as evaluation and enhancement of the plan itself. These procedures ensure that Michigan Tech's Multi-Hazard Mitigation Plan remains a current, dynamic, and effective planning document over time.

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, ensuring that post-disaster repairs and reconstruction take place after damage is analyzed and that sounder, less vulnerable conditions are produced. Mitigation planning offers many other benefits as well, such as:

- Protect public safety and prevent loss of life and injury.
- Reduce harm to existing and future development.
- Maintain university continuity by minimizing operational downtime and accelerate recovery after a disaster.
- Reduce the costs of disaster response and recovery.
- Help accomplish other university objectives, such as capital improvements, resource protection, open space preservation and green infrastructure installation, and economic resiliency.

Having a hazard mitigation plan will increase awareness of hazards, risk and vulnerabilities; identify actions for risk reduction; focus resources on the greatest risks; and communicate priorities.

History of Hazard Mitigation Planning at MTU

This plan serves as the third hazard mitigation plan for Michigan Technological University. Michigan Tech began its first hazard mitigation planning process in 2005 in response to FEMA's Disaster Resistant University (DRU) program. The DRU initiative was created as an outreach of FEMA's Project Impact Program to help universities develop actions to improve the safety of life and continuity of operations in the face of a natural disaster. Michigan Tech was awarded funds during the 2005 Fiscal Year. As a result, the Michigan Tech Disaster Resistant University Committee was created to align the mission, vision, and goals of the university to the purpose of the Hazard Mitigation Plan; the committee was charged with helping guide the process of the 2008 plan creation. The committee used FEMA resources, including hazard mitigation planning handbooks and seminars. Michigan Tech's Facilities Management department collaborated with Western Upper Peninsula Planning & Development Region (WUPPDR) to create the initial 2008 hazard mitigation plan.

In 2018, University leadership recognized the need for an updated FEMA-approved Hazard Mitigation Plan to be used as the basis for prioritizing and addressing potential risks to human life and property and as a prerequisite for mitigation grant opportunities. Because most members of the Michigan Tech DRU Advisory Committee were no longer available, the University assigned a new team to review and update the plan, seek and complete FEMA approval of the plan update, and provide recommendations for specific mitigation projects to reduce or eliminate the long-term risk to human life and property from natural hazards. Facilities Administration & Planning at Michigan Tech was charged with leading the development of an updated hazard mitigation plan in compliance with federal and state requirements for university use in seeking grant opportunities for mitigation planning and campus hazard mitigation projects. Development of the 2020 Multi-

Hazard Mitigation Plan began with a review of the 2008 plan by a new committee, which was formed specifically to update the plan. The committee met regularly from December 2018 – October 2019 to identify new projects that addressed existing and newly identified hazards. Public input on the draft was sought in May 2019 and again in October 2019. The approved plan was adopted by the University on January 15, 2020.

The planning process for the 2025 Michigan Technological Multi-Hazard Mitigation Plan was initiated in May 2022 when the university submitted a Hazard Mitigation Grant Program funding proposal (HMGP 4494) to the Michigan State Police. This funding application was awarded March 10, 2023. In May 2023, a Hazard Mitigation Steering Committee was created with representatives from across campus with a variety of different expertise areas to guide the plan update. The steering committee got to work immediately by reviewing the proposed planning process and developing a schedule for updating the university's plan.

Also, community emergency officials and leadership from the Houghton area were notified that Michigan Tech was working on its Hazard Mitigation Plan update and that their input would be valuable, including Chris VanArsdale – Emergency Management Coordinator for Houghton and Keweenaw Counties, Eric Waara – City Manager for City of Houghton, and Regional Planners from Western Upper Peninsula Planning and Development Region (WUPPDR).

Preparing the 2025 Plan

Hazard mitigation plans are required to be updated every five years to maintain eligibility for certain state and federal mitigation funding. In preparation for the 2025 Multi-Hazard Mitigation Plan update, Michigan Technological University applied to be a subrecipient of grant funding to financially assist the university in updating its plan. Michigan Tech followed the mitigation planning process recommended by FEMA and Michigan State Police - Emergency Management & Homeland Security Division (EMHSD).

The Multi-Hazard Mitigation Plan was developed using a multi-step approach, involving all stakeholders in the planning process. A steering committee was formed to aid in the updating process which provided the opportunity for all areas of campus to have input through selected representatives. The planning process began with the current plan being evaluated for effectiveness and appropriateness by addressing the following questions:

1. Do the Hazard Mitigation Plan goals and objectives continue to address current and expected conditions?
2. Has the nature or magnitude of risks changed?

3. Are there any implementation problems that impede the action plan?
4. What implementation outcomes have been completed?
5. What resources are available for future Hazard Mitigation Plan implementation?
6. How can we best incorporate socially vulnerable, underserved populations?

The Houghton County Hazard Mitigation Plan was reviewed extensively to incorporate relevant material into the University plan update. Prior to going out for public comment, the final draft of this plan was shared with local officials in Houghton including Eric Waara, City Manager of Houghton; Chris Van Arsdale, Local Emergency Management Coordinator for Houghton County; and Regional Planners with Western U.P. Planning & Development Region (WUPPDR).

For in-depth information about how the previous versions of this plan were developed, it will be necessary to review the previous versions of this plan. Plan update and review procedures were established in the previous versions of this plan and were used to prepare the 2025 update.

The Planning Team

To guide the development of the plan update, the university established a Hazard Mitigation Plan Steering Committee. While remaining consistent with the initial plan developed in 2008, it was important to reach out to more stakeholders to get a better representative sample of critical staff, university officials, and emergency personnel.

Hazard Mitigation Plan Steering Committee	
Name	**Representing Department**
Lori Weir	Project Manager, Hazard Mitigation Plan Update
Corey Voelker	Michigan Tech Student (HMP Project Intern)
Robert Garnell	Facilities Operations
Gregg Richards	Facilities Management / Campus Master Planning
Erik Crowley	Auxiliaries / Portage Lake Golf Course
Matthew Weekley	Residential Housing
Kellie Raffealli	Student Affairs
Josh Olson	Information Technology
Brian Cadwell	Public Safety and Police Services
John Velat	Risk Management / Office of General Counsel
Alan Turnquist	Office of Sustainability & Resilience
Kathy Halvorsen	Academics / Provost’s Office / Research

This committee gathered for monthly meetings from September 2023 through plan adoption in early 2025. All meetings were open to the public and the public was notified of meetings dates, time and location via postings on the Michigan Tech Hazard Mitigation Planning webpage, notices placed in Tech Today, and email invites sent out to the student government groups on campus (USG – Undergraduate student Government and GSG – Graduate Student Government).

Monitoring and annual review of this plan will be handled by Facilities Planning and Construction, with the guidance of the Hazard Mitigation Steering Committee, as noted in Section 8: Action Plan.

Public Involvement

Public participation was an important component of the mitigation planning process. Input from the campus community (e.g., students, faculty and staff) provided the planning team with a greater understanding of local concerns and increased community investment, increasing the likelihood of successfully implementing mitigation actions. As members of the campus community become involved in decisions that affect their safety, they are more likely to recognize hazards present on campus, and the other facilities covered by this plan, and take the steps necessary to reduce their impact. Public awareness is a key component of any university's overall mitigation strategy aimed at making university properties safer from the potential effects of hazard events.

In 2008, during the drafting of the original plan, the participation of the public was encouraged from the onset of the process. A press release was published in various university publications, posted on Michigan Tech's website, and distributed to the local media (newspaper, radio, and television). Additionally, the local Houghton-based newspaper, The Daily Mining Gazette, published a story highlighting the project. As a result of the press release a private consultant, Craig Holmes owner of Green Oak Solutions, LLC, contacted Michigan Tech and WUPPDR expressing interest in the planning process. Holmes, a Michigan Tech alumnus, donated 100 professional consulting hours towards the development of the 2008 plan. Holmes has over 25 years of experience in risk management, business continuity planning, and property risk control and offered valuable insight during the process. Advisory Committee meetings were open to the public, and comments from the community were solicited again after the draft plan was complete and announced for review in a second press release on campus and a public notice in the local newspaper.

In 2019, while updating the plan, working committee meetings were open to the public. University departments, staff, faculty, and students were asked for input and comment. Public feedback was solicited from the campus community in May and again in October by articles posted in Tech

Today as well as an announcement on the University website. We published a request for public review and feedback of the 2020 updated plan in *The Daily Mining Gazette* (the local Houghton newspaper) in October. As a result of this notice, we received positive feedback regarding our plan from Eric Waara, City Manager of Houghton, as well as Craig Holmes, Michigan Tech Alumni and owner of Green Oak Solutions, LLC. As mentioned above, Mr. Holmes was involved in providing consultation for the original plan in 2008. Mr. Holmes shared very positive feedback on the 2020 plan, saying, "Maintaining a consistent approach across risk identification, quantification, and mitigation planning is critical to the process and this plan does a good job with that."

Public involvement during the development of the 2025 Michigan Tech Multi-Hazard Mitigation Plan was sought using six methods:

1) public meetings during the planning process,
2) a public webpage that shared meeting information including dates, times, locations, agendas and other information,
3) a public survey (copy of survey and survey results are in Section 9: Appendix B),
4) presentations educating the campus on hazard mitigation and the planning process, and soliciting input from student groups,
5) targeted emails to university students (Green Campus Enterprise Student Organization, Undergraduate Student Government, Graduate Student Government, Student Scoop Weekly Student Newsletter), and
6) electronic and hard copies of the draft plan were made available and advertised for public review and comment in September 2024.

To involve a wide range of stakeholders, Michigan Tech made a significant effort to broadly distribute the public survey, advertise public meetings and solicit comments on the draft plan. University officials, students, faculty, staff and community members were provided opportunities to be involved and offer input throughout the mitigation planning process. In order to include underserved populations on campus, we scheduled meetings at varying times in handicapped-accessible locations as well as including Zoom as an option to make accessibility easier for many.

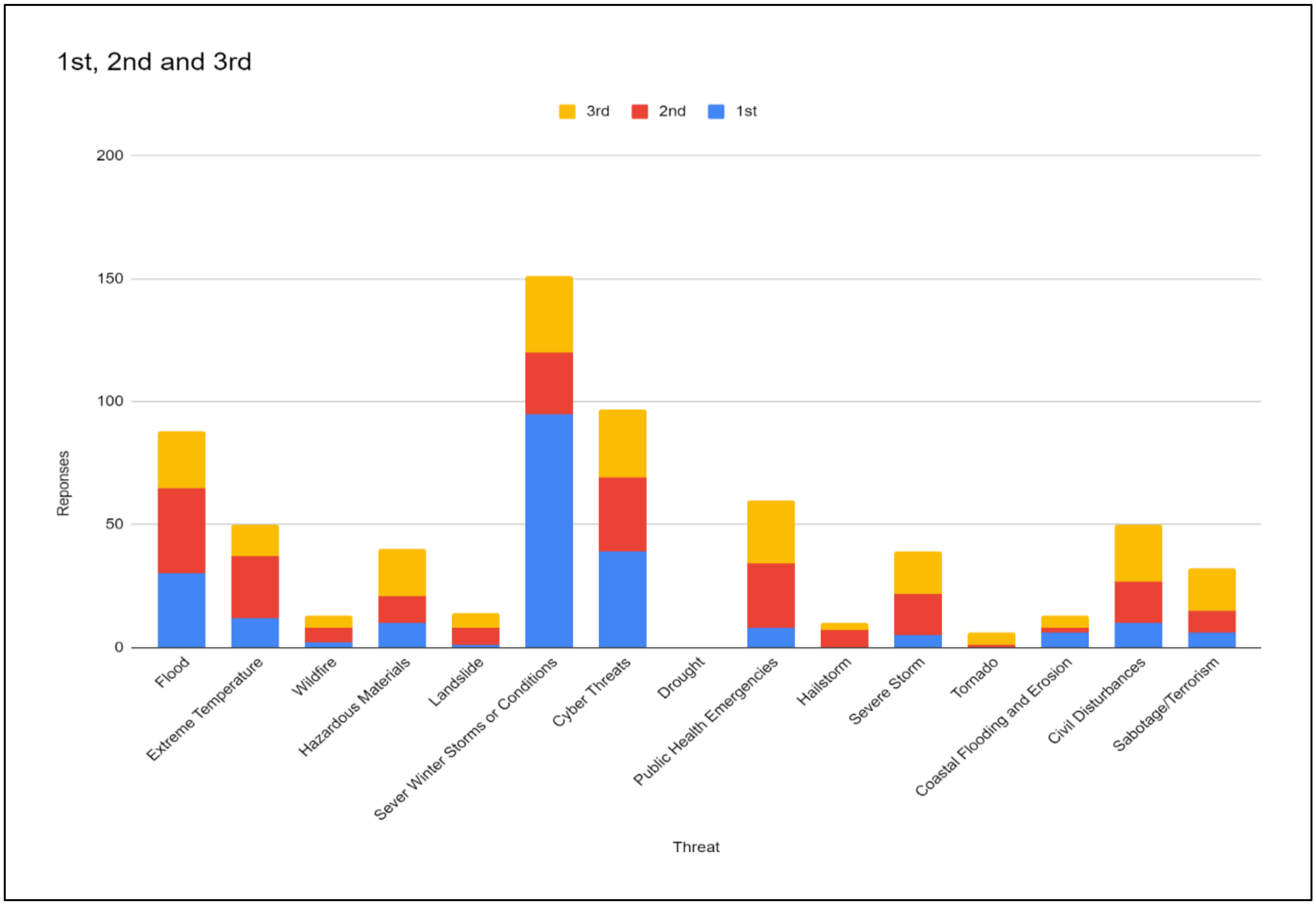
Public comment on the draft plan was sought throughout the month of September 2024. Feedback was received from Houghton County community officials, University faculty and students. As a result of this feedback, the Hazard Mitigation Plan Steering Committee revisited the proposed mitigation activities to determine why Fisher Hall (an academic building that houses the university's largest lecture hall, which seats 476) was not included as a location to install a fire suppression/sprinkler system. In reviewing the 2024 Building Assessment, it was noted that this building is "non-sprinklered". The Steering Committee reviewed classroom utilization as well as the fact that the lecture hall is used on weekends for activities and determined that this did warrant proposing a mitigation project within this facility. The project was estimated, priority ranked and added to the 2025 Proposed Mitigation Action Plan. Additional feedback included praise for the inclusion of Cyber Threats as its own category, and the forward-looking details included in the Climate Change Considerations sections.

As part of the public comment period, Lori Weir (Project Manager for the Hazard Mitigation Plan update) met with the Green Campus Enterprise. Green Campus Enterprise is a registered student organization whose goal is to annually measure the carbon footprint of Michigan Tech and design and implement projects to improve the sustainability of the Michigan Tech campus. Green Campus Enterprise has agreed to lead a project in which they study some areas on campus that are prone to excessive standing water following heavy rains and propose a nature-based solution to mitigate the issue. The student organization also plans to take a more active role in annual reviews of the Hazard Mitigation Plan as well as future plan updates.

Copies of the press releases, newspaper articles, and public notices from 2008, 2019, and 2023/2024 are located in Section 9: Appendix A.

<u>Public Participation Survey</u>

Campus community members provided input on the mitigation planning process by responding to a public participation survey. The survey captured information from those who were unable to participate in meetings or through other means in the mitigation planning process. A link to an electronic version of the survey was posted and advertised via the university hazard mitigation webpage, in Tech Today (the university daily newsletter), on local radio stations, and on fliers posted throughout the community. Public survey links were also disseminated by Steering Committee members to their departments and student organizations that they worked with. 260 people completed the survey with a fairly even distribution of faculty, staff, students and community members. One question survey participants were asked was "what are the three hazards that pose the highest threat to the university". The top five responses were severe winter storms, cyber threats, flood, civil disturbance, and public health emergencies.



Survey participants also addressed their concern about Michigan Tech being impacted by climate change with 64% saying they were "concerned", and 25% saying they were "extremely concerned".

The Steering Committee used the survey information to review the risk level of identified hazards, prioritize mitigation activities around these concerns, as well as to plan for future education and outreach to the campus specifically related to the top five hazard concerns. They discussed the incorporation of socially vulnerable and underserved populations in order to reach equitable outcomes.

Critical Vulnerability Assessment

Beginning in January 2024, Michigan Technological University contracted with OHM Advisors to perform a critical vulnerability assessment on campus buildings and a stormwater drainage assessment of the underground drainage systems on the university's main campus. The stormwater drainage assessment reviewed locations of storm structures and areas of retention/detention on the main campus and theorize how the stormwater drainage system might hold up during potential extreme weather events, such as flash flooding, urban flooding, extreme spring thaw. Potential solutions will be identified. The critical vulnerability assessments would include the inspection of 46 buildings on the main campus, 13 buildings at the Keweenaw Research Center (KRC), 33 buildings at the Ford Center and Forest, and the buildings and grounds at Portage Lake Golf Course, Mont Ripley and the Tech Trails.

The final project deliverable consisted of two reports that documented issues/concerns, provided possible solutions based on current population and usage, and provided a budget estimate for some long-term planning solutions. These reports were utilized by the Steering Committee to identify the best solutions to address the vulnerabilities that were cited during these assessments in the 2025 plan update. Copies of these assessments are in Section 9: Appendix D of this plan.

Plan Overview

This report is divided into 9 sections, which present the information and resources that assist in understanding the potential hazards that could affect the university, the university's risk and vulnerability associated with identified hazards, and a mitigation strategy to reduce the university's risk and vulnerability. The sections are as follows:

Section 1: Introduction

The Introduction presents the background and purpose of the plan, briefly introduces the university, and details the scope areas of the plan.

Section 2: Planning Process

The Planning Process provides an overview of hazard mitigation and hazard mitigation at Michigan Technological University. It details the steps of creating a hazard mitigation plan as well as involving the public in the process. It summarizes the actions needed to create a well-rounded plan and provides an overview of the sections of Michigan Tech's Multi-Hazard Mitigation Plan.

Section 3: Community Profile

This section describes the region in terms of demographics, geography, climate, industry, community development, transportation networks, and emergency facilities. It demonstrates some of the distinctive issues the university faces in terms of being located in an isolated rural environment.

Section 4: University Profile

This section details Michigan Tech through its history, growth, mission, population, structure, and curriculum. Furthermore, it presents the impact the university has on the region socially, economically, and culturally.

Section 5: Hazard Identification

The Hazard Identification section outlines all potential natural, human-caused, and technological hazards that could impact Michigan Tech.

Section 6: Hazard Analysis & Risk Assessment

The hazards were originally analyzed and ranked based on a 2001 risk assessment that considered the frequency of previous occurrences and impacts. They have been updated by assessing occurrences within the past 5 years as well as the potential impacts of climate change. Vulnerability to future events was also analyzed, in terms of potential impact, susceptibility, and exposure. A critical vulnerability assessment of campus infrastructure was completed by an outside contractor. The results and recommendations from their reports were used to identify, analyze, and prioritize mitigation activities. The committee also reviewed and considered processes and policies already implemented by the university to mitigate future hazard occurrences.

Section 7: Hazard Mitigation

This section summarizes the mitigation plan and mitigation goals. Mitigation actions are explained and prioritized, and a framework for future action is outlined. Potential funding sources for these actions are analyzed. The Mitigation Strategy presents Michigan Tech's mitigation goals, potential mitigation techniques, and an action plan. The action plan consists of specific projects identified by plan stakeholders and evaluated by Michigan Tech's Hazard Mitigation Plan Steering committee.

Section 8: Action Plan

This section describes how Michigan Tech will ensure the plan's implementation and maintenance. Also included are considerations for updating the plan, continuing public involvement, and identifying the party responsible for maintaining and implementing the plan in the future.

Section 9: Appendices

This section includes resources used to update the plan as well as public outreach information, meeting agendas, vulnerability assessment, and hazard priority ranking benchmarks.

Additionally, the 2025 update includes a reformat of the document with section titles, along with the addition of several subsections and additional details outlining the possible impacts of climate change.

SECTION 3: Community Profile

This section of the Multi-Hazard Mitigation Plan provides a general overview of Houghton County. It consists of the following subsections:

- Community Background
- Population & Demographics
- Geography & Environment
- Employment & Industry
- Housing & Community Development
- Transportation Network
- Police, Fire, & Emergency Facilities

Community Background

Michigan Tech rests on the Portage Canal in the City of Houghton, in Houghton County located in Michigan's Upper Peninsula. The City of Houghton lies on the southern portion of the Keweenaw Peninsula, a 50-mile-wide stretch of land that extends 75 miles out into Lake Superior (see Figure 2.1: Regional Location Map). Houghton's sister city, Hancock, lies on the opposite side of the canal. The Cities of Houghton and Hancock are known as the area's cultural center due to the influence of both Michigan Tech, whose beginning was born during the area's 'Copper Boom'.

The area is rich in mining history with Houghton sitting at the center of the world's largest deposit of native copper. Archaeological evidence suggests that this copper was mined by Native Americans in the Keweenaw continuously from about 3,000 B.C. through the 16th century. The 'Copper Rush' began in the 1840s after Michigan's State geologist Dr. Douglass Houghton released information on the area's deposits.

The region soon became industrialized and drew a labor force from all over Europe. The result of the mined copper decreased the country's dependence on British copper, and by the Civil War, Keweenaw Copper was in huge demand. In 1885, the Michigan Mining School, today known as Michigan Technological University, was founded in Houghton to help meet the area and national demand for mining engineers.

The success of copper mining continued through the turn of the century, bringing along wealth and jobs. It was not until the 1910s that the copper mines started to decline due to the fact that most of the copper was deep in the ground and difficult to access. Additionally, copper could be mined at lower costs elsewhere in the country. World War I brought the last surge for copper in the area, but by the 1960s all efforts were abandoned.

As in the rest of the country, the remote Copper Country became steeped in cultural diversity from the draw of immigrants seeking wealth and prosperity during the 'Copper Boom.' The majority came from England, Ireland, Italy, Finland, France, Germany, and the Slavic nations. Today the area is a social patchwork reflecting the copper mining days represented in the old mine buildings, fire halls, churches, fishing communities, cemeteries, residential districts, and universities.

Population & Demographics

Houghton County consists of 14 townships, 2 incorporated cities, and 5 incorporated villages. Additionally, it is home to numerous unincorporated small communities. Virtually all these areas are remnants of much larger settlements founded during the copper mining era. According to the 2020 US Census estimate, Houghton County's population was 37,361, with much of this population concentrated in the northern half of the county. Population distribution in the county is influenced largely by Michigan Tech, whose students comprise nearly 20% of the population and dramatically influence the demographics in the City of Houghton. Please refer to Table 2.1 for a summary of the area's demographics.

Table 2.1: Area Demographics

Demographic	City of Houghton	Houghton County	Michigan
Population	8,386	37,361	10,077,331
Male	61.6%	54.6%	49.7%
Female	38.4%	45.4%	50.3%
Under Age 18	11.2%	20.5%	21.4%
Age 65 and over	9.1%	17.1%	18.1%
Bachelor Degree or higher	54.8%	33.6%	31.7%
Poverty Level	36.0%	17.2%	13.1%
White	82.6%	93.8%	73.9%
Asian	8.1%	2.3%	3.3%
African American	1.8%	0.1%	13.7%
Blend of two or more races	6.0%	4.4%	2.2%

Source: U.S. Census Bureau

Geography & Environment

Houghton County is composed mostly of highlands, upland plains, and lake-border plains. Forests, predominantly upland hardwoods, cover over 80% of the land. The county's 1,071 square miles are abounded with lakes, rivers, and miles of Lake Superior shoreline. The local area is known as an outdoor enthusiast's wonderland, and is a draw for students considering attending Michigan Tech.

An additional consideration for prospective students and staff is the geographic isolation of the university. Houghton and Hancock are the two most northern cities in the State of Michigan. The nearest medium-sized metropolitan center, Duluth, MN is 216 miles away to the west, while the closest large cities are Minneapolis, MN, and Chicago, IL, 370 miles and 420 miles away, respectively. Due to the location of Houghton and the Keweenaw Peninsula, the area is known as a destination rather than merely a place to pass through on the way to somewhere else. Not only are Michigan Tech and Houghton isolated, but the area is subject to long winters.

Snow can be seen as early as September and as late as May. Even so, Michigan Tech draws students, staff, and faculty from around the world.

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 microclimatic 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 Lake Superior has on the air temperatures and the prevailing westerly winds.

Sixty-year weather summaries are presented in the subsequent tables (Table 2.2) with their measurements recorded at the Houghton County Airport, located 8 miles from Houghton and Michigan Tech's main campus.

Table 2.2: Weather Summary 1991-2020 NCDC Normals-Station: 203908 Houghton FAA Airport, MI

Monthly Weather Averages from 1991 to 2020														
		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual Avg**
Avg Temp (°F)	**Min**	10.7	10	17.4	29.3	40.4	49.7	55.4	54.9	47.7	37.1	26.6	16.8	33.1
	Max	22.2	24.6	33.7	45.7	60.6	70.5	75.4	74.1	65.7	51.5	38	27.7	49.3
Prec. (in)		1.7	0.9	1.2	1.8	2.7	2.8	2.8	2.5	3.4	3.1	1.9	1.4	26.3
Snowfall (in)		67.2	34.7	22.2	7.9	1.3	0.0	0.0	0.0	0.1	3.8	22.8	51.1	213.9

Source: Midwestern Regional Climate Center

The moderating effect of the lake is experienced in the spring and summer months when the cool water tends to level out temperature extremes and reduce the likelihood of frost.

Another effect of the lake is the formation of considerable cloud coverage when cold air passes over the lake in late fall and early winter. This causes early-season and heavy snow possibilities, referred to as the "lake effect". Both of these effects lessen with increasing distance from the lakeshore.

The average annual precipitation is about 26 inches, while the average snowfall exceeds 200 inches. The snowfall record, set in the winter of 1978-1979, is 376.1 inches. The large amounts of snowfall can generate heavy spring runoffs and can lead to flooding in some areas. Weather conditions can vary greatly at any time throughout the region.

Employment & Industry

Ninety-two percent of Houghton County residents age 25 and older have the equivalent of at least a high school diploma, and about 32.9% are college graduates. Of those in the civilian labor force, 5.7% are unemployed. Nearly 52% 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 2021, the median household income was $48,623 and the per capita income was $27,087. In 2022, in Houghton County, approximately 14% of the population lived in poverty, as defined by the US Census Bureau. This statistic was higher than the State level of 13.4%.

Over 25% of the civilian workers in the county are employed by state and local governments. The government sector dominates because Michigan Tech is a state-assisted institution, and several federal and state service agencies maintain branch offices in Houghton County. Other major employment sectors include educational and health services (38.8%) and retail (10%), reflecting the area's growing tourist economy. The construction industry accounts for 7% of all jobs, while just over 7% consists of manufacturing jobs centered primarily around lumber, newspaper publications, and high-tech industries. Additionally, approximately 24% of local businesses in the city of Houghton are minority-owned, providing a more diverse workforce and more inclusive workplaces.

Housing & Community Development

Single-family detached homes compose three-quarters of the housing stock in Houghton County. Much of the housing is old, and nearly half were constructed prior to 1940. However, growth in the area is represented by the fact that 5.9% of all homes have been built in the past 10 years. The median housing value in the county is $170,671, which is seventy percent less than the national median.

In the City of Houghton, 37% of the homes were built before 1940, while 8.8% were built in the past 10 years. The average value of a house is much higher in the city at $230,207, over 1.3 times the county average. The lower housing costs area-wide lead to a higher homeownership rate, although this rate is offset by the large number of students who rent or lease apartments and houses.

<u>Historic Features</u>

As previously mentioned, much of the mining remnants are left over from the copper mining heyday. Preservation efforts are continual as the rich area's history is a large draw for tourists. The area relies greatly upon the tourism industry for economic success. Among the many historic sites in the area, two that make their home at Michigan Tech include the Copper Country Archives and the A.E. Seaman Mineral Museum. The Copper Country Archives are located on the bottom floor of the J.R. Van Pelt Library on Michigan Tech's main campus. The archives include print, graphic, and manuscript resources, and house the area's largest collection of local history items. They also hold collections from the Quincy Mining Company and the Calumet & Hecla Mining Company. The archives contain unique one-of-a-kind items that tell the story of the Copper Country.

The A.E. Seaman Mineral Museum, located at 1404 E. Sharon Avenue, on the south side of Michigan Tech's campus, houses the largest public exhibit of an outstanding collection of minerals from the Great Lakes region. The A. E. Seaman Mineral Museum was officially founded in 1902 and it was designated as the official Mineral Museum of Michigan in 1991. It is the unofficial Mineral Museum of the Great Lakes Region and draws thousands of visitors each year.

Today, the museum complex consists of the:

- Main museum building
- Phyllis and John Seaman Garden
- Copper Pavilion - holding the world-record 17-ton native copper slab
- Mineral Preparation Annex

Transportation Network

<u>Roads</u>

Several major roadways cross Houghton County (see Figure 2.3). Thirty-four miles of US-41 (spanning 1,990 miles from the northernmost part of the Keweenaw Peninsula to Miami, Florida) run through Houghton County. US-41 runs along Michigan Tech's Ford Center in Alberta, intersects the main campus in Houghton, and edges the Keweenaw Resource Center in Calumet. Other highways in the area include M-26, M-38, and M-203. Additionally, there are 858 miles of roads owned and maintained by the Houghton County Road Commission. Beyond that, each incorporated city owns and maintains the local street networks within its limits. Michigan Tech owns and maintains approximately 5 miles of roads.

Portage Lift Bridge

Historically, the Portage River and Lake provided a natural pathway across the Keweenaw Peninsula dividing it nearly in half. The Keweenaw Waterway was completed in the 1860s to serve as a ship canal by connecting Lake Superior in the west to Portage Lake in the east. Completion of the shipping canal made the Keweenaw an island rather than a peninsula.

In 1875, the first bridge was constructed to connect Houghton and Hancock. The bridge was rebuilt and underwent several renovations until the current bridge, the Portage Lake Lift Bridge, was built in 1959. The bridge is recognized as the heaviest aerial lift bridge in the world. Its unique double deck has two levels for traffic: the upper for cars and the lower was originally used by trains. Trains no longer travel the area, but in the winter months, the lower level is used by recreational snowmobilers.

The bridge is a vital link for the area. The airport and two hospitals are all located north of the bridge in Hancock and Calumet. This leaves the residents of Houghton and surrounding areas vulnerable in the event the bridge becomes inoperable. The nearest hospital south of the bridge is located in L'Anse, MI, over 32 miles away.

Rail

At one time, rail was a critical factor in the development and economic growth of the area. Today, most tracks that connected towns, mines, and ports have been removed. The corridors have since been turned into snowmobile, atv, hiking, and biking trails. There are still freight trains operating in the western and southern portion of the U.P., but none are left in the Copper Country.

Ports

The Keweenaw Waterway is a shipping canal allowing for large vessel travel with maximum loads of 18,000 tons. Domestic port facilities are available in Houghton. Additionally, the canal allows for ships or boats to seek refuge or an alternative route when Lake Superior seas do not allow for safe passage around the tip of the Keweenaw.

Airports

Houghton County Memorial Airport (CMX) is located 4 miles northeast of Hancock at an elevation of 1,095 feet. Houghton County owns a non-towered airport that operates year-round with two paved runways. SkyWest (United Airlines) provides air service two times a day to Chicago O'Hare airport. Royale Air Service provides seasonal air charter service to Isle Royale

National Park while approximately 3,000 corporate, charter, and transient aircraft use the airport annually. Cargo operations are provided by FedEx and UPS with more than 600,000 pounds of freight hauled in and out of the airport annually. The Houghton County Memorial Airport is approximately 2,400 acres and hosts a 204-acre Industrial Park with the necessary infrastructure and utilities ready for hookup.

Transit

The Indian Trails Bus Line serves both the cities of Houghton and Hancock. Both cities also operate transit systems with scheduled and on-demand services. Taxicab services are available in Calumet, Hancock, and Houghton. During the fall and spring semesters, Michigan Tech Transportation Services provides shuttle service around campus and throughout downtown Houghton and Hancock, including the UP Health System Complex. The shuttle systems are as follows:

- Husky Campus Shuttle
- City Commuter Shuttle
- City of Hancock Shuttle

Police, Fire, & Emergency Facilities

Police

The area is protected by the Michigan State Police District 8, Post #87, the Houghton County Sheriff's Department (located in Houghton), Michigan Tech's Public Safety & Police Services department, and local police stations. Houghton's city police are composed of 9 full-time officers and some part-time officers.

Michigan Tech's Department of Public Safety & Police Services has the primary responsibility for maintaining a safe and secure environment at Michigan Tech. The department is staffed by trained, certified State of Michigan police officers who have full law enforcement authority (including the power of arrest) throughout Houghton County. There are 11 full-time officers as well as 5 dispatchers. The department is staffed and operates 24 hours per day and 7 days per week.

Fire

There are 24 volunteer fire departments throughout Houghton County. The City of Houghton's volunteer fire department includes a staff of 26 and has a service area of 4 square miles including Michigan Tech. The fire department is a crucial partner for the university and receives state funding to provide services to Michigan Tech.

Medical

There are two hospitals in Houghton County, both north of the Portage Lake Lift Bridge.

U.P. Health Systems Portage Health Complex is a medical complex located in Hancock. The complex includes an Emergency Department, a Walk-In Care service, 30 in-patient beds, and 44 long-term care facility beds. Aspirus Keweenaw Hospital in Laurium, 12 miles north of Houghton, offers a variety of services including 24/7 access to emergency care and is supported by five clinic locations. Aspirus Keweenaw Hospital has a total of 49 beds.

Additional medical services include Mercy EMS located in Calumet. The Western U.P. District Health Department is located in Hancock, and the Baraga County Memorial Hospital is located 32 miles away in L'Anse. Mercy EMS provides Advance Life Support (ALS) service to all of Keweenaw County and all of Houghton County, except for the townships of Duncan and Laird. Their service area is 1,250 square miles with a population of approximately 38,000 people. They utilize full and part time staff consisting of Emergency Medical Technicians, Advanced EMTs, and Paramedics.

Michigan Tech's Emergency Medical Service provides the first medical response to the campus community. Currently staffed with 39 fully certified volunteer medical technicians (EMTs), Tech EMS responds to emergencies on the main campus, with the ability to assist at any location within the city of Houghton.

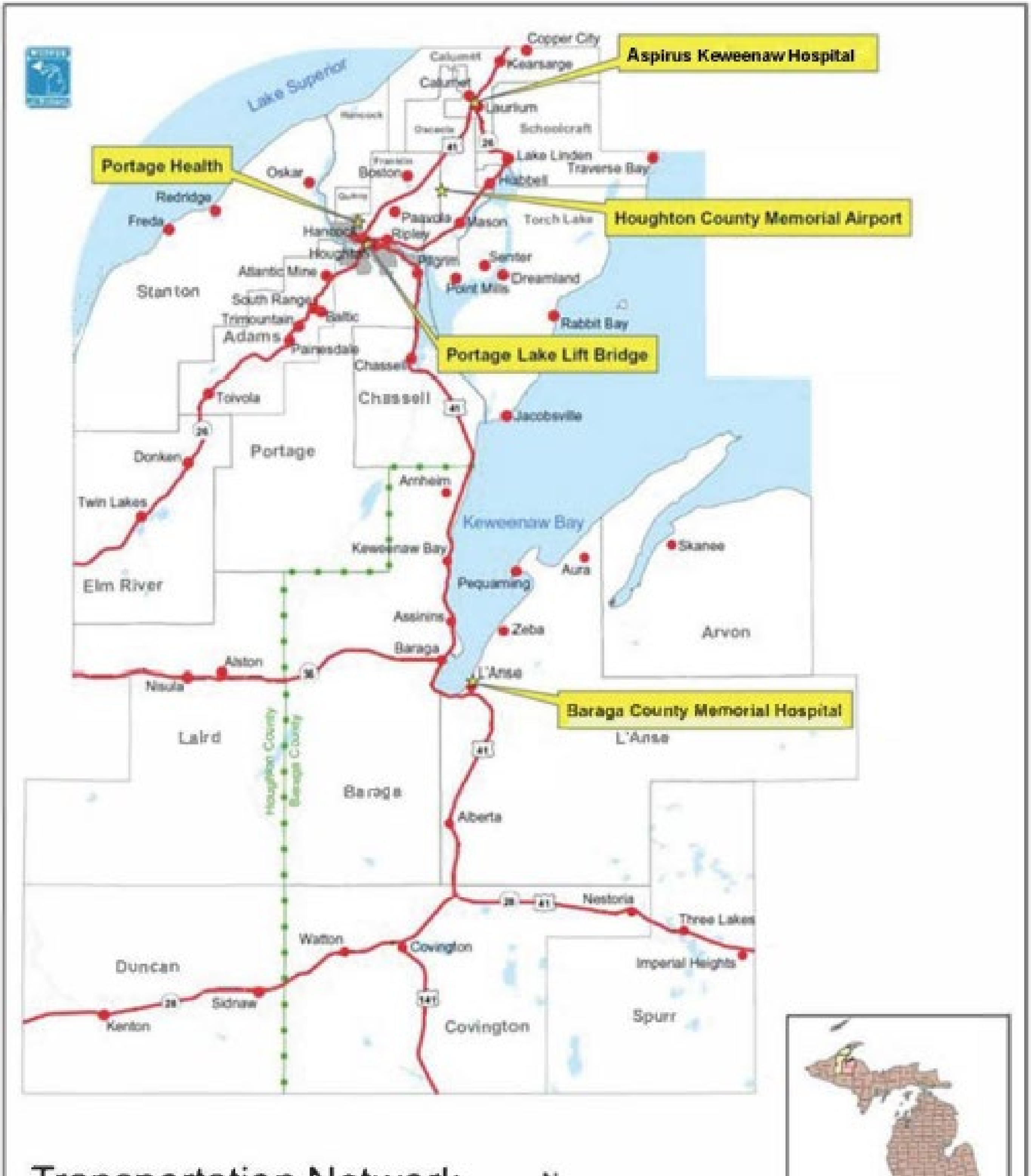
A new ambulance bay was constructed on campus that houses one ambulance and is used by Mercy EMS. The building has an area for responders to wait until called. This will allow much quicker response times for ambulances to get to areas around campus. It is the only ambulance bay south of the Portage Lake Lift Bridge, which will enable ambulances to reach Houghton in the case of a bridge closure.

Coast Guard

The U.S. Coast Guard patrols the area's waterways from its station located in Dollar Bay, located across the Portage Canal.

Office of Emergency Management

The Houghton County Office of Emergency Management is located in Houghton in the County Courthouse. The office promotes emergency and disaster education and awareness. It serves as an organization dispatch that ensures interagency coordination before, during, and after disasters and/or emergencies.



Transportation Network and Emergency Facilities

Figure 2.3

SECTION 4: University Profile

This section of the Multi-Hazard Mitigation Plan provides an overview of Michigan Technological University. It consists of the following subsections:

- University Impact
- University Mission
- University Background
- Organizational Structure
- Scope Areas Considered
- Economic Impact

University Impact

Michigan Tech is the pulse of the local communities, and the impact of an institution of its size and stature is felt throughout the community culturally and economically. Michigan Tech hosts the local community for various events including university and local sporting matches, conferences, educational functions, and cultural activities. The community is also drawn to the university to visit the Copper Country Archives and the A.E. Seaman Mineral Museum. By all popular definitions, Houghton is a college town. The relationship between Michigan Tech and the community is synergistic, and any disaster that affects one affects the other.

University Mission

Michigan Tech is committed to establishing world-class research and innovation grounded in science, engineering, and technology that promotes sustainable economic development in Michigan and the nation. Additionally, the university is diligent in attracting an outstanding and diverse population as well as providing a rigorous and distinctive learning experience. As outlined in its Strategic Plan, the University's mission and vision are:

> ***Mission***
> *"Create solutions for society's challenges by delivering action-based undergraduate and graduate education, discovering new knowledge through research, and launching new technologies through innovation."*
>
> ***Vision***
> *"Michigan Tech is a globally recognized technological university that educates students, advances knowledge, and innovates to improve the quality of life and to promote mutual respect and equity for all people within the state, the nation, and the global community."*

University Background

History

Michigan Tech was founded in 1885 as the Michigan Mining School with 4 faculty members and 23 students, but quickly became the Michigan College of Mines. It was established by the State of Michigan to meet the mining industry's need for mining engineers, fueled by the local area's 'Copper Boom'.

Over the years, as mining activities declined, the school evolved by expanding degree options and developing other areas of study. The school transformed from a college to a university, and in 1964 the school was renamed Michigan Technological University. During the 1960s and 1970s, the school experienced tremendous growth in terms of students, curricula, and property expansion. A good portion of the campus today was constructed during this time of growth. Moreover, Michigan Tech has become renowned for its College of Engineering. Presently, the university offers an array of degrees from certificates to doctorates in areas other than engineering such as Arts and Human Sciences, Kinesiology and Integrative Physiology, Business, Computing, Environmental Studies, Sciences, and Technology.

The focus on graduate studies and research became prominent by the 1980s. Michigan Tech's efforts in graduate and research programs continue to grow, and the university considers itself to be in the company of Michigan State, the University of Michigan, and Wayne State as top research centers in Michigan. Michigan Tech continues to strive for academic excellence and to be a top research university with 311,412 square feet of research space and research funds topping $102 million in the 2022-2023 academic year and growing.

Population

Michigan Tech has a population of nearly 9,000, with a faculty of 470 and a staff of 1,150 joined by over 7,400 students. Many of these students will add to the growing alumni list that is approaching 84,000 graduates. Michigan Tech's success can in part be attributed to the talented faculty, of which 90% hold the highest degree in their field. Additionally, 1,400 of the 7,300 students are graduate students.

The student population count has remained relatively stable from 2020 and earlier, but overall enrollment in 2024 is up 1.5% overall with an 88.7% retention rate (MTU's highest ever). Enrollment is projected to continue to increase. Males have always had a greater presence at Michigan Tech than females, common in the engineering and technological fields; the 10-year ratio averaged about 3 males to every 1 female. From 2020 onward, Michigan Tech has seen an increase in female student enrollment, and in 2024, approximately 30 percent of the student body is female. Despite these improvements, Michigan Tech continues to strive to attract a more diverse student and faculty population. Nearly 9% of the student population is composed of international students and over 80 countries have been represented at Michigan Tech through its international community.

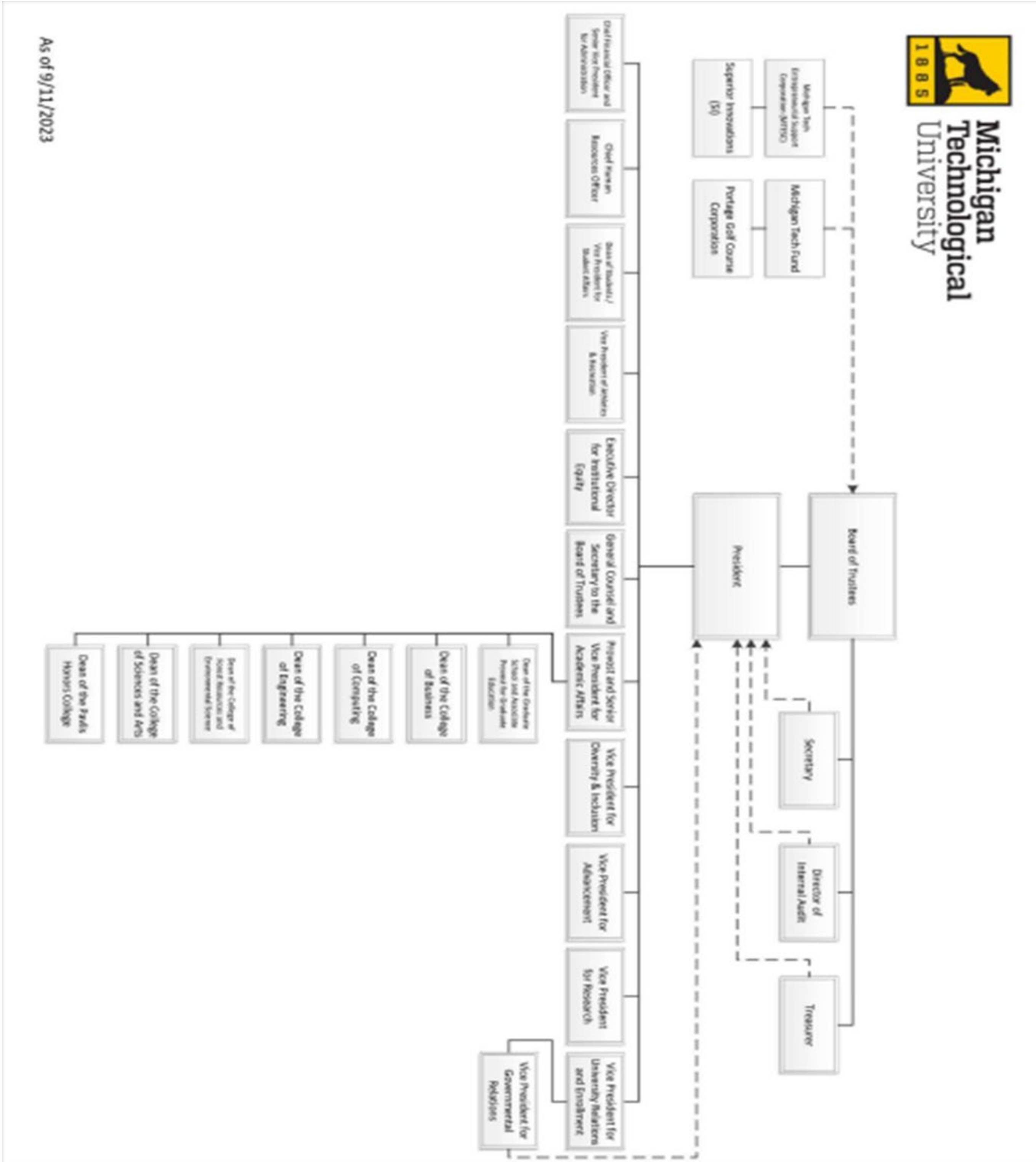
Organizational Structure

Michigan Tech, a public university, is led by a President who gets input and guidance from an 8-member Board of Trustees. The Board of Trustees include the Secretary, the Director of Internal Audit, and the Treasurer. Additionally, the Board of Trustees receives input from The Michigan Tech Entrepreneurial Support Corporation (MTESC), Michigan Tech Fund, Superior Innovations (SI), and the Portage Golf Course Corporation.

Those serving on the President's Council are the Chief Financial Officer and Senior Vice President for Administration, Vice President for Student Affairs, Vice President of Athletics and Recreation, Vice President for University Relations and Enrollment, General Counsel and Secretary to the Board of Trustees, Vice President for Diversity and Inclusion, Vice President for Advancement and Alumni Engagement, Vice President for Research, Vice President for Governmental Relations, and Provost and Senior Vice President for Academic Affairs.

Those who report to the Provost and Senior Vice President for Academic Affairs are as follows: Dean of Graduation School and Associate Provost for Graduate Education, Dean of the College of Business, Dean of the College of Computing, Dean of the College of Engineering, Dean of the College of Forest Resources and Environmental Science, Dean of the College of Sciences and Arts, and Dean of the Pavlis Honors College.

An organizational chart is presented in Figure 4.1. Governance of the university is a collaborative effort and is coordinated through the: Board of Trustees, University Senate, Staff Council, Graduate Student Council, and Undergraduate Student Government.


Michigan Technological University
1885
Michigan Tech Entrepreneurial Support Corporation (MTESC)
Superior Innovations (SI)
Michigan Tech Fund
Portage Golf Course Corporation
Board of Trustees
President
Secretary
Director of Internal Audit
Treasurer
Chief Human Resources Officer
Executive Director for Institutional Equity
General Counsel and Secretary to the Board of Trustees
Provost and Senior Vice President for Academic Affairs
Vice President for Diversity & Inclusion
Vice President for Advancement
Vice President for Research
Vice President for University Relations and Enrollment
Vice President for Governmental Relations
Dean of the College of Business
Dean of the College of Computing
Dean of the College of Engineering
Dean of the College of Sciences and Arts
Dean of the Pavlis Honors College
As of 9/11/2023

Scope - Areas Considered

Michigan Tech's main campus is located in the community of Houghton in Michigan's Upper Peninsula. Michigan Tech is also home to Mont Ripley Ski Area, a ski hill located in Franklin Township across the Portage Canal from the university's main campus, the Keweenaw Research Center (KRC), a research facility located several miles north of the main campus, and the Ford Center situated on over 1,700 acres of hardwood forests in Alberta, MI (40 miles from the main campus). Mont Ripley Ski Area is used for university physical education courses. The Ford Center is used for conferences, research and education for the School of Forest Resources and Environmental Science.

While the primary focus of Michigan Tech's Hazard Mitigation Plan is on the main campus; Mont Ripley, KRC, ASPRC, Portage Lake Golf Course, and the Ford Center will be considered for select hazard events. Campus and facility locations are presented in Figure 4.2.

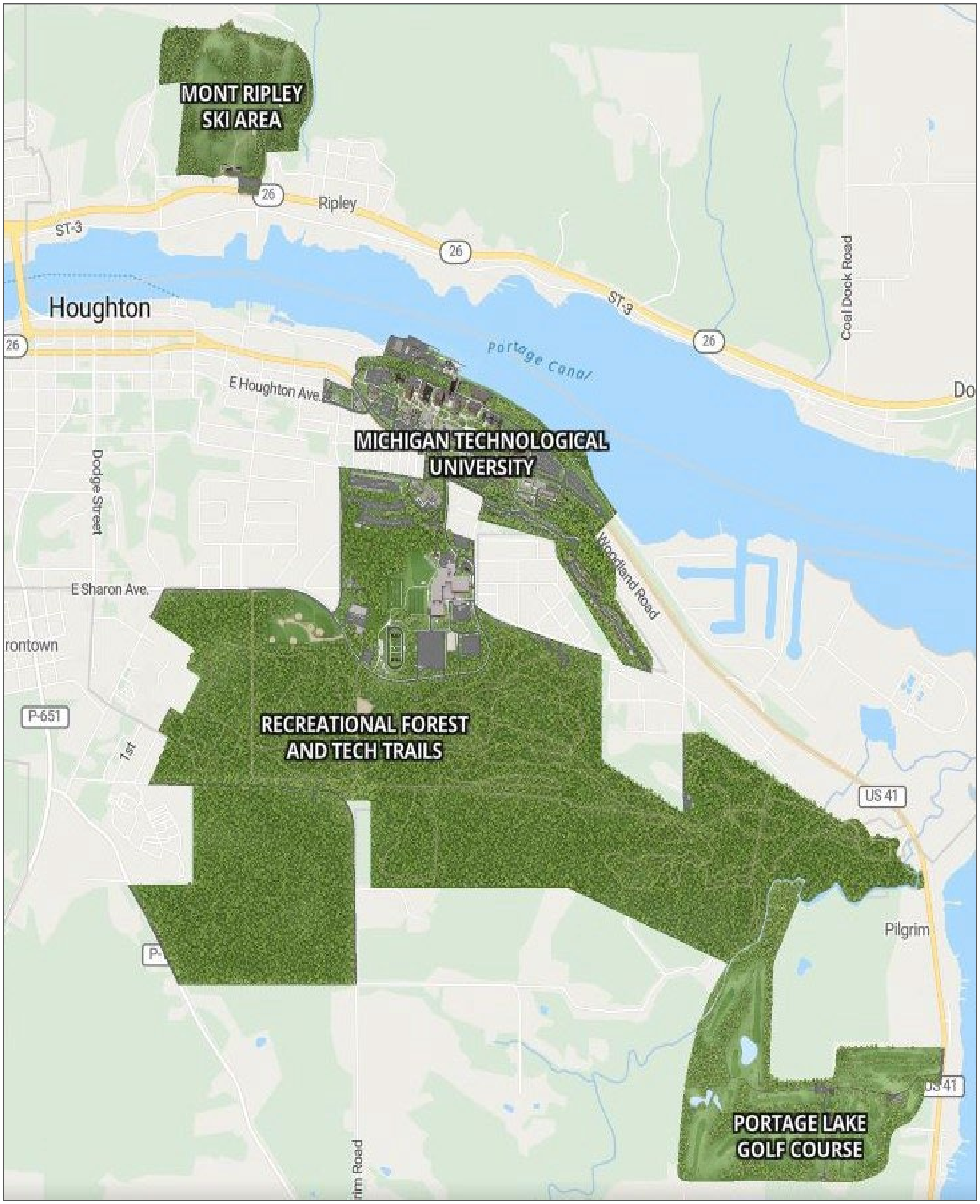
Main Campus

The Houghton Campus rests on 925 acres in the City of Houghton near the Portage Canal. Complete with typical university structures, the university is also home to an 18-hole golf course, an alpine ski hill, and year-round recreation trails used for Nordic skiing, snow shoeing, hiking, running, and biking. Figure 3.2 illustrates the locations of these facilities with regard to the main campus, Mont Ripley, the KRC, and the Ford Center.

The cross-country ski trails are located on the main campus south of the Student Development Complex. The world-class 37 km trail network has hosted the Junior Olympics and the U.S. Cross Country Ski Championships in 2007, 2008, and 2019. During the non-winter months, the popular trails are used for hiking, biking, and running.

While Michigan Tech has holdings throughout the local communities, the majority of instruction and university functions occur on the main campus in Houghton. Completion of Great Lakes Research Center, renovations to Chem-Sci Chemical Storage, and addition of the new H-STEM Engineering and Health Technologies Complex displays the dedication to university development and achievement. For Michigan Tech to better protect these investments - and the university as a whole - the consideration of potential hazards and mitigation activities is imperative. Furthermore, both the remote nature of Michigan Tech's location and the limited resources in the area reinforce the existing need for the university to develop a multi-hazard mitigation plan.

Figure 4.2 - Michigan Tech Campus and surrounding off-campus sites



For a detailed view of the MU Campus visit:

https://map.mtu.edu/?id=1308#!ct/63274?s/

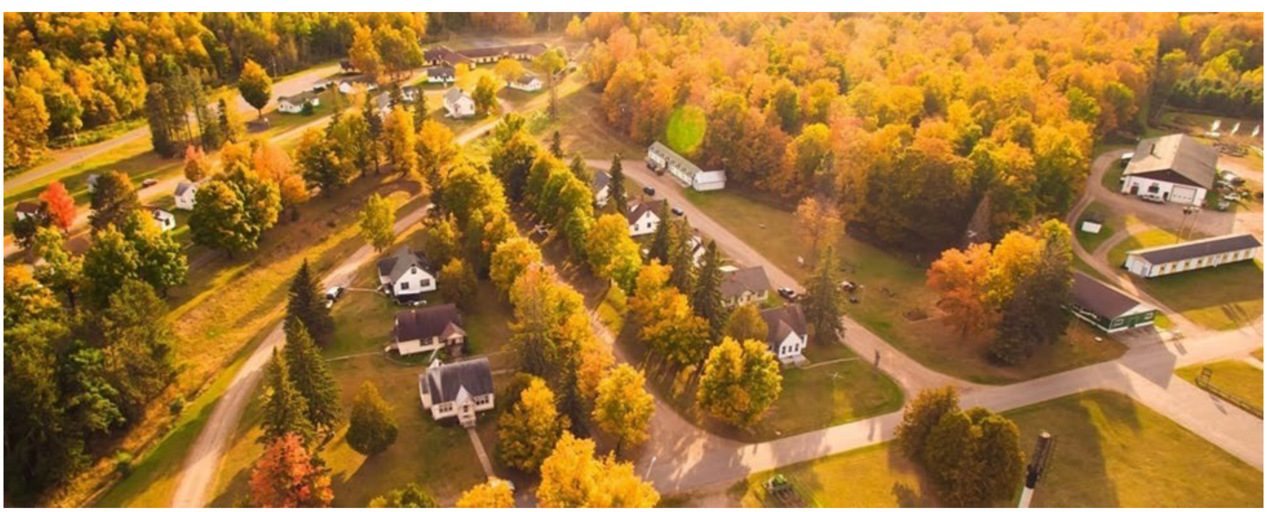
<u>The Keweenaw Research Center (KRC)</u>

The KRC, located in Franklin Township adjacent to the Houghton County Memorial Airport 7 miles north of the main campus, is a Michigan Tech research facility. Previously a test site of the U.S. Army Tank Automotive Command (TACOM), Michigan Tech assumed ownership in 1993, and TACOM continues to sponsor research and testing. KRC's mission is: "*To generate and conduct externally funded research in science and engineering in support of the University's overall educational mission.*" KRC benefits its clients in the military, automotive, aerospace, and marine industries by applying advanced engineering principles through all phases of engineering design, analysis, and testing. Due to KRC's proximity to the airport and the research nature of the facility, consideration of potential disaster should be taken seriously at this location.

Aerial View, Keweenaw Research Center

<u>The Ford Center and Forest</u>

Located 40 miles from the main campus in Alberta, Baraga County, the Ford Center lies on over 1,700 acres of hardwood forests with an additional 2,800 acres of forest in nearby parcels.



Aerial View, Ford Center and Forest

In 1935, the Ford Motor Company built from scratch the village of Alberta, complete with a sawmill, homes, and schools to harvest the lumber from the surrounding hardwood forests for their automobile industry. By the 1950s, lumber was in decline as a component for automobile production, so in 1954, Alberta and the surrounding forest were donated to Michigan Tech to be used as a "Center for Research, Demonstration, and Education in Forestry."

Today, the center is used as an educational and research center, hosting not only Michigan Tech students but also various public and private groups. The facility offers classrooms, a conference center, a dining hall, sleeping quarters, and thousands of acres of wilderness.

Mont Ripley

Mont Ripley, located in Franklin Township between the cities of Houghton and Hancock, is a ski hill taken over by Michigan Tech in 1944. The ski area has 24 trails, a 440-foot vertical drop, 112 acres of skiable terrain, six different Glade Runs, three lifts, a 3-lane tubing park, a Chalet, and several other buildings. Mont Ripley offers a learning area for college courses and community ski lessons. The Michigan Tech student activity fee includes access to the ski hill. The hill can safely support 1,000 users at a given time.

Mont Ripley Ski Area Hancock, MI

Advanced Power Systems Research Center (APSRC)

The APRSRC is a 55,000 sq ft test and research facility located a half of a mile from the Houghton County Memorial Airport. The facility was established in 2007 and declared an MTU core facility in 2014 with the aim of creating a more expansive automotive and transportation test and research facility. Research and equipment partners are an essential component of the facility, and several large corporations are involved, such as GM, Ford, Cummins, and Caterpillar. Because of its partnerships with industry, the facility and its staff provide undergraduate and graduate students with hands-on experience in research and testing.

Portage Lake Golf Club (PLGC)

The Portage Lake Golf Club is located within a two-minute drive from campus, on U.S. 41. The main course is spread across 160 acres of land between the Pilgrim River and US-41. The Club was established in 1903, one of the oldest in Michigan, and transferred over to Michigan Tech in 1945. Over the past 7 years, the university has invested over $700,000 into the course. Open to the public, the golf course is a point of pride for the local community and Michigan Tech.

Aerial View, Portage Lake Golf Course

Economic Impact

Michigan Tech is a major influence on the local economy and is the area's largest employer due in part to the aggressive improvement plans pursued by the City of Houghton and the university in the 1970s. Between 1920 and 1970 the area's population decreased by 51%, caused largely by the decline of the region's mining industry. The City of Houghton implemented a comprehensive improvement strategy that coincided with Michigan Tech's plan to increase enrollment and expand facilities. Michigan Tech continued to grow through this period, attracting students and faculty, undergoing new construction, and further developing research and educational programs. This growth continues today with reinvestment by both the city and the university.

The educational aspect is not the only branch that impacts the economy; the research function generates a significant number of jobs and revenue using local goods and services to support the programs. According to the report, *Regional Economic Impact of Michigan Tech's Externally Sponsored Research Expenditures Fiscal Years 2007-2021* (Apriesnig, J. et al.), externally sponsored programs (the majority of which is research) have generated an average of about $31 million, or approximately a total average of $75 million. Indirect and direct impacts result in employment directly associated with university research, supplies purchased in the community in support of projects, and local spending by research employees, just to name a few. Estimates suggest that about 1,000 local jobs are directly or indirectly created by these externally sponsored programs.

Overall, the University's output impact was nearly 10 times the state funding it received. Michigan Tech contributed nearly $450 Million to the Michigan economy in 2016 according to *The Economic Impact of Michigan Technological University* prepared by Anderson Economic Group, LLC and Traci Giroux, Consultant. Houghton County received nearly $130 Million. Michigan Tech salaries account for nearly $90 Million to faculty and staff and another $6 Million in student wages.

It is evident that the community provides an excellent environment for the university to thrive in, and it is also evident that Michigan Tech not only generates and promotes economic growth for the area but also brings a special vibrancy to the local community. Partnership is essential for both to operate, especially in the face of disaster. Potential hazards that could pose a threat to the university could also threaten the surrounding community and vice versa.

SECTION 5: Hazard Identification

This section of the Multi-Hazard Mitigation Plan provides an overview of the hazard identification process. It consists of the following subsections:

- Hazard Identification
- State and Federal Disaster Declarations

Hazard Identification

Hazard identification is the process of identifying the types of hazards that can affect the mitigation plan area. Hazards were identified from various sources (local, regional, and state) and from previous disaster declarations. Input from the campus community and local community was also solicited via a survey and used to identify hazards. Hazard information was gathered using regional climate data, community and university historical data, personal interviews with campus and community experts, and various hazard mitigation planning materials. Potential hazards were identified using the following publications:

- FEMA-443 Building a Disaster Resistant University
- EMD PUB-103 Michigan Hazard Analysis
- Michigan Hazard Mitigation Plan
- Houghton County Mitigation Plan
- Baraga County Mitigation Plan
- Michigan Tech Emergency Response Procedures

Three categories of hazards were evaluated for the Michigan Tech Multi-Hazard Mitigation Plan: *natural hazards*, such as floods, wildfires, and severe weather, *technological hazards*, including infrastructure failures, hazardous material spills, transportation accidents, and major structural fires, and *human-caused hazards*, such as cyber threats, civil disturbances, public health emergencies, and terrorism or sabotage. This update features two new natural hazards (fog and invasive species), and one new human-caused hazard (cyber threats).

Table 5.1 presents the results of the hazard compilation. Some hazards will not be covered in this plan (highlighted in yellow) because they did not pose risk to the university or surrounding area. The remaining hazards are profiled and assessed in Section 6.

Table 5.1: Hazards identified in other plans and for the Michigan Tech plan

Hazards	State of Michigan Haz-Mat Plan	Houghton County Haz-Mat Plan	Baraga County Haz-Mat Plan	Tech Emergency Response Plan	Michigan Tech Haz-Mat Plan
Natural Hazards					
Avalanche	N	N	N	N	N
Drought	Y	Y	Y	Y	Y
Earthquake	Y	Y	Y	Y	Y
Extreme Temperatures	Y	Y	Y	Y	Y
Flood: Dam Failure	Y	Y	Y	Y	Y
Flood: Riverine & Urban	Y	Y	Y	Y	Y
Fog*	N	Y	Y	N	Y
Hail	Y	Y	Y	Y	Y
Hurricanes/Tropical Storms	N	N	N	N	N
Ice & Sleet Storms	Y	Y	Y	Y	Y
Invasive Species*	Y	Y	Y	N	Y
Landslide	N	N	N	N	Y
Land Subsidence	Y	Y	Y	Y	Y
Lightning	Y	Y	Y	Y	Y
Severe Winds	Y	Y	Y	Y	Y
Shoreline Flooding/ Erosion	Y	Y	Y	N	Y
Snowstorms	Y	Y	Y	Y	Y
Storm Surge	N	N	N	N	N
Tornadoes	Y	Y	Y	Y	Y
Tsunami	N	N	N	N	N
Volcano	N	N	N	N	N
Wildfire	Y	Y	Y	Y	Y
Technological Hazards					
Hazardous Material: Fixed Site Incident	Y	Y	Y	Y	Y
Hazardous Material: Transportation Incident	Y	Y	Y	Y	Y
Infrastructure Failure & Secondary Technological Hazards	Y	Y	Y	Y	Y
Human-caused Hazards					
Civil Disturbance	Y	Y	Y	Y	Y
Cyber Threats*	Y	N	N	Y	Y
Public Health Emergencies	Y	Y	Y	Y	Y
Sabotage/Terrorism	Y	Y	Y	Y	Y

* = Hazards added to the updated 2025 plan

The landslide hazard was updated in the 2020 plan based on a slope failure at Mont Ripley during the June 2018 flood. Invasive Species, Fog, and Cyber Threats were added to the 2025 plan.

Disaster Declarations

Since 1974, there have been four Presidential Declarations of Emergency in Houghton County and three in Baraga County. The first included both counties in a 1978 declaration that was in response to “The Great Statewide Blizzard of 1978.” The second declaration included Houghton County in 1994 and was in response to an extensive underground freeze. The governor declared the 1994 incident a major disaster, while the 1978 event was declared an emergency. The third was the “Father’s Day Flood of 2018” which occurred on June 17, 2018, when Houghton County was struck by unrelenting rain, receiving over 7 inches in a 3-hour period. The disaster declaration included the counties of Gogebic, Houghton, and Menominee. On April 14, 2023, Governor Whitmer declared a state of emergency for Houghton and Baraga Counties for flooding. Unusually high spring snowmelt amounts over 3 days caused urban flooding and erosion damage to shoreline areas and roads.

SECTION 6: Hazard Analysis & Risk Assessment

This section of the plan describes the hazards identified by Michigan Technological University that pose a threat to people and property on campus. An assessment of risk has been developed which includes hazard descriptions and background, notable historical occurrences, the probability of occurrences for each hazard, and climate change considerations. The section includes:

- Risk & Vulnerability Rating Method
- Natural Hazards
- Technological Hazards
- Human-caused Hazards
- Hazard Priority Ranking

Risk & Vulnerability Rating Method

For the purposes of this report, risk and vulnerability are defined as follows:

- **Risk:** Exposure to a chance of loss or damage from identified natural, technological and man-made hazards. Risk is a measure of how likely it is that some event will occur based on the frequency and magnitude of past occurrences to the university and the region.
- **Vulnerability**: The level of potential impact, susceptibility, and exposure to an identified hazard while considering, when possible, processes already implemented to mitigate future hazard occurrences.

Based on Hazard Priority Ranking as outlined on page 97 and Table 6.7, risk and vulnerability to each hazard have been identified as:

- Negligible
- Low
- Moderate
- High

It is noted here that although several hazards are classified as posing *Low Risk*, the potential for their occurrence with varying or unprecedented magnitudes remains possible in some cases. These risks will continue to be monitored and re-evaluated during future updates to this plan.

Some of these hazards are interrelated (i.e., snowstorms can be accompanied by ice and sleet storms), and some consist of hazardous elements that are not listed separately (i.e., extreme hot temperatures can lead to drought conditions). It should be noted that some hazards, such as snowstorms and blizzards, may impact a large area yet cause little damage, while other hazards, such as tornadoes, may impact a small area yet cause extensive damage.

The hazard analysis component of this plan includes three major divisions that correspond to three major hazard classifications: Natural, Technological, and Human-caused Hazards. Each of these three major sections have been further organized so that readers and responders can more easily find information about hazards that are closely related.

Natural Hazards

Results from acts of nature.

DROUGHT

Drought is defined by the National Drought Mitigation Center as "a protracted period of deficient precipitation…" Periods of drought impact the natural environment, local and regional economies, human health and drinking water supplies. Drought is a normal, recurrent feature of climate. Climatic factors such as high temperatures, high wind, and low relative humidity are often associated with drought.

Risk Level: *Low*
Vulnerability Level: *Low*

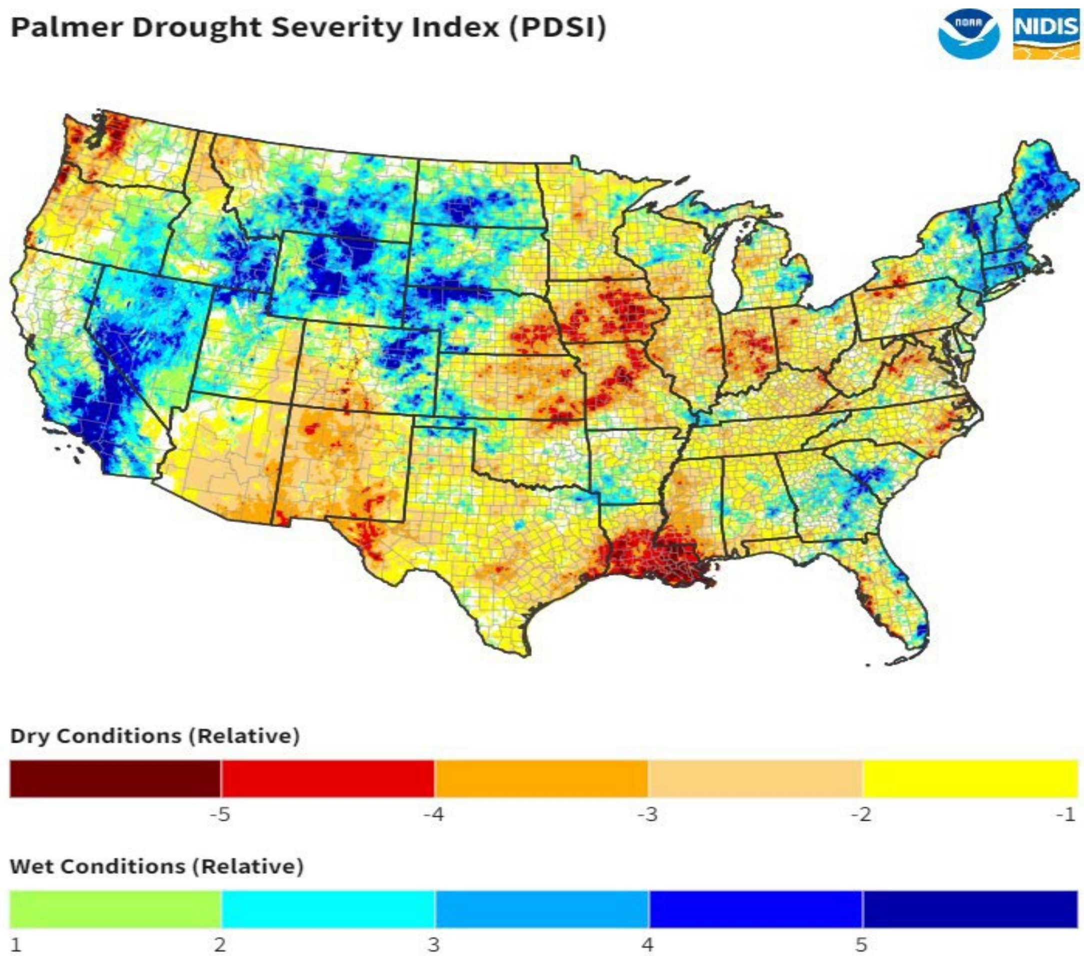
Droughts occur in Michigan and are a common component of most climates. However, droughts are different from other natural hazards in that they are difficult to define, establish their start date, and determine their severity. While droughts can be devastating to agricultural functions, they can also adversely affect urban areas that depend on reservoirs. Nearly all areas of the country are impacted by drought through reduced agricultural outputs, reduced water supply, land subsidence (from excessive groundwater pumping), and increased risk of wildfires.

Droughts typically impact a large area that cannot be precisely defined geographically. The Palmer Drought Severity Index (PDSI), see Figure 6.1, is a tool that interprets temperature and rainfall information to determine dryness and illustrates the widespread nature of drought severity. Droughts commonly affect natural resources more than built physical structures, and generally their effects are felt directly by the agricultural industry. However, the community at large may experience drought-related effects if there is a water shortage.

<u>Past Occurrences</u>

Neither Houghton nor Baraga County have had a localized drought severe enough to be recorded, however the United States Midwest has been affected by drought in five years since 1981 (about an estimated 11% chance per year). Figure 6.1 illustrates that the region has relatively wet conditions thus making severe drought a relatively low risk to the region.

Figure 6.1: Palmer Drought Severity Index (Valid 2023)



Source: National Integrated Drought Information System, UC Merced, Climate Engine

Risk & Vulnerability

Drought events affect widespread areas, yet their exact geographical boundaries are difficult to determine. If a drought event were to occur, it would extend far past the university into the region; however, the risk and vulnerability of drought to the region is considered low. Therefore, the risk and vulnerability to life, property, and environment at Michigan Tech is also considered low. The university does not have an agricultural program that could be affected by a drought event. Nevertheless, a drought could increase the risk of a secondary hazard, such as a wildfire, which could be of concern for Michigan Tech's Alberta Campus (discussed later in this section).

Drought risk and vulnerability were both considered low in both the 2008 and 2020 plans. This section has not changed in the 2025 plan due to the continued low risk and vulnerability.

Climate Change Considerations

Climate change increases the likelihood and severity of a number of hazards including drought. The effect of climate change on Michigan has involved an overall increase in precipitation, and drought severity on the state has been decreasing over the past 50 years. According to the National Integrated Drought Information System (NIDIS), "Despite overall recent trends of decreasing drought risk, long term projections of future climate in the region suggest a reversal in the future associated with warming temperatures, greater rates of evapotranspiration, more erratic precipitation, and lower soil moisture levels during the warm season. In particular, shorter-duration seasonal droughts are expected to worsen during the summer, even though overall annual precipitation rates may increase." Increasing variability in rain and snow events could bring about drought events between intervals of precipitation.

EARTHQUAKES

Earthquakes are defined as the sudden release of strain (or displacement of rock) in the earth's crust, resulting in waves of shaking that radiate from the earthquake source (epicenter). They may result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes occur without warning and can affect hundreds of thousands of square miles. Their intensity ranges from very minor (shaking not detected by humans without instruments) to very violent (catastrophic in nature). Damages follow this intensity ranging from minor to catastrophic.

Risk Level: *Negligible*
Vulnerability Level: *Negligible*

Most areas in the country, including Michigan, are subject to minor earthquakes that occur thousands of times per year. Usually, earthquakes are minor tremors that result in minimal or no loss of life, property, and essential services. Earthquakes pose a threat because they can occur without warning and can cause severe loss and devastation. Death and injury are usually the result of secondary effects, such as collapsing structures.

Earthquakes are measured by their magnitude (amount of energy released at the epicenter) and intensity (measure of damage done at one location). The Richter Magnitude Scale is commonly used to determine an earthquake's magnitude, and the Modified Mercalli Intensity Scale is used to define their intensity. On the Richter Scale, a measure of 5.1 is considered a moderate event, while a measurement of 8.0 is considered a catastrophic event. The Mercalli Intensity Scale describes 12 increasing levels from imperceptible to catastrophic.

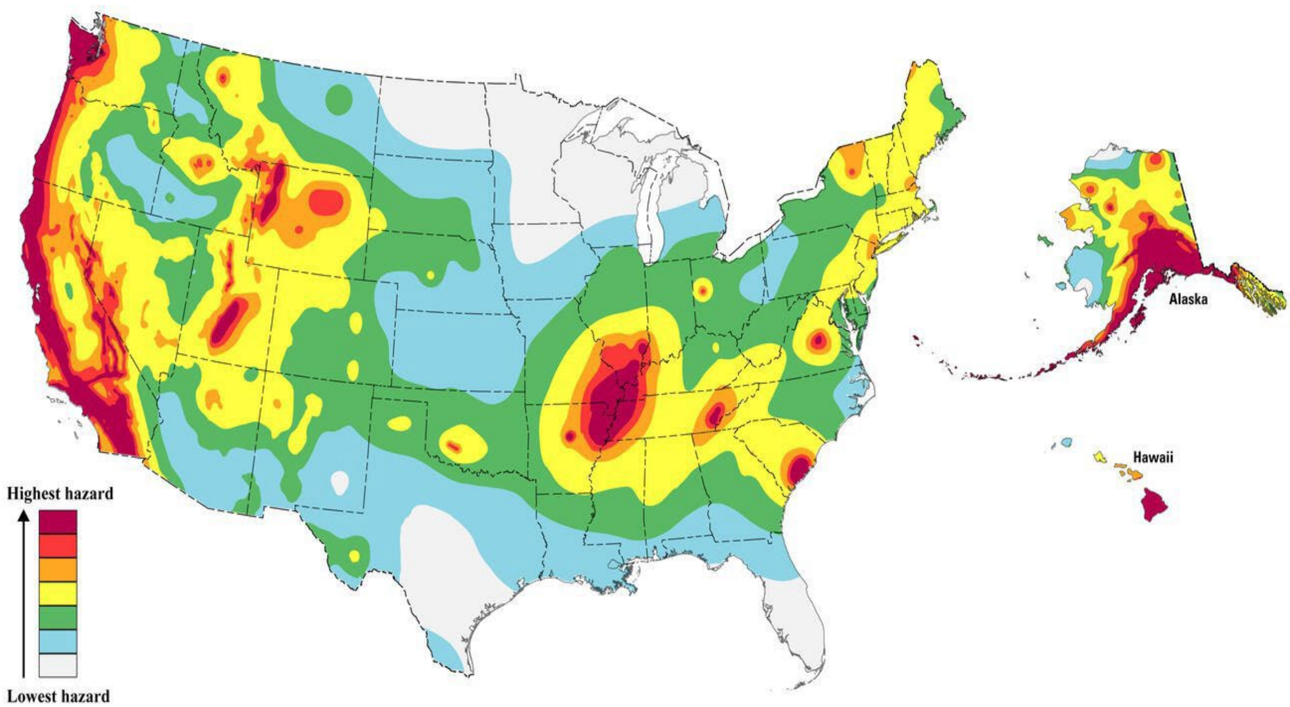
Past Occurrences

Michigan has a history of tremors and earthquake activity; however, none of this recorded activity has been the cause of death or serious damage. Most of the activity has occurred in the Lower Peninsula, which is also affected by activity from the New Madrid Seismic Zone located in the southern portion of the Midwest. Figure 4.2 presents the *United States Geographical Survey*

(USGS) National Seismic Hazard Map and shows that the Upper Peninsula, along with the rest of Michigan, is in the category with the lowest probability of ground movement.

A fault line, the Keweenaw Fault, runs along the spine of the Keweenaw Peninsula. However, this fault has not experienced any activity for over one billion years. Interestingly, between 1905 and 1909, there was a series of recorded unusual underground disturbances. They were described as explosions and tremors that caused minor damage, such as broken windows and sinkholes. These occurrences, now believed to be due to collapsing pillars in the area's mines, were at times felt up to 70 miles away. Aside from these incidents, there is no recorded history of seismic activity in the region.

Figure 6.2: USGS National Seismic Hazard Map



Source: United States Geological Survey

Risk & Vulnerability

Michigan is not an area of major earthquake activity since the fault lines in Michigan's bedrock are considered to be relatively stable. Due to the stability of the Keweenaw Fault and lack of previous occurrences, there is a negligible earthquake risk to Michigan Tech's campus. There is a <1% probability of an earthquake occurring in Houghton or Baraga Counties. The USGS map in Figure 6.2 and verification of Keweenaw Fault inactivity in an interview with Dr. Wayne Pennington, *Michigan Tech Department Chair of Geological & Mining Engineering & Sciences*, further supports this claim. Additionally, both counties are a great distance from active fault zones, which minimizes the potential risk of an earthquake affecting Michigan Tech's campuses.

Despite this negligible risk, Michigan Tech and the area's communities could be more vulnerable to an earthquake because of poor preparation. Structures and utilities are not necessarily built to withstand even small seismic events, and instruction is not provided as to how to respond to an earthquake event. However, procedures and response actions are available in university emergency manuals. Nonetheless, because Michigan Tech is not located on or near any active faults, vulnerability was also considered negligible in the 2008 and 2020 plans and has remained unchanged for this update.

FIRE HAZARDS

- Major Structural Fires
- Wildfires

Major Structural Fires

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

Risk Level: *Moderate to High*
Vulnerability Level: *Moderate*

The structural fire hazard has been called a universal hazard because it can affect any community at any time. Universities must be particularly diligent in fire prevention and education because of the nature of residence halls. Michigan Tech is home to three dormitories, Wadsworth Hall, McNair Hall, and Douglass Houghton Hall, which house over 2,000 students, and the Daniell Heights apartments (campus owned) which house approximately 570 persons (including families). The Hillside Place Apartment building was built in 2010 and houses 190 students. East Hall, a new dorm building, will house 516 students upon completion in 2025.

Michigan Tech is a research-based university home to hundreds of laboratories located across campus. Research activities in these laboratories can pose fire and/or explosion risks. Fires as a result of a laboratory incident or explosion will be further examined in the Technological Hazards—Hazardous Materials Incident section later in this chapter.

All reports of fires and fire alarms are maintained in a fire log at the Michigan Tech DPSPS. Data collected includes the nature of the fire, date and time of occurrence, and the general location of the fire.

<u>Past Occurrences</u>

There were 73 reported fire incidents on campus from 2010 to 2024. 55% of the reports were in residential buildings, 32% in academic, research or administrative buildings, and 13% were exterior fires (see Figure 6.3). Many reported fires were minor cooking fires or trash fires. There may also be small fires that occur on campus that go unreported. Therefore, it is difficult to estimate the true number of fire events.

The majority of the reported fire incidents were minor in nature. There were three fire incidents in the past ten years that caused significant damage to campus buildings and their contents.

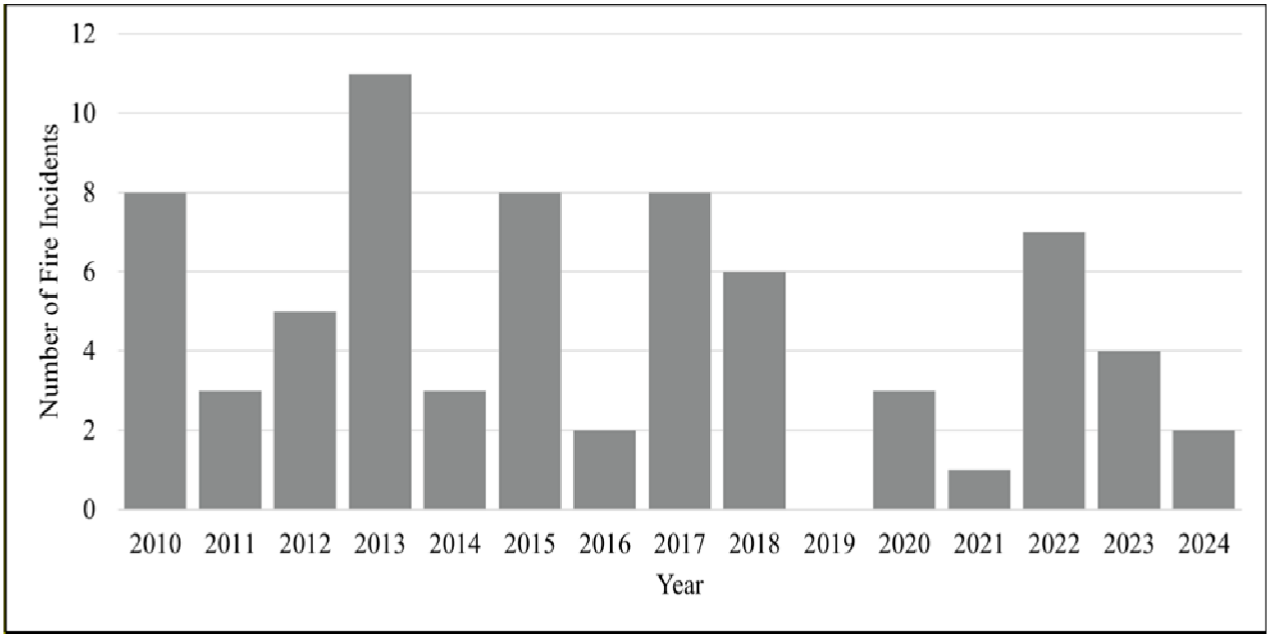
On the evening of June 30, 2010, a fire broke out in a maintenance/storage building at the Michigan Tech Portage Golf Club that caused significant damage to the building and its contents. The building did not have fire sprinklers.

A fire broke out in the Michigan Tech Archives located in the garden level of the J.R. Vanpelt and John and Ruanne Opie Library building at approximately 11:30 AM on October 26, 2012. The fire was contained within a few square yards, but water damage was extensive. The floor was flooded, and several stacks of documents were heavily sprayed by the sprinklers and fire hoses. Less than 20 percent of the documents in the archive's stacks were affected. The library was closed for 48 hours following this incident. The building is fully sprinklered.

In the early morning of February 19, 2015, a piece of mobile equipment stored in the Facilities Management building caught fire. The fire caused major damage to the building and its contents. The grounds, engineering, transportation services, skilled trades, central receiving, and facilities management offices were all displaced by the fire. Most of the snow removal equipment fleet was destroyed in the fire. Several other campus vehicles were damaged. There were no injuries or loss of life in the fire. The Facilities Building does not have fire sprinklers installed.

In the morning of June 20, 2024, a fire in one of the small research labs in the M&M Building occurred. The metal 3D printer was operating with an aluminum metal. This process is enclosed and sealed from the atmosphere, and argon gas is used in place of normal air. The argon is circulated through the chamber, and aluminum dust is collected in a filter system. During the process, the hose was disconnected to perform a procedure, oxygen got into the filter, and the aluminum dust combusted. The user was unable to get the hose reconnected, however, aluminum is not extinguished by water. The fire department was called and was able to install a cap on the canister and roll the unit outside. Minimal damage occurred. The Undergraduate portion of the M&M Building was closed for the remainder of the day so that the air could be cleared of smoke and fumes.

Figure 6.3: Fire History on Main Campus 2010-2022



Source: Michigan Tech Public Safety Incident Reports

Students who live off campus often live in congregate housing facilities throughout Houghton, Hancock, and other nearby communities. Many students live in large, older homes. A fire in the Phi Kappa Theta Fraternity house resulted in the tragic death of a Michigan Tech student in 2002 and underscored the importance of ensuring that off-campus homes also meet current fire codes and have evacuation procedures. Several fires since 2018 have also occurred in off-campus student housing, destroying personal belongings and impacting the safety of neighbors.

On Friday, June 3, 2022, a fire was reported at the Lambda Chi Alpha fraternity located on College Ave. Five students were living at the house at the time of the fire, none were injured. Funds were raised on GoFundMe to assist the displaced students, both current residents and the 14 incoming residents. The City of Houghton requires registration and annual safety inspections of all rentals within the city.

Risk & Vulnerability

While most fire incidents at Michigan Tech have been relatively minor, the potential for disaster remains, especially due to the large population that would require evacuation in the event of a large-scale fire emergency. Affected areas could range from one room to multiple buildings on campus, impacting any portion of the university population. Education and operational fire detectors can often mitigate losses from this type of hazard, and education would benefit both students who live on and off campus.

On the main campus, the residence halls are all equipped with sprinklers and smoke detection systems. The systems sound alarms directly to Michigan Tech Public Safety. In addition, the residence halls have 8 'surprise' fire drill evacuations per year. The sprinklers are checked every three months, and the smoke detectors are also inspected on an annual basis. Most of the other main campus buildings have sprinkler systems and smoke detectors installed. Fire extinguishers, sprinkler systems, and smoke detectors are tested on a regular basis. Buildings that could be further improved in these areas are listed in the mitigation action items in *Section 7: Hazard Mitigation*. Fire drills are not currently conducted in the academic buildings, which is one area that can be improved on by implementing a fire drill evacuation model, similar to what is being done in the residence halls. The university's Environmental Health and Safety Department has already begun the process of establishing a Fire Drill Procedure for the participation in fire drills and will be testing the procedure to fine-tune it prior to rolling it out campus wide.

According to the Center for Campus Fire Safety, most fires occur in student housing (both off and on campus). Michigan Tech has been proactive in implementing fire mitigation activities in the residence halls, thus reducing risk and vulnerability. These items include fire blankets in kitchenettes, fire extinguishers in every hallway and in risk areas, and fire education placards. However, while mitigation has been addressed in the residence halls, academic and support buildings are still lacking in preventive methods to reduce fire risk and vulnerability.

At the Ford Center and Forest, based on one recorded fire incident, the threat of a major structural fire is not particularly high, however, vulnerability is high. Although most Ford Center buildings are equipped with smoke alarms and fire extinguishers, many of the buildings are not equipped with sprinkler systems. Limited water supply and the remoteness of the Ford Center and Forest increase the likelihood that incipient fires could lead to major structural loss.

Wildfires

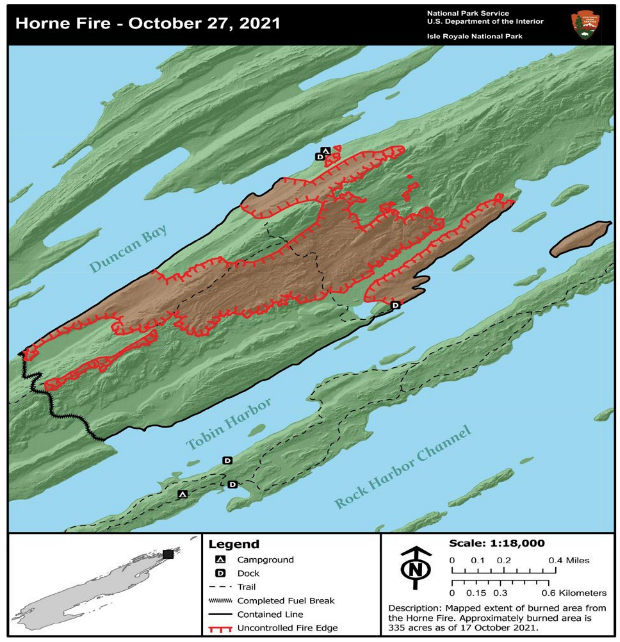
An uncontrolled fire in grasslands, brushlands or forested areas.

Risk Level: *Low*
Vulnerability Level: *Moderate*

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 structures, timber, and wildlife. Long-term effects include scorched and barren land, soil erosion, landslides, water sedimentation, loss of recreational opportunities, and in the case of Michigan Tech, loss of instructional and research functions performed at the Ford Center in Alberta.

Past Occurrences

Both Houghton and Baraga Counties have roughly an 80% forest cover, and as previously mentioned, Michigan Tech's Alberta Campus is located on 4,500 acres of heavily wooded area in Baraga County. Forest fires are most often caused by human activity while lightning causes only two percent. Although forest fires have only caused isolated damage in recent years, they remain a persistent threat. Between 1981 and 2000, 120 wildfires burned 807 acres in Houghton County, while 160 wildfires burned 570 acres in Baraga County, both under DNR jurisdiction. Since 2000, several more wildfires have occurred in Houghton, Keweenaw, and Baraga counties. Between 2015 and 2023, 55 wildfire events occurred in these three counties.



In August 2021, 335 acres were burned on Isle Royale, one of the largest fire events in Keweenaw County during the past twenty years.

Risk & Vulnerability

The risk for wildfire increases with the presence of people. Increasing urban infringement on rural areas elevates the likelihood and potential damages due to wildfires. The Michigan Tech main campus, APRSC, and KRC are located in more developed areas, and the risk of wildfire to these two locations is negligible.

The Ford Center and Forest is at a greater risk from wildfires due to its geographic location and forest surroundings. The frequency of forest fires in Baraga County is 8.1 per year based on 162 fires in a 20-year period. A wildfire could potentially affect the entire Ford Center campus and surrounding lands. The campus's population could be affected, but that number varies with each season. There is a larger student population that lives at the Ford Center during the summer and fall semesters. The Ford Center also has year-round residents, including community members who rent housing but have no ties to the university.

Conversely, the type of forest surroundings near Alberta—hardwood stands with little underbrush—have a lower risk of catching fire when compared to highly combustible vegetation such as softwood trees and shrubbery. Nonetheless, the risk of wildfire does rise due to the increased human activity at the Ford Center, involving its regular university activities, public educational functions, and conference gatherings. Risk is also increased because wildfires often occur in remote areas, making emergency response more difficult. The nearest fire response is a volunteer fire department located 9 miles away in the Village of L'Anse. At one time, Alberta had equipment to pump water out of the nearby lake to combat fire, but the equipment no longer exists. In recent years, fires in Baraga County have been minimal; however, the possibility of a catastrophic wildfire is always present and increases in times of drought. While risk of a serious wildfire event at The Ford Center and Forest (Alberta) is low, its vulnerability is moderate due to lack of on-site fire response.

Climate Change Considerations

While wildfires have not historically impacted Michigan Tech lands or the surrounding communities, increased temperatures due to climate change can lead to hot dry conditions which increase fire probabilities. The northward shifting of forest ecosystems is also another climate change feedback mechanism that is likely to impact the risk of wildfire over time. Temperate zone shifts will lead to species stress and migration, invasive species, and disease. The average wildfire season has extended 78 days longer in the United States. In addition to direct impacts, regional and continental wildfires have had a strong impact on air quality in the recent past, resulting in multiple days in the summer of 2023 where particulate matter rose to dangerously high levels.

FLOODING HAZARDS

- Dam Failures
- Riverine & Urban Flooding
- Flood Insurance

Dam Failures

The collapse or failure of an impoundment that results in downstream flooding.

Risk Level: *Low*
Vulnerability Level: *Low*

Dam failure can result in extensive damage to property and natural resources, miles downstream from the failure. Failure can occur due to poor operation, lack of maintenance, vandalism, and during flood events which cause overflow of the dam. Most failures are catastrophic because they are unexpected, with little or no evacuation time.

Past Occurrences

There is no immediate threat of dam failure to the Houghton campus or the KRC, as there are no dams in their proximity. The dam with the greatest risk of failure in Houghton County is located some 15 miles away from both areas, posing no threat.

The Ford Dam, in Alberta, is located across from the Ford Center serving as the road surface for US Hwy 41. According to an inspection conducted by a private engineering firm in 2006, the Ford Dam is an approximately 500-foot earthen embankment that stretches across the valley along Plumbago Creek and is approximately 20 feet high (see Figure 6.4). The Ford Motor Company constructed the dam in 1936 to supply water to the sawmill in Alberta. In 1946, MDOT rerouted U.S. Hwy 41 across the Ford Dam Crest and in 1954, the dam, buildings and properties were donated to Michigan Tech.

Presently the dam serves as the U.S. Hwy 41 road surface, a water supply impoundment for fire protection, and the public uses the reservoir for recreation. There are no records indicating that the dam has overtopped and caused flooding since its construction in 1936. Any spillage would bypass the town of Alberta and would run into the swampy area of Plumbago Creek.

Figure 6.4 Ford Center

<u>Risk & Vulnerability</u>

The extent of failure of the Ford Dam would cause the old Hwy 41 Bridge (replaced by a newly constructed timber bridge), located northwest of the current bridge, to be submerged, and flood waters could reach the first-floor elevations of several of the buildings at the Ford Center. Erosion of the Hwy 41 embankment is possible with a breach of the dam and could cause the loss of telephone and other utility lines along the toe of the downstream slope of the dam embankment. Emergency plans are in place for areas potentially affected by a dam failure at the Ford Dam, and flow data is available on a continuous basis on the NOAA website.

The Ford Dam is inspected on a regular basis by both the university and the Michigan Department of Transportation (MDOT). Dam Safety Inspections are completed by a professional engineering firm every 3 years. The latest inspection was completed in 2021. Minor maintenance issues noted included a rodent burrow, debris collecting at the inlet of the outflow structure, and shrub/tree growth on the dam. Past repairs and maintenance have improved dam function and increased protection from dam failure and include:

- 2005—replacement of the main spillway structure and culvert that crosses U.S. Hwy 41 which has improved the discharge capacity of the dam.
- 2005—sealing and grouting of a 48-inch diameter CMP (corrugated metal pipe) located between the dam and the downstream slope of the impoundment.
- 2006—replacement of a deteriorated concrete bridge with a wood structure downstream of the dam.

Both risk and vulnerability to dam failure are low at the Ford Center, having no previously recorded incident over the past seventy years. Additionally, the 2018 inspection performed by a private engineering firm revealed no observed dam deficiencies.

Dam Failure risk and vulnerability were both considered low in the 2008 and 2019 plans. The Ford Dam continues to be inspected and maintained on a regular schedule. This section remains low risk and low vulnerability in the 2025 plan.

Riverine and Urban Flooding

The overflowing of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice.

Risk Level: *Moderate to High*
Vulnerability Level: *High*

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

Flash floods are typically brief, heavy flows on small streams or normally dry creeks, and they differ from riverine floods in extent and duration. Normally, locally intense thunderstorms paired with significant rainfall are the cause of flash floods. This results in high velocity water, which often carries 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 rises in temperature, rapid snowmelt, and intense precipitation can quickly overwhelm an area.

Urban flooding may involve low-lying areas that collect runoff waters even though they are not adjacent to drains or bodies of water. It is usually due to the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are not in a floodplain. This risk does vary with topography, soil types, runoff rates, drainage basin size, drainage channel sizes, and impervious ground surfaces in each area. Urban flooding includes the overflow of storm sewer systems and is usually caused by inadequate drainage following heavy rainfall or rapid snowmelt.

<u>Past Occurrences</u>

Michigan Tech's campuses did not suffer direct damage from these flood incidents; however, urban flooding has occurred at the Houghton campus. While most flooding was a result of heavy rains, structural issues and cold weather can also be a factor. A brief history is as follows:

September 1978 Houghton Campus: Plugged storm sewer drains, and heavy rains caused flooding to the Administration Building parking lot, with about 2 inches of water spilling into the ground floor of the building.

1978 flooding of the ground floor and parking lot of the Administration Building

October 2007 Houghton Campus: Intense heavy rains caused flooding and ponding at areas on the main campus, due to overburdened storm sewers including the parking lot outside of the Administration Building and onto Hwy-U.S. 41, along Houghton Avenue on the south side of the Library Building and in Parking Lot 14 outside of the Walker Arts and Humanities Building. Fortunately, there was no major flooding in the buildings - just small issues with minor leaks.

Flooding of Parking Lot 14 on the Main Campus after heavy rainfall in October 2007.

June 2018 Houghton Campus: Multiple rounds of very heavy rain fell across much of the western portions of Upper Michigan during the 2018 Father's Day weekend (June 15th - 17th). The hardest-hit area was in Houghton County, MI. Up to 7 inches of rain fell in the area between 11pm and 8am, with the majority of the rainfall coming in the 2am to 5am time frame, causing massive amounts of damage to the City of Houghton and surrounding areas. Many roads were washed out, affecting staff and students' ability to reach campus. The Michigan Tech campus was closed on Monday, June 18th.

The Administration and Facilities Management buildings received the greatest amount of damage due to flood waters and backed up sewage entering the buildings. The garden level of the Administration building was flooded with 6 to 36 inches of water causing significant damage to electrical and mechanical equipment and building finishes.

June Father's Day Flood – Administration Building

The Administration building was closed for 2 weeks. Portable diesel generators served the building for 6 months until the main electrical equipment in the building could be repaired. The Garden level of the building remains closed due to flood damage. Flood repairs in the Garden level were completed in January 2020, over 18 months after the flood. The Facilities Management Building received a moderate amount of damage when the nearby city sanitary sewer main line was overloaded from the storm water infiltration. Two manhole structures were damaged causing an estimated 250,000 gallons of sewage to be discharged across the surface of the parking lot around the building. Sewage also backed up through the building piping causing flooding in the Grounds Department, Central Receiving, and Engineering Services offices. The Grounds Department area was relocated for several weeks while the area was cleaned and repaired. Several packages were damaged in Central receiving.

June 2018 Off-Campus Locations: The intense rainfall affected also affected Michigan Tech properties off the main campus. The main entrance road, retaining wall, and cart paths were heavily damaged at the Portage Lake Golf Course. Several bridges were washed away, and trails were damaged at the MTU Tech Trails. The Keweenaw Research Center test tracks and access roads were heavily damaged by washouts and erosion. Several culverts were washed out across Houghton County creating impassable roads. Other areas affected include Peepsock Creek near the Student Development Complex, Woodmar Drive pavement damage, and a landslide along Cemetery Road.

June 2018 – Mont Ripley: The Mont Ripley Ski Hill located across the Portage Canal received severe damage to the hill. Large portions of the hillside were washed away by the runoff from the heavy rains. The legacy storm structures located upstream from the hill failed, contributing to the degree of damage. Debris and runoff caused catastrophic damage to the several properties located in the town of Ripley directly adjacent to the hill. Emergency stabilization and debris removal were completed by the end of the summer. Several ski runs were closed for the ski season. Final repairs and stabilization were completed by the start of the 2019-2020 ski season.

While the frequency of flooding is low (0.7 events per year based on 7 days with a flooding event reported in the past ten years) in Houghton County, urban flooding is a greater threat to the Houghton campus. Areas with inadequate culverts become overburdened and can fail when faced with excessive snow melt and/or heavy rains. An additional consideration for Michigan Tech's Houghton campus concerns the geography of the city. Houghton was built on a hill with steep grades that increase velocity of water runoffs. The majority of the main campus is located at the bottom of the hill. Storm water is funneled into three culverts, two that fork off at the bottom of MacInnes Drive and the third collects water at the bottom of Clark Street. They then empty into the Portage Canal.

<u>Risk & Vulnerability</u>

The probability of urban flooding at the Houghton campus is moderate to high due to the geography of the campus, with a potential for storm sewers to become overburdened. Reasons that flooding occurs could include inadequate inlet structures on campus, combined with debris that hinders water flow through these inlets. The threat of urban flooding is further increased due to aging storm sewer systems on and off campus. Overwhelmed storm sewers on neighboring city streets or US Highway 41 can lead to increased runoff onto campus, further overloading the campus storm sewer system. The geographic location, at the bottom of a steep hill, of much of the main campus (including many academic and administrative buildings) indicates a greater level of vulnerability, which is estimated to be high.

There is a history of heavy rains and snow melts in the area. Past occurrences of flooding on Main Campus, coupled with the regional weather history, expose Michigan Tech to a higher risk of urban flooding; risk is estimated at moderate to high. Past occurrences of flooding on campus have resulted from short durations of heavy rainfall resulting in rapidly developing flood events as detailed in this section.

In 2024, Michigan Tech performed a campus stormwater drainage assessment. This study identified high-risk areas on campus and the needed underground infrastructure to mitigate the risk of flooding and better manage stormwater flow. The study will assist the university in developing mitigation actions that incorporate innovative and appropriate stormwater practices into new campus construction and landscape design.

Flood Insurance

Michigan Tech's campus is not located in a FEMA-designated flood plain. The FEMA National Flood Insurance Program (NFIP) makes federally-backed flood insurance available to homeowners, renters, and business owners in communities that adopt and enforce floodplain management ordinances. NFIP puts special focus on the 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." According to the official spreadsheet of NFIP repetitive flood properties dated June 11, 2018, there are no repetitive loss properties or severe repetitive loss properties located in Michigan Tech's area of jurisdiction. Michigan Tech does not participate in the FEMA National Flood Insurance Program (NFIP). However, the City of Houghton does participate but does not have a mapped flood plain. The NFIP contact for the City of Houghton is Eric Waara, City Manager. There are currently no repetitive loss or severe repetitive loss properties in Houghton County. Michigan Tech does have property insurance that provides flood coverage.

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. Michigan Tech is affected by flooding caused by drainage issues and stormwater flow and recognizes the problems associated with the location of several buildings and parking areas on campus. The University is taking steps to prevent loss by identifying facilities with high risk of flooding and investigating ways to improve capacity and flow of stormwater to alleviate this problem.

<u>Climate Change Considerations</u>

Changes in intensity and frequency of rainfall events due to climate change are of moderate concern for the university. CHaMP models show a very modest increase in predicted number of days with over one inch of rain, growing 0.33 days from an historical average of just over 4 days per year, based on a high emission scenario. However, both the overall percentage of rain falling in major events and intensity of multi-day events have increased dramatically in the region and are likely to continue to grow. Also, the larger proportions of snow precipitation cause more extensive snow accumulation and may add drainage burdens during the spring melting season. Both spring and summer flood risk are likely to worsen.

INVASIVE SPECIES

A species that is 1) non-native to the local ecosystem and 2) whose introduction causes or is likely to cause economic or environmental harm, or harm to human health.

Risk Level: *Moderate*
Vulnerability Level: *Moderate*

Invasive species can be plants, animals, or other organisms that are transported to an area where these species have little or no ecological competition. Humans typically transport these species between locations, disrupting the natural spread of organisms over time. Some of these methods of travel are on animals, ships, planes, produce, commercial goods, and clothing. As globalization and global travel increases, the risk that invasive species pose to local environments drastically grows, which currently exceeds the cost of all other natural disasters combined.

Invasive species in one area may not be invasive in another area, typically governed by the local ecological environments and other organisms that can compete with these species. When taken to a location in which the species has very little competition, the species thrives and can take over the resources and space of other native species. This competition, called natural controls, may be things such as predators or diseases.

In some cases, the introduction of invasive species may pose a threat to public health and well-being, especially in the case of animal disease or infestation in crops and food supplies. Invasive species may also create disruptions in the supply of natural resources. For example, the introduction of an invasive non-native aquatic species into water systems may take away space and resources that allow certain fish species to live. This poses a risk for communities that rely on certain food sources that would be affected by the introduction of invasive species.

Past Occurrences

Houghton County reports that there have been over 3,800 reported locations of invasive species, most of which are terrestrial invasive plants. Over the past decade, Michigan Technological University has had an increased awareness of invasive species on campus property. The Keweenaw Invasive Species Management Area (KISMA) is a partnership between many organizations throughout Houghton, Keweenaw, and Baraga Counties, including Michigan Technological University. The goal is to facilitate cooperation and education among federal, state, tribal, local groups, and landowners in prevention and management of invasive species across land ownership boundaries. The university's current goals have been to identify and address any outbreaks of invasive species.

The following are some examples of reported invasive species that have been found or threaten the local ecosystem at Michigan Tech:

Emerald Ash Borer (Agrilus planipennis): First discovered in southeastern Michigan near Detroit in 2002, this exotic beetle has killed hundreds of millions of ash trees throughout the U.S. Adult Emerald Ash Borers (EAB) feed on ash foliage but cause little damage. However, the larvae feed on the inner bark of the ash trees, disrupting the tree's ability to transport water and nutrients.

Many trees lose approximately 30 to 50 percent of their canopy in one year and the tree is often killed after 2-3 years of infestation. Most devastation has occurred in southeast Michigan, where about 20 million trees have been killed. EAB was first reported within Houghton County in 2008. Michigan Tech was impacted by Emerald Ash Borer, killing most of the campus' ash trees. The University removed them and in planting new trees took tree diversity into consideration. Planting a diversity of trees prevents one disease from destroying all the trees in the campus community.

Japanese Barberry (Berberis thunbergii): Japanese barberry was introduced to the U.S. as an ornamental in 1875. It grows in full sun to deep shade and forms dense stands in closed canopy forests, open woodlands, wetlands, fields, and other areas. Japanese barberry displaces many native herbaceous and woody plants. Dense infestations provide ideal habitat for blacklegged (deer) ticks. It spreads through seeds which are eaten by birds who spread it far and wide.

Japanese Knotweed (Fallopia japonica) (aka Polygonum cuspidatum): Japanese knotweed forms large, dense clumps 3-9 feet high in moist, open to partially shaded habitats, on riverbanks and wetlands, and along roadways and hillsides. It was introduced to the U.S. in the late 19th century. It creates dense and expansive monocultures and eliminates native plants, propagating itself through rhizomes, seeds, and broken fragments of vegetative tissue. Once established, it is very difficult to eradicate. Michigan Tech removed a large stand of Knotweed from the former Theta Tau property. Since the removal, native plants have been able to regenerate in the area.

European Chafer (Rhizotrogus Majalis): Adult flight begins in mid to late June and continues for 2 to 3 weeks. The European chafer is a nondescript light brown beetle, 0.5 inch long. They do not feed as adults. Eggs are laid from late June through July. Larvae hatch from eggs in 10 days and begin to feed on the roots of turf. They feed through late summer and fall, not stopping until the ground freezes. They resume feeding in the spring before the grass begins to grow. The larvae pupate (and stop feeding) in late May.

European Chafer tends to prefer dry or well drained soils. Infestations may be heaviest in dry sunny areas, on slopes, or in sandy soil. European chafer grubs have caused turf damage on golf course roughs, home lawns, athletic fields, and recreational turf. They are rarely a problem in turf irrigated daily with enough water to keep the soil moist. Chafer grubs feed heavily in September, October, and early November, then again in March and April, sometimes causing dead patches to appear and expand at that time. In the fall, turf damage is more likely when grubs are feeding during a period of dry weather long enough to cause drought stress. In the spring turf damage may occur when grubs feed on turf roots in March or early April before the turf begins to grow.

Spongy moth (Lymantria dispar): Formerly known as the Gypsy moth, the spongy moth is an invasive pest native to Europe. It was introduced into Massachusetts in 1869 by a well-meaning but clearly misguided amateur naturalist. Despite many efforts to contain this pest, spongy moth populations have continued to expand. People can accidentally move spongy moth egg masses or other life stages into new areas, which greatly increases the rate of spread. Populations of spongy moth are now found across much of the eastern United States and Canada.

A spongy moth outbreak can be unpleasant for people who live, work, or enjoy outdoor recreation in affected areas. Large hairy caterpillars can be abundant in forests, campgrounds and parks, and in residential areas. The caterpillars often wander in search of cool, shady areas, often resting on the sides of houses and trees during the day. Frass (insect feces) produced by the caterpillars feeding on leaves in the tree canopies can rain down on driveways, sidewalks and picnic tables. Oaks and other favorite host trees can be heavily defoliated, usually between late June and mid-July. Spongy moth outbreaks typically last two to four years, then collapse, usually because the caterpillars die from viral and fungal diseases.

Risk & Vulnerability

The probability of future occurrence for invasive species for Michigan Technological University is moderate but could rise due to the continual transport of goods into Houghton County. Tourism and the transportation of goods has created opportunities for many organisms to be transported to the area and to establish themselves in our region.

The entire population is vulnerable to invasive species because the hazard primarily impacts the environment. The destruction that invasive species have on woodlands and water features ultimately impacts humans by diminishing the positive features that nature offers and diminishing our food supply. A widespread insect infestation, such as from the Emerald ash borer, can create serious public safety threats due to dead and dying trees being fire prone (due to their dry, brittle nature) or to partial/total collapse due to high winds or ice/snow accumulation. The falling trees or limbs can bring down power lines, cause damage to public and private structures, and cause injuries or death. Transportation infrastructure is also vulnerable to damage as tree debris can fall onto roadways and trails, blocking commuters, trail users, and emergency response vehicles.

Climate Change Considerations

Changing temperature and precipitation will force many forest ecosystems to shift northward, amplifying existing stressors and lead to an increase in invasive species as well as insect pests and tree pathogens (https://glisa.umich.edu/resources-tools/climate-impacts/forests/). Due to seasonal temperature fluctuation, species that had been previously found only in warmer areas to the south have started to appear (some examples include bull thistle, common buckthorn, beech bark disease). While the definition of invasive species specifically refers to species introduced by humans, to distinguish these patterns from naturally occurring ones, species transported by human action can be more likely to survive as climate change occurs.

LANDSLIDES

The movement of a mass of rock, debris, or earth down a slope.

Risk Level: *Low*
Vulnerability Level: *Low*

Landslides are often caused by erosion of soil, rocks, and dirt on steep inclines or overhangs. They pose a large risk to roads and paths that sit next to an incline or on top of a ridge. Landslides may occur over a long time or near instantly without warning. The natural process of soil movement from gravity and water flow creates slow landslides that may take weeks or months to cause damage.

Landslides can be fatal if the incident causes debris to fall on passersby or when land gives out over a structure or pathway. While dangerous, landslides only kill an average of 20-50 people in the United States per year.

<u>Past Occurrences</u>

On June 17, 2018, several landslides occurred within Houghton County as a result of excessive rainfall. This event included a mudslide that destroyed streets and caused one death in the City of Houghton. In the city of Hancock, two ski runs on the east side of Mont Ripley Ski Hill experienced a large landslide, taking out a dirt road and many trees. One senior design student group from the Geological and Mining Engineering and Sciences Department conducted a study following the incident and concluded that the landslide resulted from large volumes of dammed water that couldn't drain quickly.

Mont Ripley Landslide following Father's Day Flood

<u>Risk & Vulnerability</u>

While landslides in the area are less common, occurrences such as those during the June 2018 floods can happen suddenly. Due to the large number of steep slopes in the area, some reaching more than 30 degrees, special care must be taken to be prepared for quick landslides. Michigan Tech sits on a large hill, and the Facilities Management, Power Generation, and GLRC buildings are all located at the foot of a steep, approximately 50-foot hill. Excessive rainfall and snowmelt could trigger landslides that block road access to these buildings.

SUBSIDENCE

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

Risk Level: *Low*
Vulnerability Level: *Low*

Depressions, cracks, and sinkholes in the ground surface can threaten people and property. Although the sudden collapse of ground surface does pose an immediate threat to life and property, subsidence depressions normally happen over a period time varying from several days to several years.

From the mid to late 1800s, the Keweenaw Peninsula was the largest producer of native copper ore in North America. The populations most at risk from ground subsidence live or work in an area where development has occurred above active or abandoned mines, where underground cavities are present near the surface. Many of the 800 mines (with more than 2,300 shafts or openings) in Michigan opened in the 1840s, and while many mine sites have been investigated by County mine inspectors, some are still unknown and/or unmarked. There are limited records of the locations of shafts, and the extent of the mine voids and proximity to the surface may be unknown. A Michigan Abandoned Underground Mine Inventory was completed in late 1998. The inventory includes information about known mine locations and surface openings. The Houghton County Mining Inspector reports that numerous ground failures occur each year in Houghton County, often due to inadequate mine capping techniques.

Subsidence may also occur over old foundations or lauders—rock pipes installed by mine companies to be used as storm drains. A small sinkhole about 3 feet deep developed in Calumet in April of 2001. 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.

<u>Past Occurrences</u>

The A.E. Seaman Mineral Museum was built on campus in 2011. Two open and uncapped mine shafts were discovered during construction of the building. The shafts are part of the Mabbs mine which operated in the 1860's. One of the shafts is located under the west wall of the building and has been capped with concrete. The other shaft has been secured with fencing. The location of the shaft and the underground workings of the mine have been located and mapped.

<u>Risk and Vulnerability</u>

Areas adjacent to the historic copper mines are susceptible to future subsidence, and awareness is important to mitigate hazard impact. The Michigan Abandoned Underground Mine Inventory 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; however, most shafts are on private lands and continue to pose a risk. Areas in Houghton County that may be more likely to experience subsidence are along the U.S. Hwy 41 corridor from Quincy Township to Kearsarge, where historical mining operations were most prevalent. Michigan Tech is not located near this corridor, and there is a low probability that subsidence would affect the university.

Vulnerability is estimated to be low; however, this was difficult to determine due to the slight history and unavailability of data on specific dangerous locations.

SEVERE WEATHER

o EXTREME TEMPERATURES

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

Risk Level: *Moderate*
Vulnerability Level: *Low*

Temperature extremes are broken down into two categories: extreme heat or extreme cold. In both instances there are extended periods of either abnormally low or high temperatures. Other meteorological conditions that can accompany extreme temperatures could include high humidity and lack of rain, or heavy snowfall and high winds. Extreme temperatures primarily affect the most vulnerable segments of the population, including the elderly, children, the impoverished, and those in poor health. Threats from extreme heat include heat stroke (a medical emergency) and heat exhaustion. Extreme heat is a greater problem in urban areas where the high temperature and humidity can be more intense. Extreme heat (or a "heat wave") - temperatures above 90°F - occurs occasionally during late May to early September in the Upper Peninsula. Individuals working outdoors, the elderly, and children need to be accounted for during oppressively hot conditions. Extreme hot temperatures also put a strain on the energy demands for an area, as air conditioning becomes a necessity for vulnerable populations.

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure and/or Strenuous Activity

Caution   Extreme Caution   Danger   Extreme Danger

(www.noaa.gov)

Extreme cold is primarily associated with the wintery months of October through May in the Upper Peninsula and categorized by temperatures plunging near or below 0°F. Periods of extreme cold are risky for those in both rural and urban areas. An extreme cold event to the NWS can refer to a single day of extreme or record-breaking sub-zero temperatures. Extended or single day extreme cold temperatures can be hazardous to people and animals and cause problems with buildings infrastructure and transportation. Threats from extreme cold include hypothermia (a medical emergency) and frostbite. Students who walk to classes may be more susceptible to exposure to extreme cold.

An additional risk during winter months includes the freezing of water pipes due to limited snow cover or other insulation. With frozen pipes comes the added risk of bursting pipes, which can cause flooding incidents, and damage from these incidents is not always minor.

Wind (mph)	Temperature (°F)																	
	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-58	-63
10	34	27	21	15	11	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-38	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-83	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-52	-60	-67	-74	-81	-88	-95
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98
Frostbite times	None		>2 hours				≤30 minutes		≤10 minutes		≤5 minutes							

(https://www.noaa.gov/jetstream/synoptic/wind-chill)

<u>Past Occurrences</u>

Extreme cold events are not uncommon in Houghton County where wind chill temperatures can reach 30°F to 40°F below 0°F. The lowest temperature ever recorded in Houghton was **-30 °F** which occurred on February 9, 1951. There were fewer incidences of extreme heat. One was on July 31, 2006 when temperatures throughout the county were above 90°F and accompanied by dew points around 70°F, sending heat indices into the 100°F to 105°F degree range. Another extreme heat incident in Houghton County was part of a larger Upper Michigan heat wave. From July 13 to 19, 2013, there was a stretch of very warm conditions, where high temperatures came with oppressive humidity. Dew points were in the lower 70°Fs, which resulted in heat indices around 100°F degrees. Most recently, a heat advisory was issued for Houghton County June 19 and 20, 2022 with high temperatures reaching 97°F on the 20th and high dewpoints as well. The highest temperature ever recorded in Houghton was 102 °F which occurred on July 7, 1988.

Incidents on-campus related to extreme cold are listed below:

January 5, 1981 Electrical Energy Resources Center-Houghton Campus: Sub- zero temperatures and an open window had caused pipes to freeze and then burst. Water seeped to the first floor, down into the basement and sub-basement of the building, causing minor damage to ceiling tiles and flooring. Estimates of damage was not available, however, damage was minor.

January 13, 1994 Areas throughout Michigan: Record cold temperatures resulted in frozen pipes throughout Michigan; estimated loss in the Upper Peninsula was $2 million.

January 1994 Areas throughout Michigan: Record cold temperatures resulted in frozen pipes throughout Michigan; estimated loss in the Upper Peninsula was $2 million.

January 23, 1998 Harold Meese Center-Houghton Campus: Cold weather was suspected of causing minor flooding and water damage when the sprinkler system was activated and a pipe broke in the building, allowing water to leak for 20 hours over a weekend. Minor damage included ruined ceiling tiles, plywood, and carpets.

March 1, 2006 JR Van Pelt Opie Library-Houghton Campus: A water pipe that led to a fire sprinkler on the library's third floor froze (due to proximity to the roof) and then burst, causing water to flow into the library at 50 gallons per minute. Damage was minor, affecting only carpeting, furniture, walls, etc., due to the quick response of university staff and personnel. The water did not affect any library collections.

January 28, 2019: The Michigan Governor declared a state emergency due to extreme cold weather and record low windchills temperatures. Michigan Tech campus was closed for 2 days.

March 23, 2022: Michigan Tech's main campus had a delayed opening due to icy conditions on local roads and in parking lots.

<u>Risk & Vulnerability</u>

All areas of the State, and subsequently the Michigan Tech campuses, are subject to extreme temperatures. The probability of an extreme cold event occurring in any given year is moderate (about 46%) while the risk of an extreme heat event is low, based on the frequency of past events. Cold weather is a way of life in this part of the country that most people expect and are prepared to deal with. Students and faculty coming from warmer parts of the nation and world are provided guidance on how to prepare for the cold weather.

Extreme cold may cause pipes to freeze and subsequently burst, as seen in recorded events. However, new constructions do include the consideration of pipe placement to minimize freezing pipes. Likely the greatest issue related to cold weather is the possibility of university closure; However, for this to occur the cold weather must usually also be teamed with high winds and/or heavy snowfall. The loss in operating costs of university closure is approximately $810,000 per day (composed primarily of salaries, wages, benefits, supplies and services, and utilities). University closure is rare because the region and the university are both well prepared to handle such weather events. Michigan Tech's risk to extreme temperatures is considered moderate and vulnerability is considered low as the University has made it a priority to be prepared for extreme temperatures (especially cold).

<u>Climate Change Considerations</u>

Certain indicators of climate change in Houghton County have already been observed. In Michigan, new heat records outnumbered new cold records 6 to 1 in the 2000s. Climate change is likely to lead to more days with extremely high temperatures. The CHaMP tool projects that the number of days with temperatures over 90-degrees will double in the next 25 years in Houghton County under the high emission scenario. This will increase cooling demands in our buildings and stress electric utility infrastructure. We will continue to monitor these changes in extreme temperatures and prioritize energy efficiency measures that decrease our base load as well as pursue avenues for efficient space cooling within future and existing infrastructure.

- ### FOG

Atmospheric conditions allow water vapor to condense into small droplets in the air.

Risk Level: *Low*
Vulnerability Level: *Low*

Fog forms near the ground when water vapor condenses into tiny liquid droplets that remain suspended in the air. Fog usually occurs when the moisture in the air is above the dew point at a specific temperature, leading to the formation of the small water droplets. Fog often appears as clouds sitting just above the ground, usually impairing visibility. As such, fog can be a significant hazard for vehicle operators, especially during darker hours of the day.

<u>Past Occurrences</u>

In the past 10 years, there have been 24 NWS dense fog advisories for northern Houghton County. Advisories for such conditions occur during most months of the year, independent of the season. However, fog does typically dissipate by mid-morning.

<u>Risk & Vulnerability</u>

While only three dense fog events were reported in the past 10 years (a frequency of 0.3 events per year), fog is a common occurrence in Houghton County. Only when fog and humans interact on transportation corridors do people and facilities become vulnerable. Dense fog may cause significant danger for drivers and pedestrians as a result of poor visibility. During the time span from 2016 to 2022, a total of 42 vehicle crashes were reported during fog conditions in Houghton County. However, Michigan Tech is aware of the increased vulnerability to students who must cross the Highway from the residence halls to the main campus and strives to make those crossings as safe as possible. Vulnerability to Michigan Tech is considered low.

- **HAIL**

Conditions where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth.

Risk Level: *Low*
Vulnerability Level: *Low*

Hail, a product of strong thunderstorms, usually falls from 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 range in size from that of a pea to a golf ball but are sometimes larger than baseballs. Hailstones can damage crops, dent automobiles, and injure people and wildlife. Hail reported in Michigan range in size from a pea (1⁄4” diameter) to a golf ball (1 3⁄4” diameter), but hailstones larger than a baseball (2 3⁄4” diameter) have occurred with the most severe thunderstorms.

<u>Past Occurrences</u>

The most significant hailstorm event in Houghton County occurred on July 8, 2007 where severe thunderstorms produced hail up to 1.75 inches and damaging winds.

Reported Hail Events in Hooughton County by Size , 1955-2018

Hail Size Reported	Number of Events
¾"	26
0.9"	10
1"	22
1 ¼"	2
1 ½"	1
1 ¾"	6
2"	1
2 ½"	1
2 ¾"	1
TOTAL	70

No significant hail events have been reported for the university in recent years.

Risk & Vulnerability

Hail is usually an accompaniment of thunderstorms and storms can vary in size, location, intensity, and duration. All areas of each campus, in addition to the community, could be affected by a hailstorm event. Average frequency for the combined counties is 0.91 events per year or about 1 hail event per year. Thus, the probability that a hail event will occur and impact any Michigan Tech campuses is relatively low. Damage from hail in the counties has generally been minor and incurred by individual property owners. The university has no reported damages from hail. Vulnerability is considered low.

- ### ICE & SLEET STORMS

A storm that generates sufficient quantities of ice or sleet to result in hazardous conditions and/or property damage.

Risk Level: *Moderate*
Vulnerability Level: *Low*

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 automobile tires, sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rains that freeze upon contact with a cold surface, coating the ground, trees, buildings, and overhead wires with ice, at times causing extensive damage.

Past Occurrences

There were three ice storms and one sleet storm recorded from 1996-2018 in Houghton County, while two ice storms were recorded in Baraga County during this time period. On both occasions, up to ½ inch of ice accumulated, causing only minor accidents and damages.

Risk & Vulnerability

The probability of future ice storms occurring in the regions where Michigan Tech's campuses are located does exist but are considered to be low. Taking the average probability for both Houghton and Baraga County based on past events, future occurrence would be approximately 1 event every 3.5 years. Due to the nature of this type of storm event, affected areas will vary as will the duration and intensity of the storm. All areas of Michigan Tech's campus could be affected along with the local area. Several critical services can be disrupted by ice storms, but most of Michigan Tech's utilities run underground. Vulnerability to Michigan Tech, while difficult to determine, is considered low. The possibility of automobile accidents does increase during such slippery driving conditions, but the impact on the university's population and holdings would most likely be minor. An additional consideration includes the possibility that emergency response times could increase due to icy conditions, but this is complicated to quantify.

Climate Change Considerations

Climate change will likely cause an increase in the number of ice and sleet storm events. Average temperatures in and around the winter months are hovering closer to the freezing point, the temperature at which ice and sleet events typically occur. Instead of traditional snowfall, Michigan winters have been characterized by cycles of thawing and refreezing. This pattern causes treacherous ice cover on frozen surfaces, puts stress on cables and tree branches, and can lead to infrastructure failures. Despite the slight decrease in the length of Michigan winters over time, the increased precipitation more often takes the form of a major snow event and provides more moisture for refreezing after the warmer thawing periods occur.

- **LIGHTNING**

The discharge of electricity from within a thunderstorm.

Risk Level: *Low*
Vulnerability Level: *Low*

Lightning is often perceived as a minor hazard, but it damages many structures and kills and injures as many, if not 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.

Past Occurrences

There have been no reports of serious incidents caused by lightning at Michigan Tech. Specific data regarding lightning incidents were not available for Baraga and Houghton Counties.

Risk & Vulnerability

Any of the university holdings could be struck by lightning, but affected areas would most likely not be widespread. The frequency of thunderstorms, based on the 2-county average of recorded storms, is approximately 2 thunderstorms per year. Several of the reported thunderstorms resulted in recordable damage; however, these damages were a result of high winds rather than lightning.

According to the Michigan Tech vulnerability analysis, the probability of a lightning storm occurrence is 2 to 3 times per year. Most injuries and deaths due to lightning strikes occur on open fields and under trees. Portage Lake Golf Club is most hazard-prone and may contribute to or intensify the effects of lightning. Main Campus and other off-campus locations have an equal vulnerability to lightning strikes as there is really no way to pinpoint exactly where, when, and to what extent lightning will cause damage. Based on the minimal number of lightning storms per year, risk from lightning is low. Vulnerability to lightning is also low due to the lack of damage caused in the past by lightning and also as a result of the mitigation efforts already in place by the university. Proper grounding procedures are followed for permanent and temporary equipment, protection procedures are in place for outdoor events, and weather monitoring and appropriate warnings are provided for the population.

- **SEVERE WINDS**

Non-tornadic winds of 58 miles per hour or greater.

Risk Level: *Moderate*
Vulnerability Level: *Low*

Severe winds are fairly common in various parts 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. Property damage from straight-line winds can be more widespread than tornadoes. Severe winds can cause damage to structures, power lines, and trees. Power outages can result in the need for sheltering those left without power for extended periods.

Past Occurrences

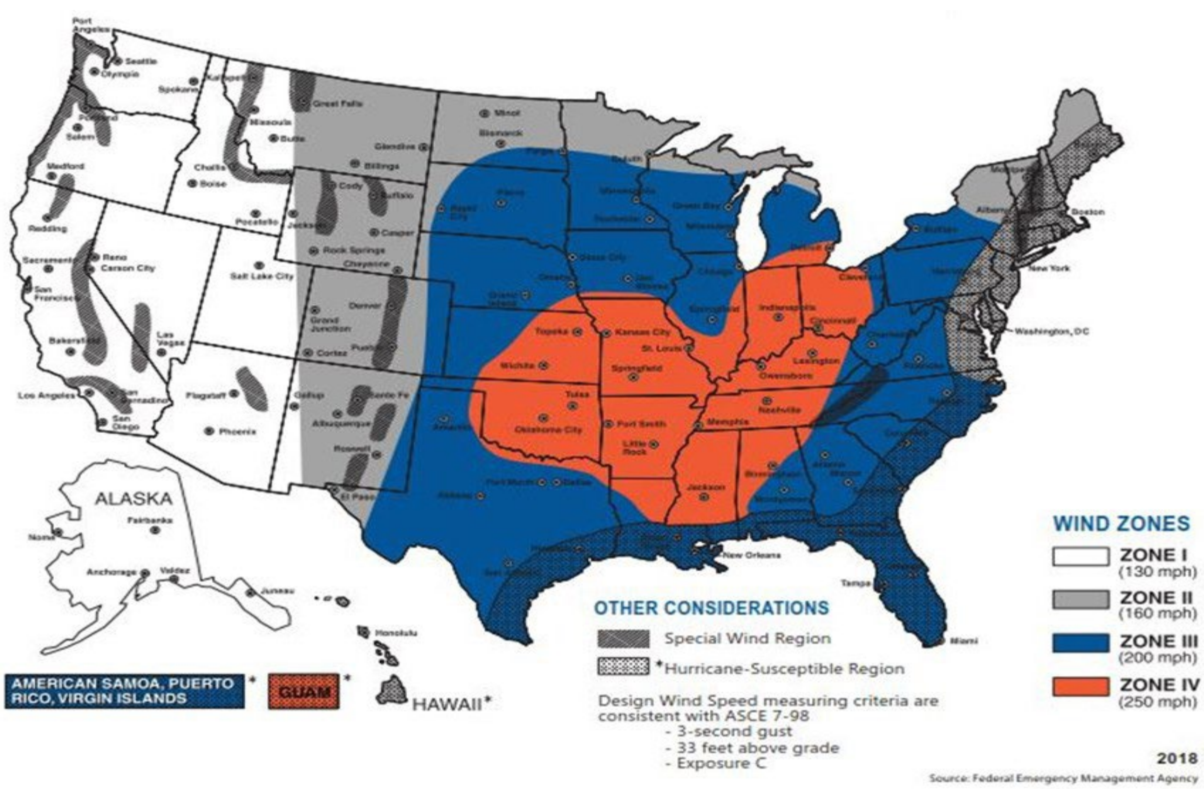
Historically in Houghton County, windstorms are rarely a singular event but are usually accompanied by other severe weather such as thunderstorms and blizzards. The largest wind gust recorded in the county since 1950 occurred near Houghton on August 1, 2002, when 92 mile per hour winds peeled off the roof of a warehouse, overturned a truck, and downed numerous trees and power lines.

Severe winds usually occur near the shoreline in Michigan. Michigan Tech is located 8 miles from Lake Superior and has experienced severe winds in the past, which have at times blown out campus building windows. Damages have been minor, and no injuries have been reported as a result of these occurrences.

<u>Risk & Vulnerability</u>

As can be seen in Figure 6.5, Michigan Tech (along with most of the Upper Peninsula) is located in a Zone II (160 mph) wind zone. At Michigan Tech, severe winds affect the campus about once every 2 years, while Houghton County averages 3.4 occurrences and Baraga County averages 2 per year. The average probability of a severe wind occurring in either county in any given year is approximately 46%. Impacts of severe winds on the Houghton campus are most prominent in the buildings whose windows have been previously recorded to be blown out by these high winds. Also fallen trees can cause damage and risk of loss of life.

Figure 6.5: Wind Zones in the United States



Vulnerability to high winds is low. University mitigation efforts include protection procedures for outdoor activities, a warning system and communication of advisories and instructions.

○ SNOWSTORMS

A period of snow often accompanied by high winds, cold temperatures, and low visibility.

Risk Level: *Moderate*
Vulnerability Level: *Low*

Snowstorms are periods of rapid snow accumulation usually accompanied by high winds and cold temperatures. These events can be dangerous for a community over a period of days or weeks. Heavy snow can shut down towns and cities for several days if snow is persistent and cannot be cleared in a timely fashion.

Blizzards are the most dramatic and perilous of all snowstorms, as the snow is accompanied by low temperatures and strong winds. Blizzard snow usually takes the form of fine, powdery particles windblown in such great quantities that, at times, visibility is reduced to only a few feet.

As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall over relatively short geographic distances. The Western Upper Peninsula experiences the most snowstorms and snowfall in Michigan each year. One reason for this is the "lake effect," a process by which cold winter air moving across Lake Superior picks up moisture from the warmer lake waters, resulting in larger snowfall amounts. Due to weather patterns, severity of different types of snowstorms varies somewhat throughout the county. Lake effect snow is almost exclusively focused on areas close to Lake Superior. System snow results from weather fronts moving across the country.

Past Occurrences

The frequency of snow events in the area is a certainty each year. Average snowfall per year is over 200 inches, but potential snowfall is substantially greater, as reflected in the record winter of 1978-1979 where annual snow accumulations measured 390.4 inches. The 2018-2019 winter recorded 357-inches of snow in Houghton County.

March 2,2007: Michigan Tech campus was closed for one day due to a severe winter storm.

January 30, 2008: Michigan Tech was closed for one day due to snow and wind.

February 19-20, 2013: Michigan Closed for a ½ day on the 19th and all day on the 20th. The Career Fair was still held.

January 30 – 31, 2019: Michigan Tech was closed for two consecutive days. Governor Whitmer declared a state of emergency for the State of Michigan due to extremely cold temperatures.

February 25, 2019: Michigan Tech campus was closed due to a severe winter storm with extreme wind chill, poor visibility and drifting snow.

March 23, 2022: Michigan Tech offices and classes were canceled until 10:00 am due to poor road conditions from snow on freezing rain.

December 23, 2022: Michigan Tech buildings, facilities, and services were closed due to a severe winter storm with high winds and sustained precipitation.

Risk & Vulnerability

Heavy snowfall affects the local area and oftentimes the greater region. Heavy snowfall can accumulate on roofs and, if not removed, can cause cave-in type damage. However, there is no history of such events occurring to university holdings. The cost of a typical snowstorm is difficult to estimate, as a series of small events can have the financial impact of one large event. In general, the local area, along with the university, is aware of and prepared to deal with excessive snow. Perhaps the greatest threat of snowstorms is closure of the school, which does happen on rare instances (more frequently in 2019 and 2022). As mentioned previously, if the weather becomes inclement enough for the university to close down, the university could incur approximately $810,000 in losses per day. The probability of snowstorms in any given year is nearly 100 percent, thus making the probability ranking high but the vulnerability low-moderate considering the precautions taken by the university and local community to prepare for major snow events each year.

Climate Change Considerations

As one of the snowiest campuses and communities in the continental United States, Michigan Tech and the surrounding communities are well-equipped to manage large quantities of snow. That said, winter temperatures in the Great Lakes region have been warming at a faster rate compared to other seasons, which impacts snowfall patterns, lake-ice coverage, and trends in freeze-thaw cycles (FTCs) observed across the region. Warmer air holds more moisture and thus the potential for larger snow events during the colder months of the year. Lake-effect snow zones such as Houghton may continue to see increasing lake-effect snowfall during the coldest months of the year as a warmer atmosphere will be able to hold increasing amounts of moisture. Snowfall during warmer weather events have higher moisture content that is more difficult to remove and could increase some infrastructure vulnerabilities such as downed limbs and power disruptions.

- **TORNADOES**

An intense rotating column of wind that extends from the base of a severe thunderstorm to the ground.

Risk Level: *Negligible*
Vulnerability Level: *Low*

The funnel associated with tornadoes can have winds of up to 300 miles per hour and interior air pressure that is 10-20% below that of the surrounding atmosphere. The typical length of a tornado path is 16 miles but tracks of up to 200 miles have been reported. The path's width is usually less than one-quarter mile but can be over a mile. Historically, tornadoes have been one of the leading causes of death by natural disaster in the nation (lightning is another). Property damage resulting from tornadoes is in the hundreds of millions of dollars every year. While the State of Michigan does see tornado activity yearly, it is rare for tornadoes to strike the Upper Peninsula, let alone the Keweenaw Peninsula.

Past Occurrences

There has only been 1 recorded tornado in Houghton County in the past 50 years. The tornado occurred in July 1987, was rated an F0, resulted in no deaths or injuries and caused only $2,500 in damages. In Baraga County there have been 2 reported tornadoes in the previous 50 years—1 in 1968 and 1 in 1980.

Risk & Vulnerability

There is minimal threat of a tornado affecting any of Michigan Tech's facilities, according to the County Hazard Mitigation Plans. In Houghton County, there is a 2% risk of an F0 tornado occurring in the future, and a 4% risk of up to an F2 tornado in Baraga County. Vulnerability at Michigan Tech is considered low due to the fact that the university has not seen loss of life or had property damaged due to a tornado. Additionally, the university conducts 2 tornado drills for the residence halls per school year—1 in the fall and 1 again in the spring.

Technological Hazards

Results from accidents or the failures of systems and structures.

HAZARDOUS MATERIALS INCIDENT: FIXED SITE

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

Risk Level: *Moderate*
Vulnerability Level: *High*

A hazardous material is any solid, liquid, or gas that can cause harm to humans and other living organisms due to it being radioactive, flammable, explosive, toxic, corrosive, a biohazard, an oxidizer, an asphyxiant, or capable of causing severe allergic reactions. Hazardous materials are present in quantities of concern in business and industry, universities, hospitals, agriculture, utilities, and other community facilities. Michigan Tech is a research university, home to approximately 370 laboratories where various chemicals are used for research and experimentation. Additionally, the main campus has 6 diesel fuel tanks with an inventory of number 2 fuel oil on hand. These tanks can hold a maximum of 160,000 gallons. Furthermore, several bottled gasses, such as Freon, MG, Propane, Nitrogen, and Halon, are present on the main campus, some of which are piped directly into some of the academic buildings.

Past Occurrences

Michigan Tech does have a history of chemical spills, releases, and leaks, some of which have resulted in fires and explosions. From 1996 to October 2020, there have been 53 reported incidents, many of which required evacuation. Most spills and releases were minor; however, the risk of more serious incidents is ever present. A summary of the more serious occurrences are as follows:

November 10, 1981: Chemistry/Metallurgy Building-Main Campus: An explosion in a sixth-floor advanced organics lab sent one man to the hospital seriously injured as a result of burns and cuts received from being sprayed with burning solvent and glass. Quick reaction by colleagues who immediately administered first aid helped to save the man's life. Damage to the lab was estimated to be around $500.

May 10, 1995: 605 MEEM Building-Main Campus: A spark landed on a pile of ground magnesium in a sixth-floor lab and caught fire, filling the sixth floor with smoke. The students in the lab immediately put out the fire using a fire extinguisher, as they had been trained on how to handle this type of fire. There were no injuries or damage reported.

October 6, 1999: 708 Chemistry/Metallurgy Building-Main Campus: A fire started and filled the lab with smoke as a result of an item in an oven catching fire. The Houghton Fire Department was called in to check out the scene. The fire was extinguished. No injuries were reported and damages to property were recorded at a value of $100.

April 24, 1999: 614 Chemistry Building-Main Campus: A small explosion injured one man, requiring local ambulance personnel to respond to the scene. The man was working on a procedure to make sulfoacetic acid in a vented hood. The temperature of the solution became too high and during the process of icing down the one-liter container, it exploded. The man was transported to the hospital; there were no damages to the laboratory.

June 5, 2001: 181 Forestry Building-Main Campus: A fire started of unknown cause, between 11:00 PM and 6:00 AM, and burned for a total of an hour to an hour and a half in an unoccupied laboratory. There were no injuries or damage recorded.

March 29, 2005: Microbiology Lab Forestry Building-Main Campus: A researcher had left a beaker unattended which overheated and let off odors and fumes. Since the researcher was absent the contents of the container were unknown. An evacuation of the building ensued as a precaution; in case the fumes were toxic. The Houghton Fire Department was called in to handle the situation. The researcher returned and advised us as to what the contents were. After approximately 30 to 45 minutes, it was determined that staff could re-enter the building.

April 14, 2006: Rm 317 Minerals & Materials Building-Main Campus: A powder ignition in an enclosed research vessel occurred, resulting in an explosion. A small amount of the chemical powder detonated in a glove box antechamber, causing a pan of the powder to flip over and generate a pressure surge inside the glovebox—fracturing a portion of the glovebox window on the back side of the box. The remaining powder was deemed unstable, and the laboratory was sealed off until the method for proceeding was determined. Fortunately, there were no injuries, but the potential for a serious explosion was present which could have caused a fatality and injuries to others had the explosion destroyed the laboratory's walls, floor and ceiling. A special hazardous materials team had to be brought in to stabilize and clean up the laboratory. The laboratory was closed for three months as the process (from determining the best way to proceed to actual clean up) took this long.

February 23, 2007: Electrical Energy Resources Center (EERC)-Main Campus: A hazardous condition was a result of spilled gasoline in a laboratory in the basement of the EERC. It is believed that gasoline in an improperly vented gas can, filled that morning, had expanded due to cold temperatures. About 2 inches of gasoline spilled from the can. No injuries or damage were reported, but cancellation of one class did occur.

August 20, 2007: Minerals & Materials Building – Main Campus: An improperly disposed of chemical caused an explosion in a garbage can when being emptied. An employee tried to stamp out the fire, which resulted in singed leg hair.

February 14, 2009: Forestry Greenhouse – Main Campus: Chemical vapors from Tulex DDVP Fumigator were reported. Two University Public Safety Officers were transported to the hospital for observation following exposure. The building was vented.

September 11, 2009: Chemistry Building – Main Campus: N-Butyl Methacrylate vapors were reported, and the building was vented. Two students were exposed and transported to the hospital for observation.

February 24, 2013: DOW Building – Main Campus: Chemical spill of Mercury Chloride was reported at 3:45pm. Steam from an overheated container was released into the face and hands of lab workers. Two students were exposed and transported to the hospital for observation.

July 12, 2013: MEEM Building – Main Campus: A faulty wire from an ultrasonic cleaner ignited the acetone fumes causing the mixture to catch fire. A student put the fire out in the sink and washed the acetone down the drain. One student received minor exposure to the skin. Michigan Tech EMS responded and provided treatment on the scene. The student refused further treatment.

September 14, 2013: McNair Residence Hall – Main Campus: The burners on a stove in the kitchen were left on creating a significant gas leak. Police and fire were called, and McNair Hall was evacuated. Houghton Fire Department shut the gas off, and SEMCO Energy was dispatched from Ontonagon. The Houghton Fire Department aired out the building. SEMCO arrived and after noting that there was no damage to the gas lines, turned the gas back on. There was no exposure; no injuries; no damage.

October 14, 2015: M&M Building – Main Campus: A graduate student attempted to dispose of Nitric Acid in a waste container holding an unknown liquid substance causing a reaction that caused the bottle to explode. Nitric acid splashed on the student's face and arms. One student was exposed and transported to the hospital for treatment.

July 24, 2019: M&M Building – Main Campus: At approximately 9:06am, while unpacking a 2.5-liter container of Xylene Substitute, the bottle was dropped and shattered. Four subjects left the room immediately and closed and locked the lab door. Environmental Health & Safety (EHS) assessed the scene and cleaned up the spill. At 10:11am, EHS advised that Public Safety could clear the scene and reopen the lab. No exposure; no injuries; no damage.

Risk & Vulnerability

Michigan Tech is a renowned research facility and the presence of hazardous materials for use in research and experimentation is to be expected. However, the proper management of these materials (referring to the diligent labeling, appropriate storage, and the implementation of safety training) and best handling procedures of chemicals (for those staff, faculty and students that have contact with them) is vital in reducing disastrous events involving hazardous materials.

A program was implemented in 2002 with the goal of broadening awareness and responsibility for safety among the university community. Activities to achieve a higher safety level included allocating more time and resources to undertake corrective measures (for example conduct training). The program involved the Environmental Health & Safety (EHS) office in performing annual laboratory audits/inspections focusing on: *Training & Education on Safety, Life Safety Issues, Environmental Issues* and *Improvements from Previous Audits.* Please note that not all laboratories are audited annually, due to the large number of laboratories on campus and limited staff.

Areas of improvement include safety training, laboratory management, chemical labeling procedures, appropriate storage of chemicals, and controlling chemical inventory levels. While the majority of the university is successful in its laboratory management, the few problematic areas put the entire university at risk. Risks from a hazardous materials event include death, injury, and property damage which could lead to several secondary problems for the university, including loss of operations, lawsuits, and damage to reputation (which could hinder attracting and maintaining students and faculty).

Due to the above listed reasons, risk from hazardous materials incidents is estimated at a moderate level, while vulnerability is high. Fortunately, to date, Michigan Tech has not lost any lives to these incidents, but severe injuries and damage have been reported.

Vulnerability is further increased as a result of the lack of a local hazardous materials response team; the closest team is located over 2 hours away. Many hazardous materials incidents can be mitigated through comprehensive training programs and proper handling, storing, and disposal procedures. While the university and the local fire departments have handled situations in the past, the university could further secure its safety by mitigating risk and vulnerability through activities such as closely monitoring chemical storage areas, designating specific receiving areas of chemicals that are shipped on campus, performing training audits, and enforcing consequences for those laboratories that consistently do not comply with audit findings. Additionally, the formation of a Hazardous Materials Response Team, in conjunction with local agencies, to serve the university and local area, could dramatically reduce response time and improve safety.

HAZARDOUS MATERIALS: TRANSPORTATION INCIDENT

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

Risk Level: *Low*
Vulnerability Level: *Moderate*

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 1-5 miles of 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, with more urban industrial areas being at greater risk.

Past Occurrences

The local region is divided by highways and a shipping canal and is surrounded by Lake Superior, which is host to shipping traffic. Michigan Tech's main campus is located between the Portage shipping canal and U.S. Hwy-41, and while the university has not been directly affected by previous transportation incidents involving hazardous materials, the local area has.

August 6, 2002 7:30 AM: U.S. Hwy-41, Santori's Corner, Hancock, MI: A tanker truck full of 6,300 gallons of hot asphalt, traveling north on U.S. HWY-41 in the City of Hancock, turned on its side. Product leaked from the vent onto the highway at about 3 to 4 gallons per minute. Due to the quick action of local fire departments and the Houghton County Road Commission, the flow was diverted from storm drains and sewers. Local agencies continued to work to contain the spill, to right the truck and trailer, and to reclaim the spilled materials. The total amount of product spilled was

1,600 gallons, but none of it made it into the natural environment in or around the spill site. The affected section of the highway was closed overnight, and on the morning of August 7, the affected road surface was ground and repaved with asphalt. The road was reopened to the public by about 3:30 PM that day.

October 2003 Lake Superior West of Eagle Harbor: Houghton County has many miles of shoreline susceptible to shipping accidents on Lake Superior and along the Portage Canal (where Michigan Tech's main campus is located). In October 2003, a Great Lakes freighter spilled fuel oil during an internal fuel transfer about 25 miles west of Eagle Harbor (Eagle Harbor is located on the northwestern side of the Keweenaw Peninsula). 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.

F*ebruary 3, 2018 US-41 Chassell Township*: A tanker truck was involved in a multi-vehicle accident causing the tanker truck to overturn. One of the vehicles in the car accident suffered a fatality. The tanker overturned on US HWY 41 at the Sturgeon River bridge approximately 1.25-miles southeast of Chassell in Houghton County, Michigan. The highway was completely closed through Saturday night. The tanker was carrying clear diesel fuel and gasoline that leaked onto the road surface and migrated onto the frozen surface of the Sturgeon River. The release volume was estimated at 4,000 gallons of gasoline and 400 gallons of diesel. The Chassell Fire Department and other local first responders provided initial containment and recovery work. U.S. EPA mobilized to lead and oversee spill recovery and public health response. Subsequently, the truck owner, Klemm Tank Lines, retained local contractors and mobilized additional response contractors to mitigate the release.

June 24, 2021 US-41 City of Hancock: A fuel truck overturned on U.S. 41 near Ethel Avenue on the bend of the road. Witnesses reported that the truck was traveling around the turn with excessive speed, likely the cause of the crash. The truck had a capacity of around 7.500 gallons of fuel, most of which leaked out onto the road. Nearby residents were told to evacuate their homes to avoid breathing fuel fumes or coming in contact with the fuel. Additional concerns from the city were voiced about fuel contamination in the sanitary water and sewer water systems.

Risk & Vulnerability

Hazardous material-transportation incidents have occurred in the region in the past. Although none of these incidents occurred on a Michigan Tech campus, risk from such an event remains due to the main campus location resting between the Portage Shipping Canal and U.S. Hwy-41. Trucks carrying hazardous materials, such as fuel trucks, traverse the area. Uncontrolled releases of any type of hazardous material usually occur with no prediction or warning, which makes these hazards more dangerous.

Risk to Michigan Tech is low, based on the fact that this type of event has not occurred on or near any of the campuses in the past. Vulnerability is more difficult to determine since there has been no previous damage to the university. It is impossible to determine when a vehicle carrying a hazardous material is going to have an accident, resulting in an uncontrolled release. The local area, along with the campus environment, buildings and population could be affected by such an event; vulnerability is estimated to be moderate.

INFRASTRUCTURE FAILURE & SECONDARY TECHNOLOGICAL HAZARDS

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

Risk Level: *Moderate*
Vulnerability Level: *Difficult to Determine*

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 fail 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.

Past Occurrences

Though many of the hazards considered in this plan could cause infrastructure failures, these failures are dangerous in and of themselves due to the harsh climate and remoteness of the region. Michigan Tech is served by a number of systems including power, water treatment, phone, etc., and the loss of any or all of the systems can have a detrimental impact on the functioning of the university. A failure of infrastructure or utilities can include anything from power outages to a malfunctioning of the Portage Lift Bridge, which could cut Michigan Tech off from the two nearest hospitals.

Michigan Tech has been affected by the loss of power on a number of occasions. While power outages are usually of a short duration, up to a few hours, the impacts of an extended outage could affect the health and safety of the campus community, along with detriment to temperature sensitive research related activities. A water leak at the Ford Center was repaired in the summer of 2018. The leak did not cause the immediate closure of the facility. The leak caused the system to draw down the well system to a dangerously unsafe condition. The leaks have since been repaired, but the age of the system causes concern for more leaks in the future.

In September 2021, the university noticed unusually high water consumption while most of the students were not present on campus due to the COVID pandemic. At the peak, it was a 50,000 gallon per day excess. Upon investigating the problem, we had a difficult time locating the leak, but it was finally found using a stethoscope and listening to the ground. The leak was an 8" pipe that is used exclusively for firefighting service, so it had no impact on any users and was completely unnoticed until water use was dropped to near-zero conditions and flow remained high. The pipe was completely severed in half under the parking lot north of the Raymond L. Smith ME-EM Building. That lot has been newly paved recently and had to be dug up to access the break in the line. The cause of the break was not obvious, but the theory was that the pipe was in contact with some sharp rocks and perhaps was a stress crack. The hazards associated with this leak were minimal, however, in the event of a fire, water pressure may not have been adequate for fighting the fire.

Table 6.6 identifies university infrastructure and frequency of failure in the past as per the university vulnerability analysis and has been updated based on the addition of generators.

Table 6.6: Infrastructure Failure Likelihood

Infrastructure Failure	**Probability of Occurrence**	
Central Heating Plant Failure	Very Low	Once every 30 years
Power Outage	Low	Once every 5 years
Water Failure		
-Broken Main Water Line to Building	Moderate	Once every 2 years
-Broken Pipe in Building	Moderate	Once every 2 years
-Water Contamination	Very Low	Once every 30 years
-Water Shortage	Very Low	Once every 30 years
Phone System Failure	Low	Once every 10+ years
Critical Records Loss/Data Security File	Low	Once every 5 years
Fume Hood/Exhaust/Ventilation – Critical System Failure	Moderate	Once every 2 years

Source: Michigan Tech Vulnerability Analysis
Updated Power outage info based on addition of generators

Risk & Vulnerability

Overall, Michigan Tech's risk of infrastructure failure is considered moderate. The main campus is heated from steam generated by four boilers located in the university central heating plant, all of which are powered by gas or fuel oil. Natural gas is brought in over the local distribution system; if this system fails, the university keeps an inventory of No. 2 fuel oil on campus. If necessary, the university is capable of supporting both electric and heat functions with the fuel oil for approximately 15 days or supporting one of the two functions for approximately 25 days.

The university's main campus electric service is supplied by the privately-owned Upper Peninsula Power Company (UPPCO) and four diesel generators (implemented in 2006). The generators provide campus electricity during peak hours and offer the university uninterrupted electric service in the event UPPCO electricity fails. Prior to the generators, the university experienced several power outages a year, but now failure has virtually been eliminated.

Water systems, wastewater systems, and phone service can also be affected by failure or secondary failure. In the past, water loss or contamination has not been an issue, although broken water pipes, usually caused from extreme cold as mentioned previously, have occurred. Also in the past, the loss of phone service has been minimal. One failure which could be an issue is a breakdown in the computer network. While the university takes steps to perform backups in several locations. The failure of an exhaust system remains a reality with a moderate level of occurrence. Procedures and backup plans are in place if such an event occurs.

An additional area of concern lies with the Portage Lake Lift Bridge. Although the bridge is not part of the university, its failure would separate the university population from medical services. Alternate emergency plans, in conjunction with area municipalities, could help lessen the burden of medical situations in the event of a prolonged bridge failure. The closest hospital on the south side of the bridge is located 32 miles away in the L'Anse Township.

Numerous factors contribute to the impact of an infrastructure failure, including services affected, weather conditions, response capabilities, time of day, etc., therefore vulnerability is difficult to calculate. However, based on the university infrastructure system, it is unlikely that one type of failure will affect the entire campus at a given time.

PETROLEUM & NATURAL GAS LEAKS

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

Risk Level: *Low*
Vulnerability Level: *Moderate*

These types of accidents are often overlooked as a threat because much of the petroleum and gas infrastructure in the area and 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°F or above. Inhalation of even 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.

The threat of potential explosion, fire or atmospheric condition as a result of one of the other gases present on campus (Freon, MG, Propane, N2, Halon) exists, but this type of gas leak was considered in the Hazardous Materials: Fixed Site Incidents section.

Past Occurrences

Michigan Tech receives natural gas over the local distribution channels, but also stores fuel oil in six 35,000-gallon horizontal single wall tanks. The tanks are located within a secondary concrete containment structure. Fuel leak detections systems also add a level of safety. The tanks were installed in the fall of 2015 to replace a 1,000,000-gallon tank. There was a report of a natural gas leak on August 15, 1996 in the Chemistry Building that caused the evacuation of 20 people. No injuries or damage were reported.

Risk & Vulnerability

There is a risk of a future petroleum or natural gas incident at the main campus caused by either sabotage or aging transmission lines. Michigan Tech's oil tanks are inspected by the Michigan Department of Environmental Quality on a regular basis. A locked fence provides a minimal level of security to protect the tanks from sabotage. The risk from a natural gas leak is low, according to the 2001 Michigan Tech Vulnerability Analysis, indicating the probability of a natural gas line failure is less than once every 10 years. Therefore, overall risk to a natural gas leak is considered to be low. Vulnerability to a natural gas or petroleum leak includes the campus population, holdings, and environment, and is estimated to be moderate.

Human-Caused Hazards

Results from the intentional actions of an adversary.

CIVIL DISTURBANCES

A public demonstration or gathering that results in a disruption of essential functions, rioting, looting, arson or other unlawful behavior.

Risk Level: *Low*
Vulnerability Level: *Low*

Large-scale civil disturbances, while rare, are typically instigated by an event, which could include labor disputes, controversial activities, resource shortages, celebrations, or disagreement concerning a particular issue between two or more groups. Some places that may be impacted by such disturbances are government buildings, prisons, military bases, businesses, critical service facilities, and universities.

Past Occurrences

Michigan Tech does not have a history of civil disturbance. Over the years, students have gathered for peaceful protests, sporting events, commencements, and celebrations, but none have resulted in civil disturbances, unrest, or riots.

Risk & Vulnerability

Although the university has no history of civil disturbances, the risk of one in the future does exist due to the nature of educational institutions. Historically, universities have been areas for demonstrations, especially during the widespread political protests during the late 1960s and early 1970s. Today most university-related riots continue to have been fueled by sporting event outcomes. Alcohol consumption is often a factor in sport-related unrest, as was the case a number of riots occurring in the Midwest region, listed below:

Michigan State University—March 27, 1999: Riots broke out after the MSU men's basketball team lost to Duke in the NCAA final four.

Ohio State University - November 23, 2002: Riots broke out as part of the celebration after Ohio football team defeated arch-rival Michigan.

Minnesota State University, Mankato—October 4, 2003: Riots broke out during homecoming weekend after the loss of the university football team.

Most recently, in the Spring of 2024, many university campuses across the United States experienced student protests over the Israel-Hamas war. Students set up encampments on campus lawns. The students are calling for universities to separate themselves from companies advancing Israel's military efforts in Gaza and in some cases from Israel itself. While many protests started out peacefully, they began growing in scope and intensity, with many colleges calling on law enforcement to help.

University of Michigan —May 5, 2024: Pro-Palestinian protesters briefly disrupted the university commencement ceremony by rushing the stage and chanting. They were subsequently removed from the University of Michigan's commencement ceremony in Ann Arbor, Michigan.

While civil disturbance is a threat to any public institution, the risk and vulnerability levels at Michigan Tech are considered low based upon the university's rural location, its history, and the presence of on-campus police through the Public Safety Department. However, vulnerability to such an event is campus-wide, with potential for affecting campus population and property.

CYBER THREATS

A cyber threat is any action or event that could result in an unwanted impact on IT infrastructures.

Risk Level: *High*
Vulnerability Level: *Moderate*

Cyber-attacks involve the use of computers, electronic devices, and/or the Internet to attack computer systems. Michigan Tech faces the same cyber threats most any organization faces – from social engineering (phishing emails and SMShing/text phishing and vishing or voice phishing) attacks to external network-based attacks to insider threats – whether malicious or unintentional. Data exfiltration, improper access, and data integrity compromises are significant risks given the depth and breadth of data collected and maintained by Michigan Tech. Reputational risk and attacks against individual or institutional reputation using compromised accounts or by tampering with proprietary data are less likely but potentially significantly impactful. Beyond that, because the university is in many ways the size and complexity of a city – with police, EMS, housing, food service, events (athletics/performing arts), and of course academics and research, Michigan Tech faces a myriad of possible supply chain attacks and compliance requirements (the latter may not be a threat specifically but is certainly a key risk that needs to be managed). Related to Michigan Tech's complexity and breadth of services, third- and fourth-party cyber risk is currently elevated, likely increasing, and visibility and maturity associated with external risk management is limited.

<u>Past Occurrences</u>

Attempted attacks occur daily. Successful attacks – especially those with significant impact – are far less frequent, but also often difficult to detect and potentially only months later. Successful negligible impact attacks typically occur weekly, successful low impact attacks typically occur on a quarterly frequency, and moderate or high impact events, whether successful or not, occur on average every 3-5 years. Successful incidents targeting MTU's third-party partners occur on average annually and generally require non-trivial resource investment from Michigan Tech IT to triage and respond.

<u>Risk & Vulnerability</u>

Unfortunately, the barrier to entry for threat actors continues to decrease and the sophistication of attacks continues to increase, so while a specific percent increase cannot be articulated, MTU is most certainly facing an increasing number of - and level of sophistication in - the attacks it faces. This trend is likely to continue, and even expand, with the increasing availability and capability of artificial intelligence, the increasing maturity and capabilities of criminal cyber organizations, the continued geopolitical instability worldwide, and the nature of the work that MTU engages in.

The university's IT department applies a defense-in-depth strategy that involves layered defenses for detection and prevention of threats and overall risk reduction. No system is perfect, and all systems require constant attention and frequent tuning and adjustment to address false positives, false negatives, and changes in threat landscape and attacker behavior and capabilities.

MTU employees are required to complete annual cybersecurity awareness training that covers a broad range of cybersecurity, insider threat, and information assurance topics. Students at this time do not have access to equivalent training, however MTU IT is very open to engaging with student leadership on providing outreach and engagement on topics like staying safe online, phishing and social engineering awareness, and more focused outreach and engagement as desired (e.g. for students engaged in research activities). While the risk to cyber threats is high, the controls Michigan Tech has put in place reduce the university's vulnerability level to moderate.

PUBLIC HEALTH EMERGENCIES

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

Risk Level: High
Vulnerability Level: High

Public health emergencies can take on 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. Public health emergencies can occur by themselves or may be a secondary event caused by other emergencies or disasters such as a flood or hazardous material incident. The common characteristic of public health emergencies is that they adversely impact or have the potential to impact a large number of people. Additionally, the strain on public health facilities can be further exacerbated by the "worried well" who could overwhelm the system by seeking treatment when unnecessary.

University campuses across the nation are concerned with communicable diseases. Due to the "close quarters" nature of residence hall living, contagions can spread more quickly among the student population. Additionally, with students and staff coming from across the country and internationally, the risk of disease exposure increases. Diseases of concern to university populations include, but is not limited to: COVID-19, influenzas, mumps, measles, tuberculosis, chicken pox, severe acute respiratory syndrome (SARS), methicillin-resistant staphylococcus aureus (MRSA)m, mononucleosis, and the most serious—meningococcal disease.

Past Occurrences

In 2009, public concern of the spread of the H1N1 virus was a national concern and to mitigate risk, Michigan Tech set up a steering committee to work with the Western Upper Peninsula Health Department and local medical facilities to monitor flu conditions. They also encouraged and offered flu vaccinations as well as shared information about symptoms and how faculty, staff and students could limit the spread of any flu.

In 2018-2019, a similar world-wide concern over the measles virus affected communities and campuses. While Michigan Tech has no recorded outbreaks on campus, the state of Michigan experienced outbreaks, and college campuses in California dealt with incidents. Michigan Tech mitigated risk by providing communications, resources, and educating the campus community, especially in regard to how to protect yourself when traveling to areas that have recorded cases of measles.

There have been 10 reported cases of MRSA on campus since 2014. There was also a case of one Michigan Tech Freshman dying as the result of meningitis, and while this incident was isolated, the possibility of a disease outbreak and contamination does exist either as an isolated event or as a secondary event from flooding or other disasters. The flooding that occurred in Houghton County on June 17, 2018 is such an example. While Michigan Tech took rapid action to minimize potential public health emergencies associated with the flooding, there does always exist the possibility of food and water safety issues and mold or sewage contamination.

In January of 2020, the first case of SARS COVID-19 was confirmed in the United States. The SARS COVID-19 virus was found to have spread to the United States through human contact. The virus, which had been unknown to scientists and health services, quickly spread to all 50 states and many countries across the world. Michigan had its first case reported on March 10, 2020. On March 11, 2020, the WHO declared COVID-19 a global pandemic, resulting in the need to protect people to prevent mass contamination. Governor Gretchen Whitmer ordered a stay-at-home requirement for all Michigan residents starting on March 23, shortly followed by mandates for business operations to cease.

Michigan Tech responded with its typical agility, suspending in-person classes initially beginning on March 16, 2020 and moved to remote instruction, face coverings indoors, and limited personnel on campus. Group gatherings were prohibited, and common areas were closed. Visitors to campus were restricted to essential contractors, and university travel was discontinued. The Department of Biological Sciences, working with the Department of Biomedical Engineering and several other campus departments, began setting up a COVID testing lab.

On May 28, 2020, Michigan Tech initiated Step One of a three-step Return to Campus Plan and entered the final step on July 27, 2020. This marked the introduction of the MTU Flex plan and a transition to a Health and Safety Levels system, known as MTU Flex. These five levels were designed to enable the University to respond quickly and appropriately to COVID on campus and in the community with scientifically informed, practical, and targeted protocols. The MTU Flex team made a special effort to keep students, faculty and staff informed during this time. They sent out weekly emails with updates on the COVID situation and campus response.

Risk & Vulnerability

Michigan Tech is aware of and prepared to deal with the risks associated with public health emergencies. Residential Life, Facilities Management, and Dining Services personnel are trained annually in emergency response procedures including health emergencies. While awareness and planning are key, a large-magnitude epidemic could overload limited emergency facilities that are not equipped to deal with this type of emergency. 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 university could also be a factor during a large-scale emergency.

Influenza-type illness is by far the most common communicable disease. The average mortality rate in Houghton County from 1980 to 2021 was 41.4 per 100,000 people, nearly double the average 22.1 deaths per 100,000 for the state of Michigan. The vulnerability of the university in a public health emergency is difficult to determine as this hazard has the potential to impact the entire university population and the local community at large, or vice versa. The Office of 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 the contamination of the food supply, either accidental or intentional, or an outbreak of pandemic or widespread flu.

The university has a pandemic response plan which outlines response procedures Michigan Tech will carry out to handle a widespread pandemic influenza outbreak. Additionally, educational programs and materials are utilized annually to educate the campus community about measures that should be taken to reduce the spread of influenza. Flu shot clinics are provided on campus each fall for students, faculty, and staff.

All current and future populations on campus are considered at risk of infectious illnesses. Buildings and infrastructure are not typically impacted by infectious illnesses but may need to be sterilized or decontaminated in some cases. Infectious illness outbreaks can include an above average occurrence of a common disease, such as the flu, or a single case of a disease not formerly diagnosed on campus. As a university, Michigan Tech has characteristics that make it vulnerable to infectious illnesses, include the close living quarters associated with residence halls and university housing, communal dining halls and bathrooms, and classrooms and libraries where large numbers of students work in close proximity to one another. These factors allow for diseases to spread quicker than they would in other settings. Further, the university receives visitors from all over the world and has many faculty and students that travel abroad, increasing the risk of bringing a disease from another country or region back to campus. Thus, the risk and vulnerability from a public health emergency is estimated to be high.

SABOTAGE/TERRORISM

The intentional, unlawful use of force, violence or subversion 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.

Risk Level: *Moderate*
Vulnerability Level: *Difficult to Determine*

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), premeditated plans of attack on institutions of public assembly, and disruption of legitimate scientific research or resource-related activities (eco-extremism). Due to recent events in the nation, virtually any public space is vulnerable to the threat of sabotage and terrorism. Universities, like other large institutions, must take additional precautions to protect their information technology services and computer services from hackers. Saboteurs and terrorists often go to great lengths to avoid detection by authorities while still seeking publicity for their organization and/or ideals, often the motive for these events.

Past Occurrences

As remote an area as Michigan Tech and the Keweenaw Peninsula are, they are not immune to acts of terrorism and sabotage. A bank robbery by a former Michigan Tech student on a Houghton bank resulted in fatalities. Eco-terrorism continues to be an issue for the local area, with loggers, on occasion, reporting vandalized equipment and spiked trees, which endanger the lives of anyone unlucky enough to be sawing through them. Michigan Tech is a premier science and engineering research university and susceptible to attacks on its offices, labs, and computer systems. A bomb scare in 2001 on the Houghton campus has been linked to eco-terrorism.

January 18, 1996 MFC First National Bank—City of Houghton: A former Michigan Tech student with a history of paranoia and schizophrenia robbed the MFC First National Bank in downtown Houghton. One employee was shot and lost her arm due to that injury. Another was held hostage for 17 hours; ending in the shooting death of the robber.

November 5, 2001 Forestry Buildings—Main Campus: Overnight Michigan Tech public safety officers discovered two incendiary bombs on the Houghton campus while on a routine patrol. One bomb was found outside of the U.J. Noblet Forestry Building and one was outside of the adjacent U.S. Forestry Service laboratory. The Michigan State Police Bomb Squad in Negaunee and agents from the FBI and Bureau of Alcohol, Firearms, & Tobacco in Marquette, were called in and by 1:00 p.m. the bombs were secured. The buildings reopened by 4:00 p.m. the same day. Investigation by DPSPS and the FBI did identify the perpetrator, Ian Jacob Wallace. In 2009, he was found guilty of the act and sentenced to three years in federal prison. He was a member of ELF.

Although incidents, such as those mentioned, are rare in the remote Keweenaw Peninsula, these two examples are proof that Michigan Tech and the area are vulnerable to acts of terrorism and sabotage. With the increase of school shooting events around the country, more caution will be needed to protect the safety of all people on campus and in the community. Considerations about safety protocols for lockdowns must be updated and communicated with all members of the university.

<u>Risk & Vulnerability</u>

Michigan Tech does have a short list of historic sabotage/terrorist activities and could be susceptible in the future as a center for research and education. In the aftermath of the attempted Forestry Building bombings, security cameras were installed to mitigate future attempts to harm the university, however, it is not feasible to post surveillance cameras everywhere on campus. Vulnerability to such events varies and is difficult to quantify (there was no damage with the past occurrences), but could be devastating and include the campus population, laboratories, buildings, property and community members.

As of 2023, there has been an increase in school shooting events in universities in the United States. This general increase, which is spread across many states and universities, raises concerns about the safety of students, faculty, staff, and local citizens. On February 13, 2023, a shooter opened fire in two buildings on Michigan State University in East Lansing, Michigan. Three students were killed and five others injured. The perpetrator, a 43-year-old American man, was not affiliated with the university and was able to freely walk into the Union building on campus carrying a firearm. This event highlighted the importance of both building safety measures and emergency response protocol.

As a result of these concerns, Michigan Tech Public Safety and Police Services now offers "Active Shooter Training for Workplaces." The program is delivered by Lt. Marc Geborkoff at Public Safety Police Services along with other local law enforcement active shooter instructors depending on class size. The training is roughly 3 hours depending on group sizes and consists of a 45-minute presentation followed by live scenarios, if the work area allows for it. These training sessions for our campus community started in early January of 2017 and are currently offered to the present date. So far, close to approximately 800 faculty and staff have been through this training.

Based on previous occurrences, and in light of recent nation-wide shooting events at universities and schools, probability for future occurrences and therefore risk is considered moderate.

Hazard Priority Ranking

Mitigation activities for Michigan Tech and the surrounding areas 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 from 1 (least risk) to 10 (greatest risk) was assigned for each of the risk factors for all hazards surrounding Michigan Tech to develop an overall score and ranking. The scoring for each hazard was based on the following:

Historical Occurrence:	Low Occurrence (1 pt) — Excessive Occurrence (10 pts)
Affected Areas:	Single Site (1 pt) — Large area (10 pts)
Speed of Onset:	Greater than 24 hours (1 pt) — Minimal/No Warning (10 pts)
Population Impact:	No Impact (1 pt) — High Impact (10 pts)
Economic Effects:	Minimal Effects (1 pt) — Significant Effects (10 pts)
Duration:	Minimal Duration (1 pt) — Long Duration (10 pts)
Seasonal Pattern:	One Season (1 pt) — Year-Round (10 pts)
Predictability:	Highly Predictable (1 pt) — Unpredictable (10 pts)
Collateral Damage:	No Possibility (1 pt) — High Possibility (10 pts)
Availability of Warnings:	Warnings Available (1 pt) — Not Available (10 pts)
Mitigative Potential:	Easy to Mitigate (1 pt) — Impossible to Mitigate (10 pts)

Table 6.7 displays each hazard and their respective criteria scores along with their hazard ranking. Those final scores highlighted in red represent the top-ranking hazards that could pose the most threat to the university.

Table 6.7: Michigan Tech Hazard Profile & 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
Drought	1	4	1	1	1	10	10	4	4	1	4	41
Fire: Structural	4	4	10	7	7	7	10	10	7	4	4	74
Fire: Wildfires	4	7	10	1	1	4	4	7	4	4	7	53
Flooding: Dam Failure	1	4	7	1	4	4	4	4	4	4	4	41
Flooding: Urban	4	7	10	1	10	7	10	7	7	4	7	74
Fog **	4	4	7	4	1	1	7	4	1	1	7	41
Invasive Species **	10	4	1	1	4	10	7	7	4	1	7	56
Landslide	1	1	10	1	4	4	10	7	4	4	4	50
Land Subsidence	1	1	10	1	1	4	10	7	4	7	4	50
Severe Weather: Extreme Temperatures	10*	10	7*	4	7*	7	4	1	4	1	4	59
Severe Weather: Hail	1	4	4	1	1	4	4	4	4	1	7	35
Severe Weather: Ice and	7*	7	7	1	1	4	7	1	4	1	4	44

Sleet Storms												
Severe Weather: Lightning	4	4	10	1	1	1	4	1	4	1	7	38
Severe Weather: Severe Winds	4	7	4	1	1	4	10	4	4	1	4	44
Severe Weather: Snowstorms	10	10	4	4	7*	7	4	1	4	1	4	56
Severe Weather: Tornadoes	1	4	7	1	4	1	4	4	4	1	4	35
Shoreline Flooding & Erosion **	4	7	7	4	7	7	7	4	7	4	4	62
Haz-material: Fixed Site Incident	7	4	10	4	4	7	10	7	4	7	7	71
Haz-material: Transport. Incident	1	4	10	1	1	4	10	10	4	7	7	59
Infrastructure Failure/ Secondary Tech. Hazards	7	7	10	4	4	4	10	7	4	4	4	65
Petroleum/Natural Gas Accidents	1	1	10	4	4	1	10	7	4	7	4	53
Civil Disturbances	1	1	7	4	4	1	10	7	4	4	4	47
Cyber Attack**	10	4	10	1	10	7	10	7	7	4	4	74
Public Health Emergencies	4*	7	7	7	7	7	7	7	7	4	4	68
Sabotage/ Terrorism	4	4	10	4	7	4	7*	7	7	7	4	65

* Score changed in this category.

**Added hazard based on inclusion of hazard in Houghton County plan and State of Michigan plan.

Hazard Summary

The following total scores represent results of the hazard priority ranking originally completed by the Michigan Tech Disaster Resistant University Advisory Committee in 2008 and have been reviewed and updated by the steering committee in 2024. *Earthquakes* were not included in the hazard ranking because they are not likely to occur in the region.

Hazard	Score out of 100	Mitigation Priority
Natural Hazards		
Urban Flooding	**74**	**1**
Major Structural Fires	**74**	**1**
Shoreline Flooding & Erosion	62	5
Severe Weather: Extreme Temperatures	59	6
Severe Weather: Snowstorms	56	7
Invasive Species	56	7
Wildfires	53	8
Landslides	50	9
Subsidence	50	9
Severe Weather: Severe Winds	44	10
Severe Weather: Ice & Sleet Storms	41	11
Flooding: Dam Failure	41	11
Drought	41	11
Fog	41	11
Severe Weather: Lightning	38	12
Severe Weather: Hail	35	13
Severe Weather: Tornadoes	35	13
Technological Hazards		
Hazardous Material: Fixed Site Incident	**71**	**2**
Infrastructure Failure/ Secondary Technological Hazards	**65**	**4**
Haz-Material: Transport. Incident	59	6
Petroleum/Natural Gas Accidents	53	8
Human-caused Hazards		
Cyber Attack	**74**	**1**
Public Health Emergencies	**68**	**3**
Sabotage/Terrorism	**65**	**4**
Civil Disturbances	53	8

Although many of the hazards identified can and do occur in and around Michigan Tech University, the seven highest priority hazards include:

- Urban Flooding
- Major Structural Fires
- Cyber Attacks
- Hazardous Material: Fixed Site Incident
- Public Health Epidemics
- Infrastructure Failure/Secondary Technological Hazards
- Sabotage/Terrorism

Hazard mitigation activities will focus on mitigating losses due to these priority hazards while also considering activities that may mitigate losses due to lower-ranking hazards. Before identifying specific mitigation activities, further investigation of university vulnerability is discussed in the next section, followed by estimated losses from potential hazard events.

SECTION 7: Hazard Mitigation

- Overview of Mitigation Strategy Development
- Michigan Tech Mission and Mitigation Goals
- Identification & Analysis of Mitigation Actions
- Recommendation & Prioritization of Mitigation Actions
- Potential Funding Sources

Overview of Mitigation Strategy Development

The purpose of this section is to provide an outline that Michigan Tech may follow to become less vulnerable against identified hazards. Michigan Tech's mitigation strategy is based on the findings from Section 6: Hazard Analysis & Risk Assessment, the 2024 Critical Vulnerability Assessment, the original work done by the DRU Advisory Committee in 2008, and consensus of the Hazard Mitigation Steering Committee along with input from experts from across campus.

The mitigation strategy will serve Michigan Tech as guiding principles for future mitigation policies, implementation, and project administration. Additionally, the strategy will provide an analysis of techniques, where available, to best meet mitigation goals and reduce the impact of potential hazard events. Developing the strategy is a four-step process:

1. The first step in developing the mitigation strategy is to revisit the Mission Statement to ensure it guides mitigation goal creation.
2. The second step is the review of Michigan Tech's mitigation goals (developed in 2008).
3. The third step involves identifying specific action-based mitigation activities (projects and policies) and analyzing these activities to determine if they are feasible economically, socially, environmentally, etc.
4. The last step in designing the mitigation strategy is the selection and prioritization of university mitigation actions. The outcome is the mitigation action plan that lists prioritized projects and policies for Michigan Tech to carry out. Additional information listed in the action plan includes departments or lead personnel assigned responsibility for project implementation, potential funding sources, and estimated project duration. The comprehensive summary of the action plan will serve as a quick reference of mitigation projects for university decision makers.

Through the updating of the mitigation action plan, the steering committee considered Michigan Tech's overall risk, vulnerability, and capacity to mitigate the effects of identified hazards. There was careful consideration of undertaking feasible mitigation projects. This process was guided by evaluating proposed mitigation activities with the FEMA-recommended STAPLEE criteria discussed further in this section.

Review and Update of Mitigation Goals

Goals for the Michigan Tech Multi-Hazard Mitigation Plan were created to address the highest-priority hazards identified in Section 6 of this plan that could afflict the university:

- Urban Flooding
- Major Structural Fires
- Cyber Attacks
- Hazardous Material: Fixed Site Incident
- Public Health Epidemics
- Infrastructure Failure/Secondary Technological Hazards
- Sabotage/Terrorism

Consideration was also given to efforts that could assist with lower-ranking or unknown hazards that may affect the university campuses. In 2008, six general goals were established to guide mitigation efforts. In the 2025 plan, the goals are still considered comprehensive and give guidance to identifying mitigation activities at Michigan Tech.

Goal 1: *Protect the lives, safety and welfare of all Michigan Tech students, faculty, staff and visitors from known hazards while focusing on priority hazards.*

Goal 2: *Improve capabilities to minimize losses of Michigan Tech property, cultural resources, and research investments by identifying and undertaking feasible projects that will help mitigate future events.*

Goal 3: *Maintain and improve communications regarding disasters and emergency measures within Michigan Tech and with neighboring jurisdictions.*

Goal 4: *Enhance emergency preparedness, increase awareness, and promote risk reduction activities through education of and outreach to Michigan Tech's population.*

Goal 5: *Be proactive in protecting Michigan Tech campuses and critical facilities by enhancing and maintaining hazard mitigation as a part of the University's standard operating procedure.*

Goal 6: *Ensure that Michigan Tech's business continuation will not be significantly disrupted by disasters, through implementation of up-to-date response plans and through upgrades as needed.*

Identification & Analysis of Mitigation Actions

A wide range of mitigation activities can be considered to help achieve established mitigation goals to create a feasible mitigation strategy and an action plan. Mitigation activities can fall into a number of categories, including **preventative measures, property protection, public education & awareness, natural resource protection, emergency services,** and **structural projects**. The following is an overview of potential activities by category:

1. Preventative Measures

The purpose of preventative measures is to protect new development from hazards and ensure that potential loss is not increased. Preventative measures are typically guided through regulatory programs or enforcement actions that influence the way land is developed, buildings are constructed, or how people respond. Prevention activities can be particularly effective where development has not yet occurred or where capital improvements have not been significant. Preventative mitigation activities include:

- Planning & Design
- Open Space Preservation
- Stormwater Management
- Law Enforcement (crime deterrence)
- Facilities Construction
- Capital Improvement Programming

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 the university, but the government can often provide technical and sometimes financial assistance. There are five general activities that can be classified as property protection:

- Building Relocation/Building Elevation
- Retrofitting (security enhancements, wind proofing, fireproofing, etc.)
- Insurance Coverage
- Demolition
- Barriers (safe rooms, shutters, impact resistant glass)

3. Public Education and Awareness

Public education and awareness is a mitigation strategy that has a broad reaching impact across both the university and community. Activities that provide university officials, faculty, staff and students, along with local governments, businesses and residents, with information on how to protect themselves and others from potential hazards that may have the greatest impact of all mitigation strategies. Information empowers people to protect their own property and lives. Examples of public education include:

- Outreach Projects
- Speaker Series
- Mock Events, Training & Preparation
- Hazard Map Information

4. Natural Resource Protection

Resource protection mitigation activities are a way to enable land to function in a natural way. 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:

- Wetlands Protection
- Erosion & Sedimentation Control
- Watershed Management
- Best Forest & Vegetation Management Practices
- Habitat Preservation

There are many benefits to naturally functioning watersheds, floodplains, and wetlands and they 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

5. Emergency Services

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, including those beyond the university in the community. While not typically considered a "mitigation" technique, emergency service measures do minimize the impact of a hazard event on people and property. There are a number of components to emergency services and they include:

- Threat Recognition

- Warning
- Response
- Critical Facilities Protection
- Post-Disaster Recovery & Mitigation

6. 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 & Crossing Improvements
- Dams/Levees/Floodwalls/Seawalls
- Drainage and Stormwater Improvements/Maintenance
- Channel Improvements

Mitigation activities are detailed action-based projects and policies that the university and its partners could engage in to reduce risk from potential hazards. The selected mitigation activities that were included in this plan were evaluated using various criteria as recommended by FEMA.

This includes using the "STAPLEE" evaluation criteria: Social, Technical, Administrative, Political, Legal, Economic, and Environmental considerations, presented in Table 7.1 (p.106). Those proposed activities that were deemed to not adequately meet the STAPLEE evaluation criteria were omitted from further consideration in the development of the mitigation strategy.

Table 7.1: STAPLEE Evaluation Criteria

Socially Acceptable	Is the proposed activity socially acceptable to the university community? Is the activity compatible with present and future university values? Are there disparity issues that would leave one part of the university community adversely affected? Are there any equity issues? Are socially vulnerable and underrepresented populations impacted?
Technically Feasible	Will the proposed activity be effective in the long run? Will it create negative secondary impacts? Will it create more problems than it solves? Will it solve the problem or only the symptom?
Administratively Possible	Does the university have the capability to implement the proposed activity? Is there someone who will coordinate, implement, and maintain the activity?
Politically Acceptable	Is there political support to implement the proposed activity? Is there enough university and/or community support to ensure the success of the activity?
Legal	Does the university have the authority to implement the proposed activity? Is there a clear legal precedent, and are there any potential legal consequences of the activity?
Economically Sound	Are there current sources of funding to implement the proposed activity? Do the benefits outweigh the costs of the activity? Is the activity compatible with other economic goals of the university?
Environmentally Sound	How will the proposed activity affect the environment? Will this activity comply with local, state, and federal environmental laws and regulations? Is the activity consistent with University environmental goals?

Source: FEMA Publication 386-3: *Developing the Mitigation Plan*

Recommendation & Prioritization of Mitigation Actions

A wide range of mitigation activities were considered in order to help achieve the established mitigation goals. These activities were suggested and discussed by advisory board members and various university staff. All identified projects in Table 7.2 are consistent with Michigan Tech's mitigation goals.

Once activities were selected for inclusion in the mitigation strategy, each activity was assigned a priority level (or ranking) for implementation. Priority was determined by evaluating each mitigation action on seven different criteria. A score from 1 to 5 was assigned for each of the mitigation criteria for all identified mitigation actions in order to develop an overall score and ranking. The higher the score, the higher priority ranking the mitigation action received. The scoring for each mitigation action was based on:

Number of Goals Addressed:	One goal (1 pt) — Five or more goals (5 pts)
Number of Hazards Addressed:	One hazard (1pt) — All Hazards (5 pts)
Life Safety Affected:	Low (1 pt) — High (5 pts)
Protection of Property:	Low (1 pt) — High (5 pts)
Affected Area:	Partial Building (1 pt) — Campus-wide (5 pts)
Cost:	$500,000< (1 pt) — <$25,000 (5 pts)
Urgency to Implement:	5+ years (1 pt) — Immediate (5 pts)

The evaluation and benchmarking tools used to assign priority, along with the results for each mitigation activity, can be found in Appendix C. Priority of some projects changed due to new projects being assessed and added as well as the addition of new hazards to the plan (fog, invasive species, and cyber threats).

A summary of projects and details are listed in **Table 7.2: Proposed Mitigation Projects**. Projects vary from structural measures to education and are prioritized based on impacts from persistent, known hazards and potential resources available to complete the project. Equitable outcomes for underserved populations were discussed by the Steering Committee before considering each project. Selected projects were considered cost effective based on the benefit to the University and community. Although projects are prioritized on a university-wide basis, this does not limit the university or coordinating department's ability to pursue identified projects as funding becomes available. A number of these projects are ongoing action activities that will be accomplished as time and resources permit.

Table 7.2: Proposed Mitigation Projects

Mitigation Activity	Location	Hazard(s) Addressed	Goals Addressed	Estimated Cost	Coordinating Department	Partners	Schedule	Possible Resources	Priority
FACILITIES-BASED Projects									
Implement remote lockdown of all exterior doors on campus	Main Campus	Sabotage/ Terrorism, Civil Disturbance	1,5,6	600,000	Public Safety & Police Services	Facilities Mgmt; Risk Mgmt.	Contingent upon funding: Unknown	University Funding; Grant Funding	**1** (Previous ranking 3 – moved up because previous 1 & 2 projects were completed)

Flood proofing of sensitive equipment or buildings having routine issues, as identified in the 2024 Critical Vulnerability Assessment.	University -wide	Urban Flooding, Infrastructure Failure & Secondary Technological Hazards	1,2,5,6	500,000	Facilities Management		Contingent upon funding: Unknown	FEMA BRIC Program	**2** (new project)
Hardwire smoke detectors in Daniel Heights to alert Public Safety	Daniell Heights Pats	Major Structural Fire, Hazardous Materials Incident	1, 2	500,000	Facilities Management	Residential Living	Contingent upon funding: Unknown	University Funding	**3** (Previous Ranking 4 - Moved up because previous projects 1 & 2 were completed)
Complete a CCTV inspection and hydrologic analysis and develop a campus stormwater master plan addressing stormwater flow and volume and action needed to be taken to improve and maintain the system.	University -wide	Urban Flooding, Infrastructure Failure & Secondary Technological Hazards	2, 5, 6	450,000	Facilities Management		Contingent upon funding: Unknown	FEMA BRIC program; Michigan HMGP	**4** (new project)
Install fire suppression/sprinkler system	Daniell Heights Apts	Major Structural Fire, Hazardous Materials Incident	1, 2	1,800,000	Facilities Management	Residential Living	Contingent upon funding: Unknown	University Funding	**5** (Previous Ranking 7 – Moved up based on removal of projects no longer being considered)
Install dry pump system for fire combat	Ford Center	Major Structural Fire, Wildfires	1, 2	50,000	Facilities Management	Ford Center	Contingent upon funding: Unknown	Us Forest Service; Fire Assistance Grants	**6** (Previous Ranking 8 – Moved up based on removal of projects no longer being considered)
Install fire suppression/sprinkler system	Chem-Sci Building	Major Structural Fire, Hazardous Materials Incident	1, 2	725,000	Facilities Management		Contingent upon funding: Unknown	University Funding	**7** (Previous Ranking 12 – Moved up based on addition to the building)
Install storm sewer outtakes and address other flooding issues in problem parking lots	Main Campus	Urban Flooding	2, 6	195,000	Facilities Management		Contingent upon funding: Unknown	FEMA BRIC program	**8** (Previous Ranking 10 – Moved up based on new critical vulnerability assessment)
Install fire suppression/sprinkler system	Administration Building	Major Structural Fire, Hazardous Materials Incident	1, 2	360,000	Facilities Management		Contingent upon funding: Unknown	University Funding	**9** (Previous Ranking 13 – Moved up based on new critical vulnerability assessment)
Install fire suppression/sprinkler system	Forestry Building	Major Structural Fire, Hazardous Materials Incident	1, 2	435,000	Facilities Management		Contingent upon funding: Unknown	University Funding	**10** (Previous Ranking 14- Moved up based on overall fewer projects being considered)

24x7 Security Operations Center (SOC)	University -wide	Cyber Threats, Sabotage/Terrorism	2,6	$1 Million annually	IT	Facilities Mgmt	Contingent upon funding: Unknown	University Funding	**11** (new project)
Install fire suppression/sprinkler system	Fisher Hall	Major Structural Fire, Hazardous Materials Incident	1, 2	920,000	Facilities Management		Contingent upon funding: Unknown	University Funding	**12** (new project)
Install fire suppression/sprinkler system	ME-EM Building	Major Structural Fire, Hazardous Materials Incident	1, 2	735,000	Facilities Management		Contingent upon funding: Unknown	University Funding	**13** (Previous Ranking 15 - Moved up based on overall fewer projects being considered)
PLANNING & OUTREACH-BASED									
Review and Revise the Multi-Hazard Mitigation Plan to reflect changes in development, progress in mitigation efforts, and changes in priorities annually. Resubmit to the State and FEMA every 5 years.	University -wide	All	All	$40,000/ Staff Time	Facilities Management	University HMP Steering Committee	Within 5 years	Michigan HMGP; University Funding	**1** (new project)

Integrate the Crisis Management Plan with Hazard Mitigation Plan	University -wide	All	5, 6	Staff Time	Risk Management	Facilities Mgmt, Public Safety & Police Services, Incident Command Team (ICT)	Contingent upon funding: 12-18 Months	University Funding	**2** (Previous Ranking 4 – Moved up based on completion of previous projects ranked 2 & 3)
Develop University-wide business continuity plan	University -wide	All	5, 6	Staff Time	Risk Management	EHS, Public Safety & Police Services, IT, Facilities Mgmt	Contingent upon funding: 12-24 Months	University Funding	**3** (Previous Ranking 5 – Moved up based on completion of previous projects ranked 2 & 3)
Creation of university/community Hazardous Materials Response Team	Regional	Hazardous Materials Incident	1, 3	Staff Time	EHS / Risk Management	Local Fire Department	Contingent upon funding: Unknown	Community Grants; Rural Development Grant Program	4 (Previous Ranking 8 – Moved up based on completion of previous projects ranked 2, 3 & 8)
Continue to invest in Cybersecurity Tools and Technology	University -wide	Cyber Threats	2,6	$500,000 annually	IT		Contingent upon funding: Unknown	University Funding	**5** (new project)
Implement the use of an enterprise-grade Security Information and Events Management (SIEM) tool	University -wide	Cyber Threats	2,6	$500,000 annually	IT		Contingent upon funding: Unknown	University Funding	**6** (new project)
Complete an Invasive Species Assessment and Management Plan	Main Campus, Portage Lake Golf Course, Ford Center, Mont Ripley	Invasive Species	1, 2, 5	$55,000	Facilities Management	KISMA	Contingent upon funding: Unknown	Michigan Invasive Species Grant Program	**7** (new project)
Investigate securing and sealing telecommunication manholes on campus	Main Campus	Sabotage/ Terrorism	2, 6	85,000	Public Safety & Police Services	Facilities Mgmt	Contingent upon funding: Unknown	University Funding	**8** (new project)

The status of previous plan items (as noted in Table 7.2 above) that are continuing in the current plan is noted below:

- **Facilities-Based Priority Project #1** – Progress has been made on exploring how to accomplish this and the cost to implement. Unable to move beyond the planning phase due to lack of funding.
- **Facilities-Based Priority Projects #3, 5, 6, 7, 8, 9, 10, and 13** - No progress because of lack of funding.
- **Planning/Outreach-based Priority Project #2 and #3 –** No progress because of the lack of available staff to commit extensive time to these projects.
- **Planning/Outreach-based Priority Project #4 –** No progress due to lack of funds and staff time.

There were also four projects from the 2020 Multi-Hazard Mitigation Plan that were explored further and have since been determined to no longer meet the mitigation needs of the university as technology and communication equipment has advanced considerably since the original plan. These four projects are noted below, along with the reasoning for removing them from the Proposed Mitigation Projects.

1. **Plan and implement network, telephone, cellular, and catv with backup power generation at 3 emergency operations sites**

Reason for not moving forward - With the advent of Zoom and the proliferation of mobile device connectivity as well as the acquisition of the Lakeshore Center and other buildings in the greater area this is no longer a necessary project.

2. **Plan and implement supplemental power generation for communications infrastructure in campus buildings**

Reason for not moving forward - All communications infrastructure (network switches, etc.) have individual standalone universal power supplies that will maintain service long enough for the typical startup time of the campus generators, which makes this project redundant and unnecessary. The campus data centers also have their own supplemental power generation.

3. **Implement redundant hardware and software to maintain hot standby production databases**

Reason for not moving forward - Lack of funding. We've supplemented the need for this project by maintaining a secondary datacenter on campus where new servers could be placed and service could be restored with the help of manual intervention.

4. **Develop and implement a water (flood) mitigation plan for the Network Operations Center**

Reason for not moving forward - We've shrunk the physical size of the primary datacenter by 50% over the course of the last five years. We also split critical infrastructure between our primary and secondary data centers wherever possible which lowers the risks and associated challenges with an EERC flood. Water mitigation/prevention in an underground facility is likely quite expensive.

Potential Funding Sources

Potential funding sources for mitigation projects can be found from a variety of sources. The following list (Table 7.3) 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. Most mitigation funding sources recur through legislation or government support but may also be from an isolated instance of financial support.

Creative financing is encouraged and is made possible when partnering with other agencies or businesses to achieve common or complementary goals. Additionally, many opportunities for mitigation funding exist in both the public and private sectors through foundations or philanthropic organizations. Self-funding through operational budgeting and/or deferred maintenance is also a source of funding for mitigation projects. As the University engages in an Annual Capital Planning process, this Hazard Mitigation Plan will be a resource to potentially include mitigation work into our planned infrastructure projects.

Table 7.3: Potential Funding Sources

Name	Description	Managing Agencies
Americorps	Provide funding for volunteers to serve communities, including disaster prevention.	Corporation for National & Community Service
Assistance to Firefighters Grants	Provides funding for fire prevention and safety activities and firefighting equipment.	US Department of Homeland Security (DHS)
Building Resilient Infrastructure and Communities (BRIC)	Provides funding to support work that reduces their hazard risk. The program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience.	FEMA – Region V
Coastal Planning and Construction Grants	Provides funding to assist in the protection, preservation, restoration, enhancement and wisely develop the nation's longest freshwater coastline, the Michigan Coastal Management (MCM) Program provides grant funds to promote vibrant and resilient coastal communities.	Environment, Great Lakes, and Energy
Community Development Block Grant (CDBG)	Provides funding for sustainable community development, including disaster mitigation projects. Also runs the Disaster Recovery Assistance program.	US Housing and Urban Development

Copper Shores Community Grants	Provides funding to assist organizations in the implementation or support of new or existing programs, projects or services that will cultivate a thriving community.	Copper Shores Community Health Foundation
Economic Development Administration (EDA) Grants and Investments	Invests and provides grants for community construction projects, including mitigation activities.	US Economic Development Administration
Flood Mitigation Assistance (FMA) Program	Provides pre-disaster flood mitigation funding (with priority for repetitive flood loss properties under the National Flood Insurance Program).	Michigan State Police Emergency Management and Homeland Security Division FEMA—Region V
Hazard Mitigation Grant Program (HMGP)	Provides post-disaster mitigation funding.	Michigan State Police Emergency Management and Homeland Security Division FEMA—Region V
Hazardous Fuels Mitigation Program	Provides funding for the reduction of hazardous fuels for wildfires	US Bureau of Land Management
Homeland Security Grants	Multiple grants that provide funding for homeland security activities.	US Department of Justice US Department of Homeland Security (DHS)
KCF Field of Interest Grants	Provides funding to support specific areas of need and interest to meet the changing conditions and enhance the quality of life in the Keweenaw.	Keweenaw Community Foundation
Michigan Invasive Species Grant Program (MISGP)	Grant funding designed to address strategic issues of prevention, detection, eradication, and control for both terrestrial invasive species and aquatic invasive species in Michigan.	Dept. of Natural Resources Environment, Great Lakes, and Energy Agriculture and Rural Development
National Fire Plan (NFP)	Provides funding for pre-disaster wildfire mitigation.	US Forest Service

Pre-Disaster Mitigation (PDM) Program	Provides grants through a competitive process for specific mitigation projects, including planning.	Michigan State Police Emergency Management and Homeland Security Division FEMA-Region V
Rural Development Grants	Provides grants and loans for infrastructure and public safety development and enhancement in rural areas	US Department of Agriculture, Rural Development
Rural Fire Assistance Grants (RFA)	Funds fire mitigation activities in rural communities.	National Interagency Fire Center

SECTION 8: Action Plan

- Past Mitigation Accomplishments
- Adoption & Implementation
- Plan Maintenance

Past Mitigation Accomplishments

Mitigation works the best when it is part of a long-term strategy integrated with existing processes and plans. We are excited to highlight our successes. Below tables 8.1 and 8.2 summarize the status of completed mitigation action items from both the 2008 and 2020 Multi-Hazard Mitigation Plans.

Table 8.1: Proposed Mitigation Activities that were proposed in the 2008 plan and completed

Proposed Activity	Site/ Location	Hazard(s) Addressed	Goals Addressed	Cost	Resources
Address cracked storm sewer	Near Rosza Center along US-41	Urban Flooding	1,2,6	$340,000	University Funding
Upgrade fire alarm system in Dillman Hall	Dillman Hall	Major Structural Fire, Hazardous Materials Incident	1,2	$122,750	University Funding
Upgrade water-based fire suppression system in Network Operations Center	Data Center, EERC Building	Major Structural Fire, Hazardous Materials Incident	1,2	$26,550	University Funding
Upgrade fire alarm system in ME-EM Building	ME-EM Building	Major Structural Fire, Hazardous Materials Incident	1,2	$197,000	University Funding
Replace current halon gas fire suppression system in 11 labs with human-friendly system	M&M Building	Major Structural Fire, Hazardous Materials Incident	1,2	$137,713	University Funding
Crisis Management education, tabletops & exercises	University-wide	All	1,2,4	Staff Time	University Funding
Train appropriate university staff in compliance with NIMS	University-wide	All	4,6	Staff Time	University Funding

Tabe 8.2: Proposed Mitigation Activities that were proposed in the 2020 plan and completed

Proposed Activity	Site/ Location	Hazard(s) Addressed	Goals Addressed	Cost	Resources
Install passive flood barrier at the driveway entrance to Admin Building/Lot	Administration Building/ Parking Lot	Urban Flooding	1,2,5,6	$300,000	FEMA
Complete initial Campus Stormwater Drainage Assessment	Main Campus	Urban Flooding	2,5,6		Michigan HMGP; University Funding
Conduct a new Critical Vulnerability Assessment	University-wide	All	All		Michigan HMGP; University Funding
Evaluate bio-hazard levels, storage, and handling practices on campus	University-wide	Hazardous materials Incidents/Major Structural Fire	1,2,6	Staff Time	University Funding
Integrating hazard mitigation into Campus Master Plan	University-wide	All	5	Staff Time	University Funding
Develop and implement a water (flood) mitigation plan for Mont Ripley Ski Hill. Did work to redirect water flow and will be replacing the culvert.	Mont Ripley	Urban Flooding, Severe Weather: Precipitation	1,2,5,6		

Adoption and Implementation

By adopting the Michigan Tech Multi-Hazard Mitigation Plan, the University recognizes the need to incorporate hazard mitigation activities into everyday decisions for all University campuses and holdings. This adoption commits Michigan Tech to working on mitigation efforts within its boundaries and in cooperation with neighboring jurisdictions when opportunities arise.

Every mitigation action proposed in the mitigation strategy in Section 7 is assigned a coordinating department responsible for facilitating implementation. In addition, a timeframe is provided to ensure that the projects are being implemented in a timely manner. Michigan Tech's Facilities Management Department has the overall responsibility for implementing the Michigan Tech Multi-Hazard Mitigation Plan. This includes monitoring the coordinating departments, their assigned tasks, and project implementation.

Michigan Tech has and will continue to integrate this Multi-Hazard Mitigation Plan into other University plans and processes where appropriate. Opportunities to incorporate the requirements of this plan into other planning tools will continue to be identified through the annual and five-year review periods. The Facilities Management Department will ensure that the plan is being considered during implementation of current and development of new University planning mechanisms.

As stated previously, Michigan Tech will seek funding from a variety of outside sources to implement mitigation projects in both the pre-disaster and post-disaster environments. The Facilities Management Department will be responsible for coordinating funding applications and proposals for proposed mitigation actions.

Plan Maintenance

Improve Data Collection Systems

Facilities Planning & Construction will continue to improve its method for collecting and documenting incidents for inclusion in future plan updates.

Annual Plan Review

The plan will be reviewed annually by the Hazard Mitigation Steering Committee and Facilities Management in coordination with other University operation plan updates to determine if revisions are needed. Annual Review will provide an opportunity to document successful mitigation implementation and learn how to improve in the future. At each annual review, an annual action schedule will be created that will include prioritizing projects, monitoring project implementation, and developing funding proposals.

Five Year Plan Review

The Multi-Hazard Mitigation Plan will be thoroughly reviewed and updated every 5 years by a committee representing the University, local agencies, and concerned parties to determine whether there have been any significant changes at Michigan Tech that would necessitate changes in the plan. The Facilities Management Department will be responsible for continuing to provide regular communication with the steering committee and facilitating the 5-year review.

Factors that may affect changing plan content include an increased exposure to hazards, new development in identified hazard areas, and changes to Federal or State legislation relating to hazard mitigation. The plan review will also provide the University with an opportunity to measure success levels of implemented mitigation activities. It will help guide the replication of successful activities and provide evaluation of less successful mitigation activities.

Other areas that may be considered when reviewing the plan include:

- Evaluating if the goals are still consistent with current conditions and expectations
- Assessing if the mitigation strategy is aligned with the plan goals
- Measuring if the magnitude of risk and vulnerability have changed
- Determining if implementation obstacles or coordination issues exist
- Identifying if there are new stakeholders that should be invited to the table
- Assessing if identified mitigation actions are still appropriate given current resources and incorporating equitable outcomes including the possibility of including equity in our priority ranking criteria for proposed projects
- Stating if Michigan Tech has been affected by any disasters since the plan was adopted

Following the 5-year review, those revisions deemed appropriate will be made. It will be the responsibility of the Facilities Management Department and the Hazard Mitigation Steering Committee to ensure that the appropriate stakeholders are invited to participate in plan revisions and updates.

The results of the 5-year review and subsequent recommendations will be summarized in a report which will be made available for public review before the revised plan is adopted by the University. For any changes or updates to the mitigation actions, Michigan Tech will re-assign responsibility for task completion as necessary.

Amending The Plan

At the discretion of Michigan Tech Administration, minor updates and amendments to the plan (including the Mitigation Strategy) may not necessitate a formal updating process. For all other updates, Michigan Tech will inform all interested parties including all directly affected university departments and personnel, the greater university community (as deemed appropriate), the Houghton County Office of Emergency Measures, and the Michigan State Police—Emergency Management & Homeland Security Division, if necessary. Proposed amendments will be disseminated in order to seek comment and feedback before adoption. At the end of the declared review period, the Steering Committee will amend the plan and recommend adoption of the revised plan to Michigan Tech's President.

Continued Public Involvement

Public participation is a crucial component to the hazard mitigation planning process. As previously described, major amendments to the plan shall require the involvement of the general university community as deemed appropriate prior to any formal adoption procedures. The Facilities Management Department will facilitate the public comment process working with the Hazard Mitigation Steering Committee, the University, Student Government, and the State Hazard Mitigation Office.

Solicitation of public comment on major plan amendments will include:

- Notifying the public of HMP Steering Committee meetings (which are open to the public)
- Incorporate means and methods to continue to address equitable outcomes for underserved and vulnerable populations
- Meeting with local community municipalities for input
- Submitting press releases to university outlets and other area media updating them on the progress being made on the plan
- Using the Michigan Tech website to announce current review activities
- Planning and holding outreach sessions and workshops

SECTION 9: Appendices

- Appendix A: Meeting Agendas
- Appendix B: Public Outreach Documentation
- Appendix C: Priority Ranking Benchmarks
- Appendix D: Building Assessment Forms (2024 Critical Vulnerability Assessment)
- Appendix E: Resources

Appendix A: Michigan Tech Meeting Agendas

Note that all meetings were open to the public, advertised online on the MTU Hazard Mitigation Planning webpage, and consideration was made as to the location and time of meetings to encourage public engagement.

Agenda

Project Name Hazard Mitigation Annual Review
Kickoff Date January 8, 2021
10:30am – 11:30am

Topic	Action Items
Discuss Annual Plan Review & Timeline - Who should be involved? - Areas to consider when reviewing plan (checklist)	Annually (January thru March?): Prioritize Projects - **All** Monitor Project Implementation - **Gregg** Develop Funding Proposals – **Lori** Timeline & meeting schedule - **Lori**
Review Long-term Action Items from Plan 1) Improve Data Collection 2) Update Critical Vulnerability Assessment 3) Complete a Campus Storm Drainage Assessment	
Develop 5-Year Timeline **(Year 1)** - Who should be involved When? Appropriate Stakeholders? - Public Involvement - Critical Vulnerability Assessment - Storm Drainage Assessment - Other?	

<u>HMP Annual Review – Work Session</u>
February 14, 2022
Facilities Conference Room

2 Year Review

☐ Review list of proposed mitigation projects (any way to work any into the FY23 budget year). Does Campus Master Planning include any Hazard Mitigation Planning? Need to be sure the HMP has the same message as the CMP.

☐ Building Assessment Forms / Critical Vulnerability Assessment - Gregg

☐ Timeline / Cost (WUPPDR vs. In-house) / Possibility of BRIC Grant Funding

☐ Mitigation Planning Team

Discussed who to include in plan update steering committee meeting

- 7 from Tech - IT, Public Safety, Sustainability, Student Life, General Counsel, Facilities (2)
- 2 from community (possibly 3 if WUPPDR is not involved in the re-write)

Next Steps????

- National Risk Index (Section 4 and Table 4.1)

- Reformatting the plan

- Recreating the **Proposed Mitigation Projects** Tables

Hazard Mitigation Plan Steering Committee

AGENDA 6-28-2023

Work session, Prep for 2025 Hazard Mitigation Plan Update & Vulnerability Assessment

A. Review Timelines

B. Development of Steering Committee / Project Planning Team
   1. Are these 2 separate groups?

   2. Previous discussion of make-up of the group: **7 from Tech** - IT, Public Safety, Sustainability, Student Life, General Counsel, Facilities (2) & **2 from community** (possibly 3 if WUPPDR is not involved in the re-write)

C. Hiring Student Intern (s)
   1. Hours allocated from both grants:
      Vulnerability Assessment= 85.75 hrs @ $15 per hour (over the course of 10 months) --- 8.575 hours per month
      Hazard Mitigation Plan Update = 442 hrs @ $15 per hour (over the course of 18 months) --- 24.5 hours per month

   2. What function would the student fill? Writing, researching, formatting, accessibility(?), maps (?)

D. Quarterly Reporting / Reimbursement Timing
   1. Have not received forms from MSP yet. Not sure if Randy (SPO) has sent the signed agreement back. Followed up with an email yesterday.

   2. How would we like to do labor reimbursements? Quarterly? More often? Less Often?

Michigan Technological University
Hazard Mitigation Plan Update
Steering Committee Kick-Off Meeting
11-8-2023

- Welcome
- What is Hazard Mitigation?
- Hazard Mitigation at Michigan Tech
- Review of Planning Process

- Steering Committee Role

- Timeline

- Hazard Identification/Risk Assessment

- Mitigation Strategy/Proposed Mitigation Projects
- Community Engagement

Committee Timeline for Plan Update

Mitigation planning breaks the cycle of disaster damage, reconstruction and repeated damage. Hazard mitigation includes long-term solutions that reduce the impact of disasters in the future.

Committee Objective: To update hazard identifications and risk analyses based on events and changing climate, and to propose mitigation actions (potential projects) to prevent or lessen the impact of future disasters.

Rough Timeline (note that there may be some overlap):

December/January	Planning Process, Community Outreach
February/March	Hazard Identification
April/May	Risk Assessment
June/July	Mitigation Strategy/Potential Projects
August/September	Review Draft Plan
October	Submit to FEMA for Review/Approval
November/December	Address any edits requested by FEMA
January	University Adopts Plan

MICHIGAN TECHNOLOGICAL UNIVERSITY

HAZARD MITIGATION PLAN

Steering Committee

DATE: December 19, 2023
TIME: 3:30 – 4:30 p.m.
PLACE: Michigan Technological University
Facilities Management (Building 44)
Conference Room

AGENDA

I. Review Project Scope

A. Sections 1, 2, 3 updates will be done by myself and the Student Intern. They are more basic updates to data.

B. **Scope – Areas Considered** – Do we need to change the scope at all?

II. Review Hazard Identification Table 4.1

A. Possible updates based on other plans - Change “Coastal” to “Shoreline”; Add Fog?; Add Invasive Species?

B. MTU Emergency Response Plan column – Is this information accurate?

III. Hazard Assessment

A. Public Engagement
1. Review Survey (link to survey: Draft - Public Survey)
Review Survey Flier
2. Outreach Brainstorming (review attachment prior to the meeting - FEMA Guidelines for Equitable Outreach)

B. Steering Committee Exercise

MICHIGAN TECHNOLOGICAL UNIVERSITY

HAZARD MITIGATION PLAN

Steering Committee

DATE: January 30, 2024
TIME: 10 a.m. – 11 a.m.
PLACE: Michigan Technological University
Memorial Union Building – Superior Room

AGENDA

I. Further Discussion Project Scope

   A. **Scope – Areas Considered** – MTRI vs. other off-campus sites

II. Review Hazard Identification Table 4.1

   A. Change "Coastal" to "Shoreline"; Add Fog; Add Invasive Species; Add Cyber Threats

III. Update on Public Survey

IV. Brainstorming exercise – Ways to increase Public Engagement

Hazard Mitigation Plan Steering Committee

Agenda – 3/19/2023 3:00pm

Zoom meeting

1. Critical Vulnerability Assessment - Gregg

2. Public Survey Results – Hazard Identification

- # of participants / Breakdown
- Top 3 Hazard Concerns
- Summary of Comments
- Climate Change

3. Updates to this Section of the plan

- Add **Fog** and **Invasive Species**
- **Urban Flooding** – Based on the public survey and hazard identification evaluations from this group, I believe the risk level should stay the same (moderate to high), but should Vulnerability level remain at HIGH? Mitigation project completed at Admin Building. Stormwater drainage assessment will help guide this.
- **Public Health Emergency** – Current Risk level is moderate pre-covid. Should this risk level change? Vulnerability Level – based on historical occurrence can we define this better now?
- **Cyber Security, Threats, Breeches** – Current plan is missing the involvement of computers or electronic devices as a means of "attack". This was one of the top concerns mentioned in the public survey. Currently one of many things lumped into Sabotage/Terrorism. Is there a better place for this. Should it be its own Hazard/Threat?
- **Active Shooters -** Currently one of many things lumped into Sabotage/Terrorism. Is there a better place for this. Should it be its own Hazard/Threat?

3. Risk Reduction/Mitigation Project Ideas Exercise

- Overview of Mitigation Techniques with examples
- April meeting – brainstorming

Hazard Mitigation Plan Steering Committee

AGENDA 5-3-2024

MTU, Facilities Conference Room

Work Session Exercise: Hazard Mitigation / Risk Reduction projects

- Gather project ideas based on university needs
- Group by mitigation category (prevention; Education, Emergency Services, Property protection, Natural Resource Protection, etc.)
- Discuss possible funding sources

Hazard Mitigation Plan Steering Committee

AGENDA 6-3-2024

MTU, Memorial Union Building, Datolite Room

Session on Risk Management led by John Velat, Manager of Risk Management & Compliance for the Office of General Counsel at Michigan Tech

Hazard Mitigation Plan Steering Committee

AGENDA 6-28-2024

9:00am – 10:00am Facilities Conference Room

A. Review Timeline for getting draft out for Public Comment

B. Review Draft

C. Discuss Potential Mitigation Activities/Projects

D. Review STAPLEE methodology

E. Homework – Review Criteria used for priority ranking potential projects

Hazard Mitigation Plan Steering Committee

AGENDA 8-20-2024

1:00pm – 2:00pm Zoom Meeting

A. Update on timeline for getting draft out for Public Comment

B. Review Draft

C. Review and Discuss of Critical Vulnerability Assessment Final Report

D. Final review of potential mitigation activities

E. Homework – Complete priority ranking worksheet for all potential projects (due by the end of the month)

Hazard Mitigation Plan Steering Committee

AGENDA 9-4-2024

9:00am – 10:00am Facilities Conference Room

A. Review Final draft of Multi-Hazard Mitigation Plan Update for 2025
   - Project priority

B. Review Public Comment timeline and planned outreach
   Public Comment period – September 5-25, 2024

C. Discuss FEMA approval process

D. Discuss process for University Adoption following FEMA Approval

E. Review Steering Committees role following approval and adoption

Hazard Mitigation Plan Steering Committee

AGENDA 9-26-2024

1:00pm – 2:00pm Zoom Meeting

A. Review Public Comments and how to incorporate suggestions/feedback into the Plan Update

B. Finalize timeline to submit to FEMA for approval

C. Discuss process for University Adoption following FEMA Approval

D. Review Plan Maintenance process and discuss timeline for how this will work YR.1, YR. 2 and YR.3 with the next 5-year update beginning in 2028.

Meeting Agenda

Meeting: Hazard Mitigation Planning

Attendees: Lori Weir, Kerri Sleeman, Gregg Richards, Larry Hermanson, Jennifer Johnson

Date: Monday, January 7, 2019 **Time:** 3:00 pm – 4:00 pm

Location: Facilities Conference Room

	Agenda Items	Who	Action Item
1	Review Charge • Info from Job Aid • Timeline • Resources • Meeting Schedule • Assign Sections • Need to get Campus Critical Vulnerability Assessment – currently blacked out on final report • Need Appendices -listed on Index; not available in report	Lori	Touch base with community resources: - WUPPDR - Eric Waara (city of Houghton) - Review other community plans
2	Section 1: Introduction	Kerri	
3	Section 2: Community Profile	Lori	
4	Section 3: University Profile	Gregg	
5	Section 4: Planning Process	Larry	
6	Maps Throughout Plan	Jennifer	

MEETING AGENDA

Meeting: Hazard Mitigation Planning

Attendees: Lori Weir, Kerri Sleeman, Gregg Richards, Larry Hermanson, Jennifer Johnson

Date: Monday, January 21, 2019 **Time:** 3:00 pm – 4:00 pm

Location: Facilities Conference Room

	Agenda Items	Who	Action Item
1	Update on Action items - Critical Vulnerability Assessment - Economic Impact of Michigan Tech - Mabbs Vein and Mineral Museum - Sturgeon River Gasoline Spill	Lori	
2	Review and Discuss changes/updates to: ➢ Section 1: Introduction (Kerri) ➢ Section 2: Community Profile (Lori) ➢ Section 3: University Profile (Gregg) ➢ Planning Process (Larry)	All	
3	Maps – Updated Sections 1-4	Jennifer	
4	How to handle Section 5 – 7 • Hazard Identification & Risk Analysis • Vulnerability Assessment • Mitigation Strategy	Lori/All	**Section 5** **Lori** – intro and summary portions as well as Section 6 **Larry** – Natural Hazards **Gregg** – Technological Hazards **Kerri** – Societal Hazards
5	Next Meeting - February 4, 2019		

Notes:

- Discussed Section 6 and 2001 Vulnerability Assessment – Address that we will continue to refer to this study, but a new assessment is needed prior to the next plan update (2024).

MEETING AGENDA			
Meeting:	Hazard Mitigation Planning		
Attendees:	Lori Weir, Kerri Sleeman, Gregg Richards, ~~Larry Hermanson, Jennifer Johnson~~		
Date:	Monday, February 4, 2019	**Time:**	3:00 pm – 4:00 pm
Location:	Facilities Conference Room		

	Agenda Items	Who	Action Item
1	Review and Discuss changes/updates to: ➢ Section 1: Introduction (Kerri) ➢ Section 2: Community Profile (Lori) ➢ Section 3: University Profile (Gregg) ➢ Planning Process (Larry)	All	
2	Progress on Section 5 **Lori** – intro and summary portions as well as Section 6 (add to Appendix – new wording) **Larry** – Natural Hazards **Gregg** – Technological Hazards **Kerri** – Societal Hazards	Lori/All	
4	Next Meeting (2/11) ➢ Kerri will meet with Eric Waara to discuss our plan and how it supports the City of Houghton plan	Lori	

MEETING AGENDA			
Meeting:	Hazard Mitigation Planning		
Attendees:	Lori Weir, Kerri Sleeman, Gregg Richards, Larry Hermanson, Jennifer Johnson, Dan Bennett (Incident Command Team), Chris Maxson (EHS)		
Date:	Monday, February 11, 2019	**Time:**	3:00 pm – 4:00 pm
Location:	Facilities Conference Room		

	Agenda Items	Who	Action Item
1	Update on Action Items	Lori	
2	Fire Data from EHS	Chris	
3	Input from Incident Command Team on additions to plan Suggested to add info on Active Shooter Trainings	Dan Bennett	
4	Add Mont Ripley to the plan update - Discussion	All	
5	Next Meeting (2/26)	Lori	

Notes:

- Jennifer will create a map for Mont Ripley (similar to the ones for Ford Center and KRC)

MEETING AGENDA			
Meeting:	Hazard Mitigation Planning		
Attendees:	Lori Weir, Kerri Sleeman, Gregg Richards, Larry Hermanson, Jennifer Johnson, Theresa Coleman-Kaiser		
Date:	Monday, February 26, 2019	**Time:**	10:00 pm – 10:30 am
Location:	Facilities Conference Room		

	Agenda Items	**Who**	**Action Item**
1	Update on Action Items	Lori	
2	Letter of Adoption from President	Theresa	
4	Section 7 **Table 7.2** Proposed Mitigation Projects - Completed projects - Projects no longer being considered	All	Scoring and ranking of proposed projects
5	Next Meeting (3/4/2019)	Lori	

Notes:

- Review FM Global report for potential proposed mitigation projects for updated plan.

MEETING AGENDA			
Meeting:	Hazard Mitigation Planning		
Attendees:	Lori Weir, Kerri Sleeman, Gregg Richards, ~~Larry Hermanson~~, Jennifer Johnson, Jarrod Karau (IT), Roy Britz (Public Safety)		
Date:	Monday, March 18, 2019	**Time:**	3:00 pm – 4:00 pm
Location:	Facilities Conference Room		

Agenda Items		Who	Action Item
1	Update on Action Items	Lori	
2	Identify any IT-specific concerns/needs	All	
3	Identify any Public Safety cocerns/needs	All	
4	Discuss Plan implementation and maintenance	All	

Notes:

MEETING AGENDA		
Meeting:	Hazard Mitigation Planning	
Attendees:	Lori Weir, ~~Kerri Sleeman~~, Gregg Richards, Larry Hermanson, Jennifer Johnson	
Dte:	Wednesday, April 10, 2019	**Time:** 10:00 am – 11:00 am
Location:	Facilities Conference Room	

	Agenda Items	Who	Action Item
1	Review of Near-Final draft	Lori	
2	Discuss Table 5.3	All	
3	Section 7 • Discuss Tables that need updating	All	
4	Plan for Public Review Period	All	

Notes:

MEETING AGENDA

Meeting: Hazard Mitigation Planning

Attendees: Lori Weir, Kerri Sleeman, Gregg Richards, Larry Hermanson, Jennifer Johnson

Dte: Wednesday, September 18, 2019 **Time:** 11:00 am – 11:45 am

Location: Facilities Conference Room

	Agenda Items	Who	Action Item
1	Review of FEMA Review Tool & Checklist	Lori	
2	Assign role for required updates	All	A2-b: Lori A3-a: Lori B1-c: B2-b:
3	Discuss Public Input and request for feedback on the draft plan	All	
4	Next Steps / Future Meetings	Lori	

Notes:

EETING AGENDA			
Meeting: Hazard Mitigation P l'annirng			
Attendees: Lori Weir, Keni Grngg R,ichards, Larry Hermanson, Jlennifer Johnson			
Rm,: Tuesday, October 8, 201g,		**lime:** 10:00 am - 11 00 am	
Location: Facilitiies Conference Room			
Aaenda Items		**Who**	**Action Item**
11	Review Assiigned Updafes	Lorii	
2	Public Input,(University),	Lori	-Add llangLJage to the draft from May 10 advertiseme11t for public input Add what input we reoeived. -Seek input on updated draft (add langLJag1e to pl'an including responses -Share drafts with stude11t government leadership a11d ask for their review/input (imlude any and all documentation that of this within the appendix of the plan)
3	Public Input ,(Community)	All	-Seek input on updated draft (add langLJagie to pl'an including responses (iindlude any and all documentation that of this within the appendix of the plan)
4	Next Steps / Future Meetings	Lorii	-I will have the final draft pulled together for review by October 10 -Public comment notifications out around 10/14 -Draft submittal to IFEMA 11/1

Notes:

Michigan Tech Disaster Resistant University Advisory Committee

October 26, 2006

Michigan Tech University 1400 Townsend Drive Houghton

9 AM (EST)

1. Introductions
2. Project Overview (presentation)
   a. Purpose
   b. Phases
3. Project timeline
4. Michigan Tech DRU mission statement
5. Next meeting: Late January/Early February 2007 (Hazard Identification, Hazard Ranking, Vulnerability Assessment)

Michigan Tech Disaster Resistant University Advisory Committee

April 17, 2007

Michigan Tech University 1400 Townsend Drive

Houghton 8:30 AM (EST)

1. Introductions
2. Project Timeline Update
3. Project Activities
   a. Craig Holmes
   b. Plan update
4. Risk Assessment
   a. Attachment (Hazard Table)
   b. Hazard Analysis (Sub-committee)
5. Critical Facilities
   a. Attachment of Critical Facilities Criteria
   b. Preliminary Critical Facilities List
   c. Additions
6. Other Business

Michigan Tech Disaster Resistant University Advisory Committee

July 26, 2007

Michigan Tech University 1400 Townsend Drive Houghton

9 AM (EST)

Agenda

1. Review/comment on plan sections I, II, and III submitted in June
2. Plan progress update
   a) Risk Assessment
   b) Vulnerability Assessment
   c) Mitigation Strategy
3. Discussion of goals
4. Revised Timeline
5. Next Meeting

Michigan Tech Disaster Resistant University Advisory Committee

December 10, 2007

Michigan Tech University 1400 Townsend Drive Houghton

9 AM (EST)

Agenda

1. Review plan section V submitted in November
    a) Discuss committee comments
    b) Discuss comments provided by Craig Holmes
2. Plan progress update
    a) Written plan
    b) Information needed from committee
3. Brainstorm problem statements
4. Draft mitigation goals
5. Discuss mitigation objectives
6. Mitigation activities brainstorm

Meeting Goals

- *Collaborate with committee members to help gather remaining information*
- *Draft a list of university problem statements based on identified hazards*
- *Draft University Mitigation Goals*

Michigan Tech Disaster Resistant University Advisory Committee

Tuesday April 8, 2008

Michigan Tech University 1400 Townsend Drive Houghton

1 PM (EST)

Agenda

1. Review plan sections VI & VII submitted in March
   a) Discuss committee comments
2. Discuss Mitigation Activities
   a) Identified in Plan
   b) Additions
   c) Prioritize
3. Discuss Plan implementation & maintenance
4. Set next meeting
5. Adjourn

Meeting Goals

- *Finalize mitigation activities & prioritize.*
- *Determine which university body will oversee implementation and maintenance of the plan after it attains FEMA approval.*
- *Set next meeting date and time (bring your calendar)*

Michigan Tech Disaster Resistant University Advisory Committee

Tuesday June 17, 2008

Michigan Tech University 1400 Townsend Drive Houghton

8 AM (EST)

Agenda

1. Discuss current draft
   a) Comments
2. Discuss mitigation activities
   a) Additions
   b) Priority
3. Other Business
4. Adjourn

Meeting Goals

- *Finalize mitigation activities.*

Appendix B: Public Outreach Documentation

Hazard Mitigation Planning Website:

https://www.mtu.edu/facilities/resources/hazard-mitigation-planning/

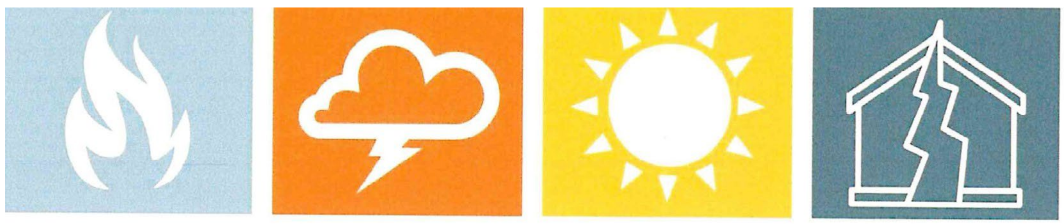
See pages 145-147 for a printout of the webpage layout

Michigan Tech

Facilities Management [https//www.mtu.edu/facilities/]

Facilities Management [httP-s://www.mtu.edu/facilities/] > **Hazard Mitigation Planning**

Hazard Mitigation Planning



Thank you for your interest in Michigan Technological University's Multi-Hazard Mitigation Plan. The plan will be updated during the 2023 and 2024 academic years.

What is Hazard Mitigation?

Hazard mitigation planning reduces the loss of life and property by minimizing the impact of disasters. It begins by identifying natural disaster risks and vulnerabilities on campus. After identifying these risks, long-tern strategies are developed for protecting people and property from similar future events. Mitigation plans are key to breaking the cycle of disaster damage and reconstruction. Our plan also includes human-caused hazards such as hazardous materials, cyber threats, pandemics, and active shooters. A hard copy of the **2020-2025 Michigan Tech Multi-Hazard Mitigation** Plan is available to view in the Facilities Management department at 100 Facilities Building, Houghton, MI. To receive a digital copy of the plan, please e-mail facilities@mtu.edu.

How Can I Help?

Michigan Tech wants your involvement in the hazard mitigation planning process. Here are just a few ways you can help us update our plan.

- **Complete the Survey -** Survey closed on March 15, 2024. **THANK YOU to all who completed the survey.** The information you provided will help us better understand your hazard concerns and help us identify mitigation activities that should help lessen the impact of future hazard events on campus.
- **Attend meetings** - All steering committee meetings and work sessions will be open to the public. See the listing of meeting below.
- **Give us your feedback** - We will also be asking for you to review and provide feedback on the draft of the updated plan in August/September 2024.
- **Share** - Make sure your voice is heard. Share your opinions, ideas and/or concerns any time. Email Lori Weir at llweir@mtu.edu

Currently Scheduled Steering Committee Meetings

Steering Committee Meeting	Friday, May 3, 2024	9:00-10:00am	Facilities (Building 44) Conference Room
Steering Committee Meeting	Monday, June 3, 2024	10:00am - Noon	MUB- Datolite Room -100
Steering Committee Meeting	Friday, June 28, 2024	9:00am - 10:00am	Facilities (Building 44} Conference Room
Steering Committee Meeting	Friday, August 2,2024	9:00am-10:00am	Facilities (Building 44) Conference Room
Steering Committee Meeting	Tuesday, August 13,2024	2:00pm-3:00pm	ZOOM: httP-s://michig1mtech.zoom.us/j/89012338226 [bllP.£LL_mlchigantech.zoom.us/j/820123382261
Steering Committee Meeting	Tuesday, August 20, 2024	1:OOpm-2:00pm	ZOOM: httP-s://michigantech.zoom.us/j/89012338226 [httgs://michigantech.zoom.us/j/89012338226].
Steering Committee Meeting	Wednesday, Septembere 4, 2024	9:00am - 10:00am	Facilities (Building 44} Conference Room
Steering Committee Meeting	Tuesday, September 26, 2024	1:00pm-2:00pm	Facilities (Building 44) Conference Room

Want to Participate Even More?

If you would like to take on a more active role in planning or outreach, there may be opportunities that fit your interests. Please complete this form _[httP-s:l/forms.gle/zvBSNQ6e7gB2XaeD8Jto let us know how you would like to help.

Facilities Management [https://www.mtu.edu/facilities/]
Facilities Building 100
1400 Townsend Drive
Houghton, Ml 49931
Ph: 906-487-2303
Contact us [bttP-s://www.mtu.edu/facilities/contact/office/J

Tomorrow Needs Michigan Tech [htq:is://www.mtu.edu/tomorrowneeds/] I

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Public Notices

Request for public comment of the updated MTU Multi-Hazard Mitigation Plan 2025-2030 placed in The Daily Mining Gazette on 9/9/2024, 9/14/2024, and 9/23/2024.

PUBLIC NOTICE

A draft of the 2025 updated Michigan Tech Multi-Hazard Mitigation Plan is available for inspection on the MTU Facilities Management website. The 2025 draft plan and more information about the plan can be viewed at ***www.mtu.edu/facilities/resources/hazard-mitigation-planning*** or by contacting Lori Weir, Director of Administrative Services and Projects at ***llweir@mtu.edu***.

This Plan Update was funded by a grant from FEMA and the Michigan Hazard Mitigation Grant Program. Michigan Tech values the input and feedback from the community, and any feedback provided will be reviewed and addressed in this plan prior to the final submission to FEMA.

The deadline to provide feedback is Wednesday, September 25, 2024.

The Mining Gazette – Houghton, MI

The Lode (Michigan Tech Student Newspaper)

Multi-Hazard Mitigation Plan Draft Feedback

A draft of the 2025 updated Michigan Tech Multi-Hazard Mitigation Plan is available for inspection on the MTU Facilities Management website. The 2025 draft plan and more information about the plan can be viewed at **www.mtu.edu/facilities/resources/hazard-mitigation-planning** or by contacting Lori Weir, Director of Administrative Services and Projects at llweir@mtu.edu.

Michigan Tech values the input and feedback from the community, and any feedback provided will be reviewed and addressed in this plan prior to the final submission to FEMA.

Comments on the MTU Multi-Hazard Mitigation Plan Draft must be submitted by **Wednesday, September 25.**

Tech Today Articles

Tech Today

Subscribe Calendar Weather Jobs

September 17, 2024

Submit a Story

1 Campus Construction Update: H-STEM and Chem Sci
2 Join MSE for Aluminum Day
3 Upcoming Banner Production System Maintenance
4 Claudio Mazzoleni and Will Cantrell Receive 2024 Juan Fernandez de la Mora Prize
5 Seminar with Rajath Nagaraj '21
6 BioMed Seminar Series Speaker: Julia Jeannine Mack
7 Husky Folio Lunch and Learn
8 Chemistry Seminar with Dennis Livesay

Updated Hazard Mitigation Plan Available for Public Comment

A draft of the 2025 updated Michigan Tech Multi-Hazard Mitigation Plan is available for review. The original plan was developed in 2008 to protect the health and safety on Tech's campus, and it was updated in 2020 after the Father's Day flood. A plan update is required by FEMA every five years. Our current plan expires on Jan. 15, 2025.

View the 2025-2030 Draft Plan.

Michigan Tech values the input and feedback from the community, and any feedback provided will be reviewed and addressed in this plan prior to the final submission to FEMA before adoption.

Comments on the MTU Multi-Hazard Mitigation Plan Draft can be provided anonymously through the **Michigan Tech Hazard Mitigation Plan Feedback form**. They can also be emailed directly to Lori Weir at **llweir@mtu.edu**.

The deadline to provide feedback is next Wednesday, Sept. 25.

*****

Tech Today

Subscribe Calendar We

September 9, 2024

Submit a Story

1 Huskies on the Rise: Michigan Tech Welcomes a Thriving Pack
2 University and Distinguished Professor Nominations Sought
3 Updated Hazard Mitigation Plan Available for Public Comment
4 Michigan Tech Innovation Showcase: Event Registration Open to MTU Community
5 Enhance Your Teaching Skills with the Inclusive STEM Teaching Project Course
6 Season Debut: Rozsa Art Gallery Exhibition Opens Friday
7 Physics Colloquium with Juan E. Peralta

Updated Hazard Mitigation Plan Available for Public Comment

by Facilities Management

A draft of the 2025 updated Michigan Tech Multi-Hazard Mitigation Plan is available for review. The original plan was developed in 2008 to protect the health and safety on Tech's campus, and it was updated in 2020 after the Father's Day flood. A plan update is required by FEMA every five years. Our current plan expires on Jan. 15, 2025.

View the 2025-2030 Draft Plan.

Michigan Tech values the input and feedback from the community, and any feedback provided will be reviewed and addressed in this plan prior to the final submission to FEMA before adoption.

Comments on the MTU Multi-Hazard Mitigation Plan Draft can be provided anonymously through the **Michigan Tech Hazard Mitigation Plan Feedback form**. They can also be emailed directly to Lori Weir at **llweir@mtu.edu**.

The deadline to provide feedback is Sept. 25.

University Beginning Update of Hazard Mitigation Plan

by Lori Weir, Facilities Management

Michigan Tech is updating our Multi-Hazard Mitigation Plan, which will identify and mitigate the risks of natural and human-caused hazards that may impact people, buildings, infrastructure and research at the University.

Hazard mitigation plans are required to receive Federal Emergency Management Agency (FEMA) grants and must be updated and approved every five years. Michigan Tech's current plan was approved on Jan. 15, 2020, and must be updated by Jan. 15, 2025, to remain in compliance.

Facilities Management has established the Hazard Mitigation Plan Steering Committee, which will assist in updating the plan by reviewing hazard identifications and risk analyses based on events and changing climate. They will also propose mitigation actions to prevent or lessen the impact of future disasters.

The project lead on the Hazard Mitigation Plan update is Lori Weir (FM). Members of this steering committee include:

- Erik Crowley, general manager/director of golf, Administration and Auxiliary Services
- Matthew Weekley, executive director of the residential enterprise, Residential Education and Housing Services
- Kellie Raffaelli, dean of students, Student Affairs
- Josh Olson, chief information officer, Information Technology
- Brian Cadwell, director and chief of police, Public Safety and Police Services
- John Velat, manager of risk management and compliance, Office of the General Counsel
- Alan Turnquist. director of sustainability and resilience, Office of Sustainability and Resilience
- Gregg Richards, associate vice president for facilities management, Facilities Management (Planning and Construction)
- Robert Garnell, maintenance manager, Facilities Management (Operations)
- Kathy Halvorsen, associate vice president for research development, Vice President for Research Office

Michigan Tech wants input from students, staff, faculty and community members as well. The steering committee will be meeting regularly, and all meetings are open to the public. The next meeting will be Dec. 19 at 3:30 p.m. in the Facilities conference room, located in the **Facilities/Husky Motors Building**.

To learn more about Hazard Mitigation Planning at Michigan Tech, visit **our web g** .

Opportunity to Provide Input on Hazards Affecting Michigan Tech Community

by Lori Weir, Facilities Management

Michigan Tech is updating our Hazard Mitigation Plan, which will identify and mitigate the risks of natural and human-caused hazards that may impact people, buildings, infrastructure and research at the University.

Input from students, faculty, staff and the surrounding community is important for plan development. Please take the **Hazard Mitigation Public Survey** and help us understand your perceptions of hazards and the potential impact of climate change on them. It's confidential and voluntary, and will only take a few minutes.

Take the Survey.

For more information about Hazard Mitigation Planning at Michigan Tech, visit our **Hazard Mitigation Planning webP-gg** .

Opportunity to Provide Input on Hazards Affecting Michigan Tech Community

Michigan Tech is updating our Hazard Mitigation Plan, which will identify and mitigate the risks of natural and human-caused hazards that may impact people, buildings, infrastructure and research at the University.

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Take the Survey.

For more information about Hazard Mitigation Planning at Michigan Tech, visit our **Hazard Mitigation Planning webp...i:!g** .

MTU Needs Student Opinions!

by Facilities Management

Michigan Tech is updating our Hazard Mitigation Plan, and we are seeking input from students.

Student feedback will help us better understand your hazard concerns and help us identify mitigation activities that should help lessen the impact of future hazard events, including the impacts of climate change.

Please help us by completing our **MTU Hazard Mitigation Plan survey** by March 15!

All responses will be kept anonymous and confidential and will only be used to inform the committee when updating the plan.

Keweenaw Report Articles

MICHIGAN TECH RELEASE HAZARD MITIGATION SURVEY FOR PUBLIC RESPONSE

0 2 hours ago II Featured, Local News, News ® 125 Views

Michigan Tech University will update the school's Hazard mitigation plan. As a part of the university process, it will seek input from the public through a survey, which was recently published online. Responses to the Hazard mitigation public survey will help the university understand the community's hazard concerns. As well as identify potential mitigation activities that could lessen the impact of future hazard events. The university will accept survey responses from the community unit on March 15th. Residents without access to a computer or the internet may request a paper copy of the survey to respond to. Find more information about the Hazard Mitigation public survey including links to the survey here. Contact Lori Wier by email for a paper copy of the survey: llweir@mtu.edu

Student Scoop Articles

September 11, 2024 Issue of the Student Scoop

MTU Multi-Hazard Mitigation Plan Update Available for Public Comment

Thank you to those who participated in the initial public survey for Tech's 2025 Hazard Mitigation Plan update! The final draft and google form is located on Tech's Hazard Mitigation Planning site. For a hard copy, contact Lori Weir at llweir@mtu.edu.

Any comments for improvements or additions can be submitted anonymously to the form or emailed to Lori Weir. **Feedback collection will end on September 25.**

Michigan Tech
JhttP-:l/www.mtu.edu]

Michigan Tech University is updating its Hazard Mitigation Plan. Student feedback will help us better understand your hazard concerns and help us identify mitigation activities that should help lessen the impact of future hazard events, including the impacts of climate change.

Please help us by completing this survey [httJ;,!s://m ich igantech.qualtrics.com!jfe/form/SV 7TE2VdFhB3D146al by **March 15, 2024.** All responses will be kept anonymous and confidential and will only be used to inform the Committee when updating the plan.

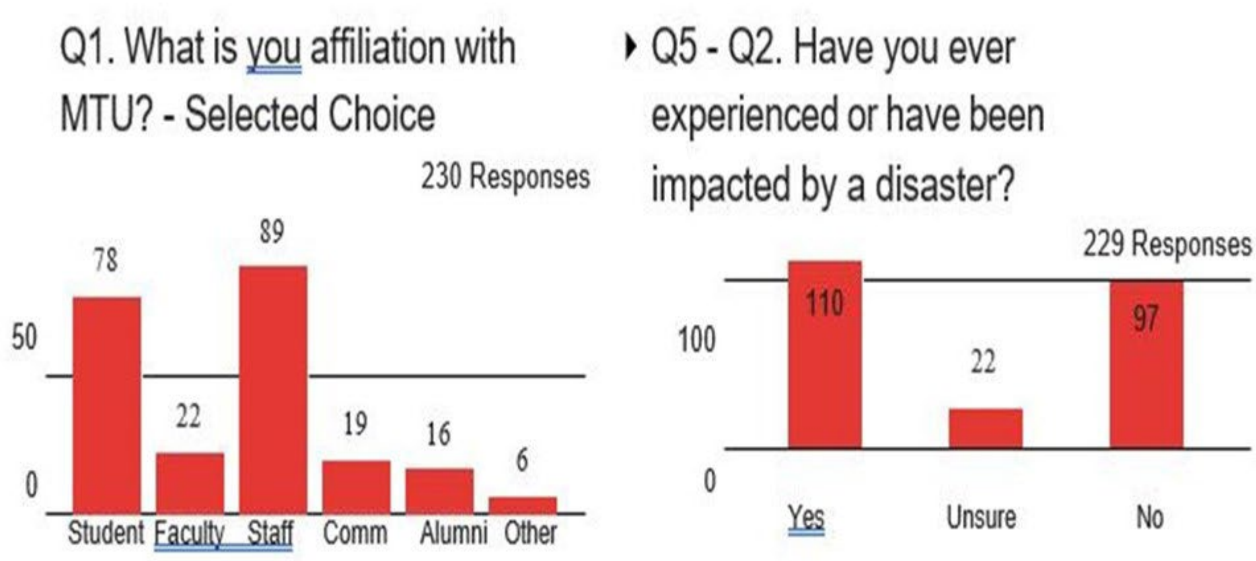
Career Closet

Public Survey Flyer

<u>(posted around campus and the community)</u>

Hazard Mitigation Public Survey Results

Michigan Tech 2025 MHMP Survey Results (As of 3/18/2024)



Q3. Please explain the situations in which you were impacted by a disaster

Lots of Hurricanes (lived most my life in Florida), tornadoes, flooding.

tornado caused damage to my garage

The 2018 "Father's Day Flood"

A tornado hit my property in 2011 dealing damage to the landscape; a flood did significant damage to our basement in 2019;

Father's Day Flood in 2018

High temperatures have impacted the winter season this year, I have been unable to do the events I usually do such as skiing and broomball

I am from houghton and was affected by the Father's Day flood years ago.

June 2018 Houghton flood
Hometown tornado growing up

As snowbirds we lost our hone in FL due to Hurricane Ian.

COVID, but also personally impacted by living in communities during natural disasters (earthquakes, floods, tornado)

The magna Earthquake when I lived in Utah. Little damage was done but it was a scary time.
Fathers Day Flood - there were sink holes on all roads around my home, not allowing me to leave.

Fathers Day Storm

The Father's Day Flood.

Father's day flood affected some of my property

Hurricane storm damage, major 1000 year winter storm recovery, 2008 economic collapse, COVID-19, Forest fires (many), terrorism, major civil unrest and war.

I was impacted by damage resulting from natural disasters, financial impact of destruction, cleanup efforts, I was involved in recovery of hostages from terrorists in Colombia indirectly. Worked with government agencies to assist with post-war repairs/modernizations.

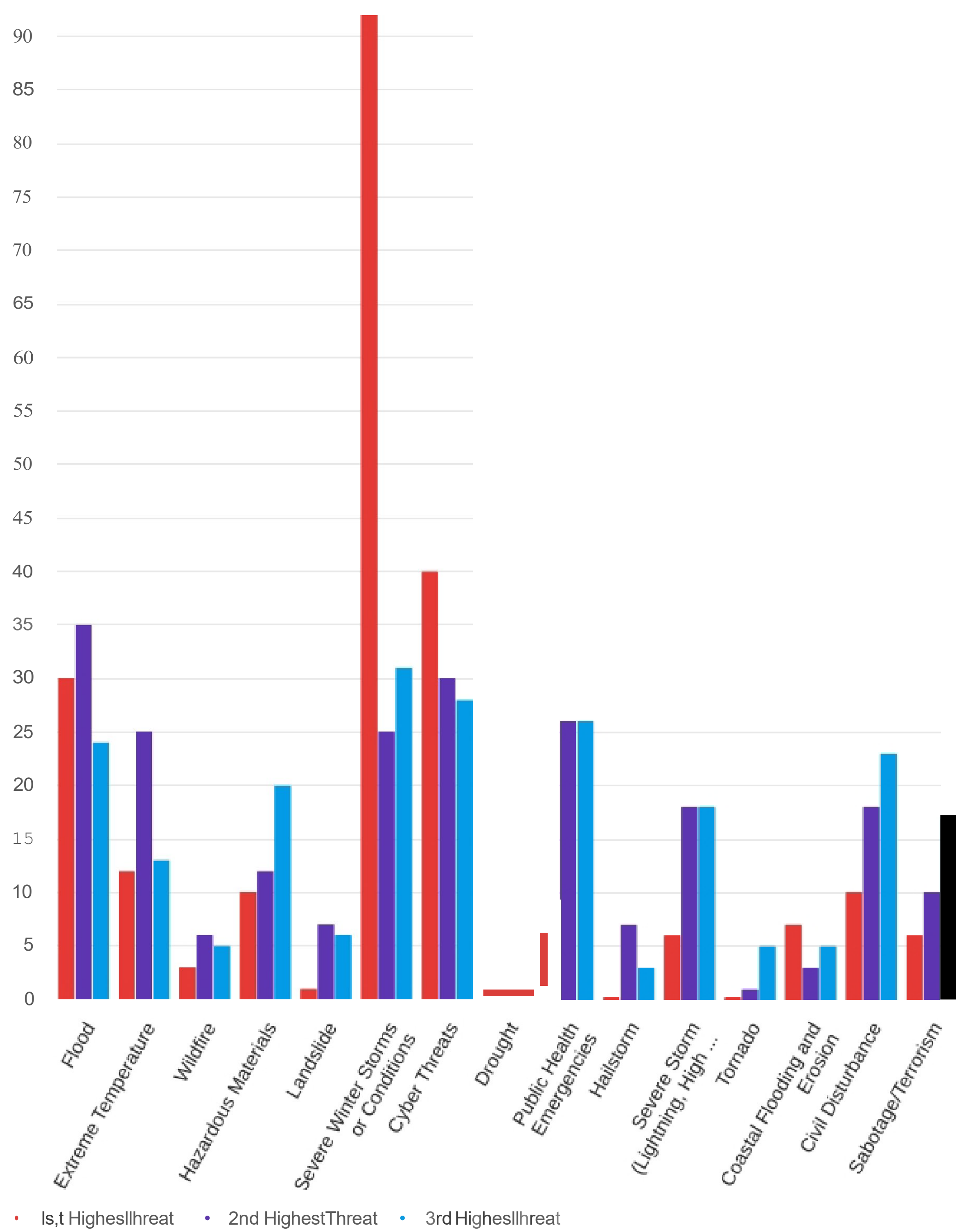
Fathers day flood @ MTU

Tornado in SE
Michigan, Flooding
in the UP

COVID 19. become underemployed during this time until able to retire.

Q4. Please rank the three hazards that you think have the highest threat to the university.

227 Responses



Q8 - Q5. Please use this space to add comments and reasoning for your above choices

Q5. Please use this space to add comments and reasoning for your above choices

1. Public health because COVID continues to circulate and mutate and very little at the university or the state/federal government is being done to control it's spread, while the disease itself is known to weaken the immune system of EVERYONE who has been infected by it. This along with climate change further spreading tropical diseases and the general lack of awareness of the heightened chances of the severely disabling effects of coronavirus mean that even as remote as we are we are looking at several future public health crises. 2. Everything else on this list is much less of a threat in my eyes than number one but as our climate warms we are expected to see more precipitation in the area and more severe events, so while I don't think the university is especially vulnerable to flooding I do think it will become more of a factor as the university is built on the side of a hill in a river valley. 3. Follows number 2, old construction and new construction alike destabilize slopes along which the university is built and the increased chances of flooding (especially when there are alternating periods of extreme lack of precipitation followed by massive precipitation events like we have seen with climate change) means that we will be under heightened chances of slope failure.

Tech is a fairly safe, remote school that isn't especially noteworthy on a national scale, so human-driven disasters like terrorism and civil disturbance seem unlikely. I know Houghton's infrastructure has had flooding problems in the past, and the reasoning behind severe weather conditions should be obvious.

Extreme winter weather is something that the university has to deal with almost every year. Commuting/travel can be very dangerous. People like Charlotte Jenkins have died from these hazards.

The fathers day flood was devastating for the community of

Houghton. Covid was scary to navigate.

Cybercrime increases every year, and most organizations are underscored. Flooding with extreme rain is a serious problem, especially with climate change increasing rainfall. Something like a school shooting shouldn't be ruled out as a possibility and we have never seen one here.

Flooding was ranked highest because it is something that has been experienced here on multiple occasions and always remains a possibility.

Hazmat was ranked second highest because there university is home to many different chemicals, but there is no local Hazmat Team available to immediately respond to an incident.

Severe storms was ranked third because if damage does occur, the amount of available resources in the area to recover quickly is limited. This often means waiting for distant resources to arrive before recovery efforts can begin.

the human sorts of threats don't strike me as directly impacting the university, even if (when) the rest of the country melts down. And despite flooding of Admin, I think our position on the heights by the Portage makes truly hard impacts unlikely.

I am of the opinion that it is imperative to put a plan in place for an active shooter scenario. A lot of students talk about how worried we are that we don't know what the university's plan for this is.

Due to the environment MTU is in, coastal flooding, tornadoes, significant hail, droughts and wildfires are all not of particular concern towards the campus.

Of those that remain, mtu's reputation for winter weather places that firmly at the top of the list, with flooding as a result of general snowmelt on top of rising variability in spring conditions being a concern as well. I place extreme temperatures 3rd because while we have a reputation for cold weather, the impacts of a changing climate along with Lake Superior generally making cold air masses more temperate make this less concerning, though in the past MTU has canceled class for temperature and

With the steep slopes surrounding campus I think we're at risk for flooding and erosion.

Flooding and landslides have occurred before, and may happen again if heavy rainfall occurs. Hazardous materials incidents happen somewhat often, being that all fuel is transported by road in the Keweenaw. Several tankers have had accidents requiring larger Hazmat responses, which do not exist locally and must be brough in from elsewhere in the UP or in WI/the Lower Peninsula

Rain-on-snow events will increase runoff increasing the risk of flooding. These events happen because it will be warmer out therefore instead of snow it will rain. Climate change also causes extreme weather events so we could have more severe storms like in January that one week where we got 50+ inches of snow.

Re: Civil disturbance, I believe that it will be in the form of fringe groups purposefully invoking a reaction on campus to get media response, with subsequent lawsuits and other legal troubles.

Storms in the winter and the severe weather in end of summer and fall are the two biggest things that affect us here. Some flooding occurs but only due to the extreme weather.

We have experienced extreme heat on a limited basis but it will become more frequent. Few homes and apartments have air conditioning and local utilities may not have then reserve capacity to handle a sustained heat wave. Flooding is a major issue in specific areas and will likely get worse as the conditions than created the 2018 Father's Day flood.

Wildfire because it seems most likely of those listed to occur. Cyber threats because although the likelihood might be lower, the impact would be greater than some of the other threats to the function and safety of the university community. Civil disturbance because of likelihood of event (especially given the differences between the community and many on campus) and the disruption to the safety of university community - especially those underrepresented populations and given our remoteness.

The university has few buildings or little use to deal with extremely high temperatures. He can be extremely dangerous and the fact that there's no air conditioning or it's not used very much throughout the campus this concerning. Especially in the student housing buildings.

With the average snowfalls per year, especially from lake effect snow, we are more likely to have

issues with campus safety. If we were to have a larger storm 18+ inches, the Houghton community would likely go into "emergency personnel only" until roads are considered safe.
College campuses, as a whole, have a high likelihood of shootings and bomb threats. We have seen this during this academic year -- difference of opinions and mismanagement of emotions can lead to an unsafe environment. The close proximity of students provides a higher likelihood of spreading illness.

As a Technological School, Cyber is highest. Given the issues with foreign actors and uncontrolled illegal immigration the other 2 fall into place. The first 2 have also already happened.

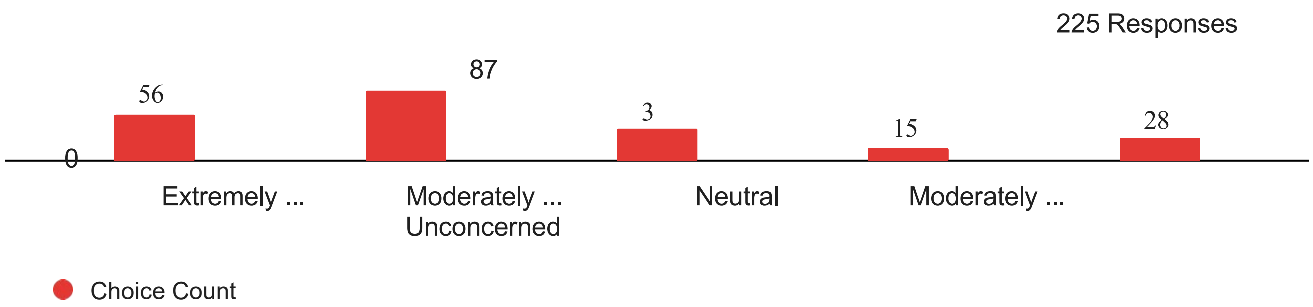
We live where severe winter conditions exist, therefore those risks are always present. Likely. The flooding part has proven to be a real issue at times, as a side effect of the winter snow. Last, we have had public epidemic experiences, largely caused by over-reacting. Hence, one can expect that people and governments will do irrational things without valid information.

Cyber threats worry me too, but I am prepared to live without the modern comforts, so I worry about it less.

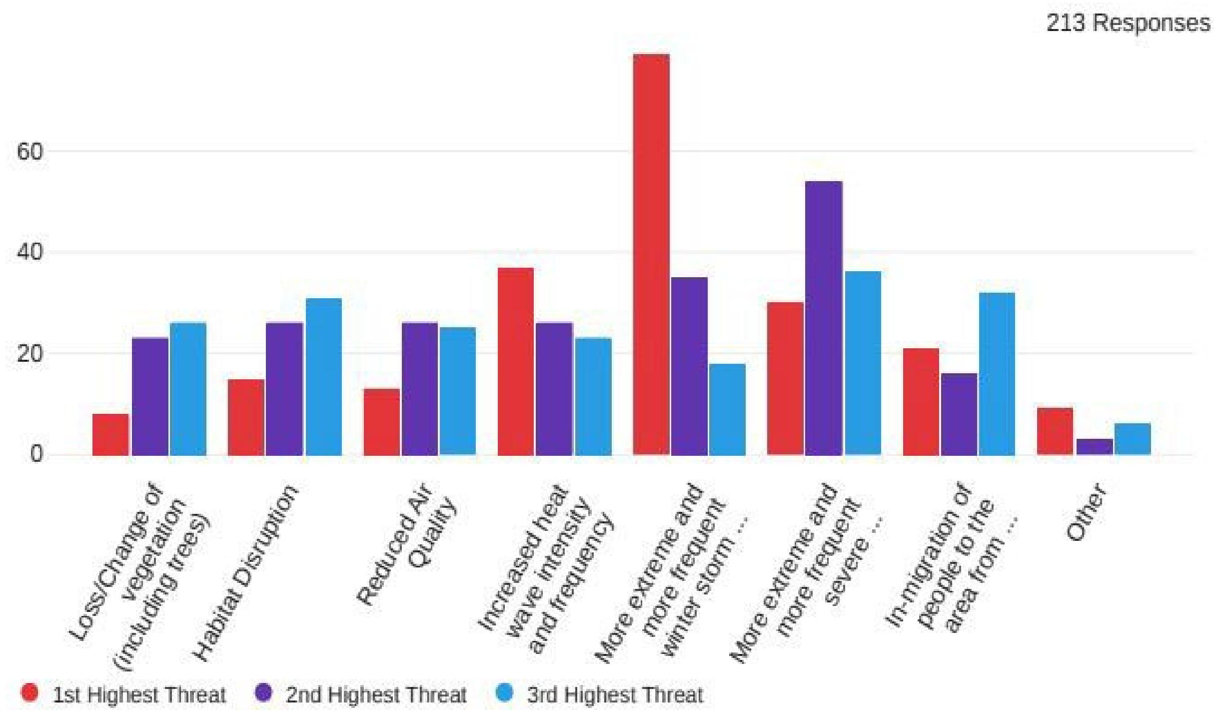
If we have a very dry year or two wildfires could easily become an issue in the forests that surround our area. Smoke from these wildfires could severely impact our area and campus.

Snowstorms are a fact of life for us, but with warming temperatures we could experience substantially more ice storms which could seriously impact us.

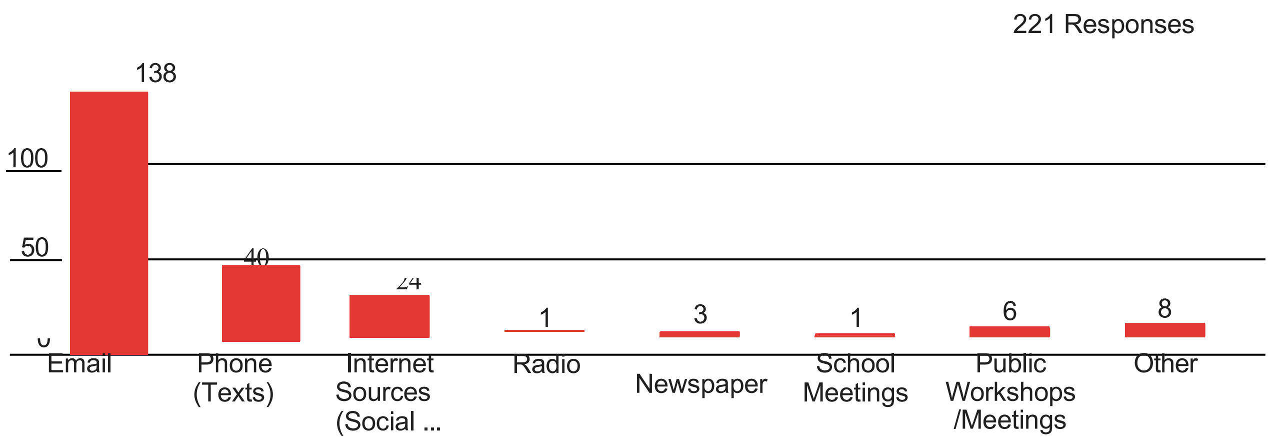
Q7. How concerned are you about the possibility of MTU being impacted by climate change?



Q8. Please rank the three climate change aspects you think have the highest threat toward the university.



Q11. What is the most effective way for you to receive information about initiatives to make the university more resistant to hazards?



Outreach from Previous Plans

Michigan Tech

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Tech Today

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May 10, 2019

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1. Instructors Needed for Summer Youth Programs
2. Public Notice: Updated Hazard Mitigation Plan
3. Career Services Annual Report
4. Faculty Handbook Rename
5. Geological Field Trip to Isle Royale, June 17-23
6. New Funding
7. In Print
8. Free Cybersecurity Summer Camps
9. Job Postings

Instructors Needed for Summer Youth Programs

by Center for Pre-College Outreach

Attention Michigan Tech faculty, staff, and undergrad/graduate students! If you have enthusiasm for a couple of subject areas, we have a great opportunity for you: Become a Summer Youth Program instructor or teaching assistant and deliver academic curriculum for several of our popular explorations!

Find out all the details—including dates and how to volunteer—**on our blog**.

1

Public Notice: Updated Hazard Mitigation Plan

by Facilities Administration and Planning

A draft of the 2019 updated Michigan Tech Multi-Hazard Mitigation Plan is available for inspection on the **facilities administration and planning website**. The original plan was developed in 2008 to protect the health and safety of the students, faculty, staff, and visitors. It also includes ways to minimize damage to property, research, and instruction. This plan will be submitted to the State of Michigan and FEMA for approval. The approved plan will be used as a comprehensive reference document for planning and mitigation activities.

1

To view the 2019 draft plan, visit the **facilities webpage**. The deadline for submitting comments is May 17 (Friday) and can be made **electronically** or by contacting Lori Weir at **llweir@mtu.edu**.

Career Services Annual Report

by Career Services

Career Services is excited to announce that its Annual Report is

PUBLIC NOTICE

A draft of the 2019 updated Michigan Tech Multi-Hazard Mitigation Plan is available for inspection on the Facilities Administration and Planning website. The 2019 draft plan can be viewed and commented on by visiting the Michigan Tech Facilities website at https://www.mtu.edu/facilities/ or by contacting Lori Weir, Director of Administrative Services & Projects at llweir@mtu.edu. Comments must be submitted by Friday, October 25.

The original Michigan Tech Hazard Mitigation Plan was developed in partnership with WUPPDR in 2008 with funding from Federal Emergency Management Agency (FEMA). Michigan Tech values the input and feedback from the community, and any feedback provided will be reviewed and addressed in this plan prior to final submittal to FEMA.

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Updated Hazard Mitigation Plan

by Facilities Administration and Planning

A draft of the 2019 updated Michigan Tech Multi-Hazard Mitigation Plan is available for inspection on the Facilities Administration and Planning website. The original plan was developed in 2008 to protect the health and safety of the students, faculty, staff and visitors to the University. It also includes ways to minimize damage to property, research, and instruction. We value the input and feedback from our campus community, and any feedback provided will be reviewed and addressed in this plan prior to final submittal to FEMA.

The final FEMA-approved plan will be adopted by the university and used as a comprehensive reference document for planning and mitigation activities. The 2019 draft plan can be viewed **online**. Comments can be submitted **here** or by contacting **Lori Weir**. Comments must be submitted by Friday, Oct. 25.

MichiganTech
TECH TODAY
February 14, 2006
Michigan Technological University Faculty/Staff Newsletter * Published Daily by University Marketing and Communications

News

Students Make The Today Show
Executive Secretary Mary Stevens was watching The Today Show Thursday when she saw some familiar faces. Anna Meyers and Amanda Leep, both Michigan Tech undergraduates in the Study Abroad Program, were being interviewed.

Reporter Al Roker was chatting with the audience in Turin, Italy, where NBC is covering the Olympics. In the crowd were Meyers, Leep and their map of the U.P., with a star by Houghton. Al Roker interviewed them, and TV 6 showed the segment later on the local evening news.

Michigan Tech Announces New Apparel Program
The University is offering a new apparel program to help employees show their Michigan Tech spirit on Husky Fridays. The program was originally proposed by UAW 5000 and was included in their contract this year. The University is expanding the benefit to allow faculty and professional staff, as well as UAW members, to receive one free item of Michigan Tech clothing from a select group and to purchase another item of equal or greater value at cost.

In addition, Michigan Tech AFSCME and POA members, who wear uniforms on the job, will be able to purchase two items at cost.

"We've always encouraged everyone who can to wear Michigan Tech apparel on Fridays in support of the Huskies," Vice President of Administration Ellen Horsch said. "This new program will make it easier for everyone to show their Michigan Tech spirit on Husky Fridays, at athletic events and out in the community."

The policy was developed by the Apparel Committee, including Celine Grace, Sharron Paris, Mary Peters, Beth Reed, Megan Ross and Sue Sergey. Its charge was to recommend to the Vice President for Administration a "Husky Day" Apparel Program specifically designed for (but not necessarily limited to) front-line employees at the University.

Letters will be sent to eligible employees announcing the apparel program.

You can choose from among several items, which are shown at http://www.bookstore.mtu.edu/michtech2/outerweb/apparelprogram.asp . To get your free and/or low-cost Michigan Tech clothing, visit either the Campus Store or University Images anytime this week, Monday-Friday, Feb. 13-17. Try on the sample items to make sure you receive the right size, and then place your order.

When the items are available for pickup, an announcement will be run in Tech Today.

Flags to be Lowered Feb. 15
Governor Jennifer M. Granholm ordered that flags throughout the state of Michigan be lowered Wednesday in honor of Army Corporal Walter B. Howard II of Rochester who died Feb. 2 while on active duty in Iraq. Flags should return to full-staff on Thursday.

Howard, 35, was killed when a bomb detonated near his M1 Abrams tank in Balad, Iraq. He was assigned to the Army's 1st Battalion, 8th Infantry Regiment, 3rd Brigade Combat Team, 4th Infantry Division, Fort Carson, Colo.

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TECH TODAY
Michigan Technological University Faculty/Staff Newsletter * Published Daily by University Marketing and Communications

Entertainment and Enrichment

Stir Up Your Mind with International Coffee Hour Thursday

The International Coffee Hour series continues Thursday with "Global Warming" from 3 to 5 p.m. in the Memorial Union Peninsula Room A. Coffee, tea, hot chocolate and **a** dessert will be served.

The International Coffee Hour is a series of open discussions on global topics led by students, faculty and staff. The upcoming topics this semester include Emerging Asian Markets, African and African-American Women in Art and lhe Impact of Westernization in Latin American.

The International Coffee Hour is sponsored by international Club, International Programs and Services, International House (McNair Hall) and Student Life.

"Goblet of Fire" Friday and Saturday

The film "Harry Potter and the Goblet of Fire" will be shown Friday and Saturday, at 5:30, 8:30 and 11:30 p.m., in Fisher 135.

Hany's fourth summer and the following year at Hogwarts are marked by the Quidditch World Cup and the Triwizard Tournament, in which student representatives from three wizarding schools compete in a series of increasingly challenging contests. However, Voldemort's Death Eaters are gaining influence and Hany may no longer be safe, even at Hogwarts.

This film is brought *to* you by the Film Board.

Seminars and Workshops

ME-EM Graduate Seminar Thursday

Associate Professor Miguel Levy (Physics and MSE) will present a gradute seminar, "Photonic Crystals and Magnetophotonic Crystals," Thursday at 3 p.m. in ME-EM 112.

ME-EM Faculty Candidate Presentation Friday

ME-EM faculty candidate Xiaoyi Wu will present "Experimental and Computational Biomaterials in Cardiovascular Tissue Engineering," Friday al 9 a.m. in ME-EM 403. Wu is a postdoctoral research fellow at Emory University's School of Medicine and the Georgia Institute of Technology.

Regular Features

On the Road

Assistant Professor Debra Charlesworth (Biomedical Engineering) gave an invited seminar, "Orthopedic Biomalerials: New Materials and Characterization Methods," to the Department of Biomedical Engineering in the Wake Forest University School of Medicine on Feb. 8.

Charlesworth and Associate Professor Michele Miller (ME-EM) participated in SF panel reviews of graduate research fellowship applications for the Engineering Directorate Feb. 10-12.

Proposals in Progress

Jaime Camelio (ME-EM), "Quality Performance Evaluation of Assembly Systems Using Process Health Monitoring Methods," SME Foundation

TECH TODAY

Michigan Technological University Faculty/Staff Newsletter * Published Daily by University Marketing and Communications

Roshan M. D'Souza (ME-EM), "Finite Element Analysis of Selective Volumetric Sintering (SVS) Using Microwaves," SME Foundation

Ranjit **Pati** (Physics), "Theoretical Study of Magnetic and Magneto-Transport Properties of 1-D Magnetic Barcode Nanowices," ACS PRF

David J. Flaspohler (SFRES/ESC), "Balanc.-ing Biomass Production and Biodiversity Conservation in Co-Managed Agroecosystems: A Systems Approach to Assessing Key Trade-Offs," USDA-CSREES

Eugenijus Umezius (Chemistry), "Bimetallic and Trimetallic Transition Metal Complexes and Their Redox Activity: Models for Polymetallic Assemblies," American Chemical Society-Petroleum Reseai:-ch Fund

Qiong (Jane) Zhang, Noel R. Urban and JudithPerlinger (CEE/SFI), "Improved Spatial-Multimedia Compartmental Model to Predict the Fate of Toxics in the Great Lakes Region," Great Lakes Commission

Judith Perlinger (CEE/RSI), "Measurement and Modeling of PBT Transport in Lake Superior," Great Lakes Commission

William Blumhardt (Facilities) and Jon Ahola (Public Safety), "MTU Pre-Disaster Mitigation Grant PDMC-PL-050MI02005-QJ," Michigan StatePolice

Terry McNinch (CEE/M'ITl), "RoadSoft 2006," Michigan Department of Transportation

Brad Baltensperger (Education), "Building Bridges: Professional Development for Mathematics Teachers," Dickinson-Iron lSD

Michael R. eu.man (Biomedical Engineering) "Detection of Chewing and Swallowing to Estimate Energy Patterns and Energy Intake: Subcontract to Michigan Tech," Clarkson University-Primary Sponsor. NCH

Richard Horuath (CEE/RSI), "NO and NO2 Measw-ements as Part of a Study of Ozone Photochemistry at Summit, Greenland," University of Colorado at Boulder

Sarah A. Green (Ch.emistry) and Judith Wells-Budd (GMES), "Determination of CO2 Flux from Lake Superior by Combining Remote Sensing with Field Measurements," NASA

Komar Kawatra (Chemical Engineering) "Studies of Dust Suppressant Performance: Why Do They Not Always Work?" Environmental Protection Agency

Valerie Pegg (UCE), "Community Connections-The Acting Company Presents Three Musketeers," Heartland Arts/Arts Midwest

Michigan Tech Receives FEMA Grant

For more information on this story contact:
Email Marcia Goodrich <mlgoodrimtu.edu>
Phone: 906/487-2343

Dec. 11, 2006--Michigan Tech has received $56,250 from the Federal Emergency Management Agency (FEMA) to create a multi-hazard mitigation plan as part of its Disaster Resistant University Program. The program helps universities plan ahead to reduce their vulnerability to natural, manmade and technological disasters.

Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce risk to life and property. In addition to reducing risk, the planning process helps universities form partnerships and build better relationships with the surrounding communities.

"We're looking forward to working with our partners as we develop the multi-hazard mitigation plan," said Jon Ahola, Michigan Tech's director of public safety. "We'll be looking at what preparations we have in place, fine-tuning and improving our existing plans, and investigating opportunities for more cooperation within the community."

Michigan Tech is working with the Western Upper Peninsula Planning and Regional Development Commission (WUPPDR) to develop the plan. WUPPDR helped create hazard mitigation plans for the surrounding counties in 2005. The university and the WUPPDR are each providing $9,375 toward the cost of the project.

An advisory committee of university staff and community members was formed in October to help guide the plan's progress and offer advice and feedback to WUPPDR.

A draft plan is due by October 2007, when the plan will be made available to the public for review and comment.

For more information, contact Ahola at 906-487-2024 orjwaholamtu.edu, or Meghan Pachmayer, assistant planner-WUPPDR, at 906-482-7205 or mepachmayercharterinternet.com.

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Published: Thursday, December 14, 2006

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Tech acquires funds, partners with WUPPDR

By KAVLA GAHAGAN, DMG Writer

HOUGHTON - Michigan Tech University has received a $56,250 grant to help plan ahead for disasters.

The grant came from the Federal Emergency Management Agency (FEMA) to create a multi-hazard mitigation plan as part of its Disaster Resistant University Program.

It's designed to help the university and community plan ahead for natural. manmade and technological disasters, said Meghan Pachmayer, Western Upper Peninsula Planning & Development Regional Commission (WUPPDR) assistant planner.

"It's not for response to disasters, but ... looking at specific actions can be done before a disaster happens, to reduce the risk in the event a disaster does happen," she said.

Michigan Tech is working with WUPPDR to develop the plan. WUPPDR helped create hazard mitigation plans for the surrounding counties in 2005. WUPPDR applied for the grant on behalf of the university and both are providing $9,375 toward the cost of the 18-month project.

Hazard mitigation is defined by WUPPDR as any action taken before, during or after a disaster to eliminate or reduce risk to life and property.

One general example of planning ahead, Pachmayer said, would be moving a bulldlng's contents to higher ground if it sits on low ground and has flooded in the past.

In addition to reducing risk, the planning process helps universities form partnerships and build better relationships **with** the surrounding communities.

"We're looking forward to working with our partners as we develop the multi-hazard mitigation plan," said Jon Ahola, Michigan Tech's director of public safety, in a Tech press release. "We'll be looking at what preparations we have in place, fine-tuning and improving our existing plans and investigating opportunities for more cooperation within the community."

Sites Of Interest

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Pachmayer said an advisory committee of university staff and community members was formed in October to review the plan and offer advice and feedback to WUPPDR, she added.

A draft plan is due by October 2007, when the plan will be made available to the public for review and comment.

It is planned to be returned to FEMA in February 2008.

Ahola said in a later interview that the money is a big help.

"It's very good," he said. "It helps us fine tune what we have in place already. The final outcome is to try to coordinate a better effort with the community. We could be a valuable resource for the community and vice versa."

Pachmayer agreed.

"The university brings a lot to the community and the community brings a lot to MTU," she said. "We want to focus on how to work together in the event of emergencies."

Kayla Gahagan can be reached at **kgahagan@mininggazette.com**

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Tech Alum Newsletter

December 18, 2006 (Vol. 13, No. 31)

TECH RECEIVES FEMA GRANT: Michigan Tech has received $56,250 from the Federal Emergency Management Agency (FEMA) to create a multi-hazard mitigation plan as part of its Disaster Resistant University Program. The program helps universities plan ahead to reduce their vulnerability to natural, manmade and technological disasters. Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce risk to life and property. In addition to reducing risk, the planning process helps universities form partnerships and build better relationships with the surrounding communities. "We're looking forward to working with our partners as we develop the multi-hazard mitigation plan," said Jon Ahola, Michigan Tech's director of Safety public safety. "We'll be looking at what preparations we have in place, fine-tuning and improving our existing plans, and investigating opportunities for more cooperation within the community."
More: <http://www.admin.mtu.edu/urel/news/media_relations/524/

PAGE 2

The Weste11y View

June UPEDA Meeting

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AFFIDAVIT OF PUBLICATION

IN THE MATTER OF PUBLIC NOTICE MICHIGAN TECH HAZARD MITIGATION PLAN

STATE OF MICHIGAN

COUNTY OF HOUGHTON SS

PUBLIC NOTICE
MICHIGAN TECH HAZARD MITIGATION PLAN

A draft of the Michigan Tech Multi-Hazard Mitigation Plan is available for inspection at the Western U.P. Planning & Development Region (WUPPDR) office located at 393 E. Lakeshore Drive, Houghton, between the hours of 8:00 AM to 4:30 PM. To view the plan or submit comments, contact Meg Pachmayer, Assistant Planner-WUPPDR at: mpachmayer@wuppdr.org or 906-482-7205, ext. 315. Comments must be submitted by Wednesday, October 8, 2008.

Michigan Tech received funding from the Federal Emergency Management Agency (FEMA) to create the plan under the Disaster Resistant University program, which helps universities plan ahead to reduce their vulnerability to natural, manmade and technological disasters.

Michigan Tech partnered with WUPPDR to create the plan under the guidance of an advisory committee composed of university staff and community members.

MichiganTech Michigan Technological University is an equal opportunity educational institution/equal opportunity employer.

YVONNE ROBILLARD

Being first duly sworn, says that he/she is the agent of the Publisher of The Daily Mining Gazette, a newspaper published in the English language for the dissemination of local or transmitted news and intelligence of a general character and legal news, which is a duly qualified newspaper, and that annexed hereto is a copy of a certain order taken from said newspaper in which the order was published on the following dates:

SEPTEMBER 15, 2008

Yvonne Robillard
Agent of the Publisher of the Daily Mining Gazette

Subscribed and sworn before me this 16th

Day of Sept A.D., 2008

Catherine O'Connell Ricci
Notary Public, Houghton County, Michigan

Acting in and for the County of Houghton Michigan

CATHERINE O'CONNELL RICCI
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MY COMMISSION EXPIRES Aug 10, 2011

TECH TODAY

Michigan Technological University Faculty/Staff Newsletter * Published Daily by University Marketing and Communications

Calendar Weather | Arts and Entertainment | Iob Postings | Previous Issue Next Issue

Printable Version (PDF)

October 1, 2008

News

1. Hazard Mitigation Plan Available at WUPPDR

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To view the plan or submit comments, contact Meg Pachmayer, assistant planner-WlJPPDR, at mpachrnpayer@wuppdr.org or 482-7205, ext. 315. Comment3 must be submitted by Wednesday, Oct 8.

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Michigan Tech partnered with WUPPDR to creale !be plan under t.he g11idance of an advisory committee composed of University staff and community members.

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2. Board of Control to Meet Thursday

Michigan Tech's Board of Control wilJ meet TI111rsday, Oct. 2, at 8:30 a.111. in the Memo1ial Union Ballroom.

Board of *Control* meetings are open to the public, and all members of the University community are welcome to attend.

3. New Tuto1·ials Launched on ID Standards Site

Now it's even easier lo download logos and add backgrounds to create PowerPoi.nt slides using Tech images.

Univenl'ily Marketing and Communications bas created haudy online Luloria1s for these and other problems, like unzipping ZIP tiles.

Just go to www.mtu.edu/idstandards/downloads/t11lorials/ for these lhrcc-miaule sessions. While you're there, you can check out the rest of the ID Standards site.

If you have any questions, email umc@mlu.edu .

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4. Tomorrow's Entrepreneurs Meet Today's Success Stories: Extreme Entrepreneur Tour Visits Tech

by Dennis Wafikainen, senior editor

Make spreadsheets easier to use for football coaches.

Tum yo-yoing into a successful online business.

Those were two examples of entrepreneurship shown to Michigan Tech students assembled iJ1 tbe Memorial Union Monday for the Extreme Entrepreneur Tom (EET), n success story iu its own right. The lour was brought onlo campus by the School of Business and Economics Center for Technological Innovation, Leadership and Entrepreneurship (CenTILE) and the Entrepreneurs and Inventors Club.

Appendix C: Priority Ranking Benchmarks

EVALUATION MEASURES & BENCHMARK FACTORS
HAZARD RANKINGS

Summary			
Historical Occurrence Excessive Occurrence	10 pts	Affected Areas Large Area	10 pts
High Occurrence Medium Occurrence Low Occurrence	7 pts 4 pts 1 pt	Small Area Multiple Sites Single Site	7 pts 4 pts 1 pt
Speed of Onset Minimal/No Warning	10 pts	Population Impact High Impact	10 pts
Less than 12 Hours 12-24 Hours Greater than 24 Hours	7 pts 4 pts 1 pt	Medium Impact Low Impact No Impact (none)	7 pts 4 pts 1 pt
Economic Effects Significant Effects	10 pts	Duration Long Duration	10 pts
Medium Effects Low Effects Minimal Effects	7 pts 4 pts 1 pt	Medium Duration Short Duration Minimal Duration	7 pts 4 pts 1 pt
Seasonal Pattern Year-round Occurrences	10 pts	Predictability Unpredictable	10 pts
Three Season Occurrences Two Season Occurrences One Season Occurrence	7 pts 4 pts 1 pt	Somewhat Predictable Predictable Highly Predictable	7 pts 4 pts 1 pt
Collateral Damage High Possibility	10 pts	Availability of Warnings Warnings Unavailable	10 pts
Good Possibility Some Possibility No Possibility	7 pts 4 pts 1 pt	Generally Not Available Sometimes Available Warnings Available	7 pts 4 pts 1 pt
Mitigative Potential Impossible to Mitigate	10 pts		
Difficult to Mitigate Possible to Mitigate Easy to Mitigate	7 pts 4 pts 1 pt		

EVALUATION MEASURES & BENCHMARK FACTORS
MITIGATION ACTION RANKINGS

Criteria Summary

Number of Goals Addressed Five Goals	5 pts	**Affected Areas** Campus-Wide	5 pts
Four Goals	4 pts	Several Buildings	4 pts
Three Goals	3 pts	Two Buildings	3 pts
Two Goals	2 pts	One Building	2 pts
One Goal	1 pt	Partial Building	1 pt
Number of Hazards Addressed All Hazards	5 pts	**Cost** <$25,000 or Staff Time	5 pts
Eight to Thirteen Hazards	4 pts	$25,001-$50,000	4 pts
Three to Seven Hazards	3 pts	$50,001-100,000	3 pts
Two Hazards	2 pts	$100,001-$500,000	2 pts
One Hazard	1 pt	$500,001<	1 pt
Life Safety Affected High	5 pts	**Urgency to Implement** Immediate	5 pts
Moderate to High	4 pts	1 Year	4 pts
Moderate	3 pts	2 to 3 Years	3 pts
Low to Moderate	2 pts	4 Years	2 pts
Low	1 pt	5 + Years	1 pt
Protection of Property High	5 pts		
Moderate to High Moderate Low to Moderate Low	4 pts 3 pts 2 pts 1 pt		

MITIGATION ACTION PRIORITY RANKINGS

Facilities-Based Projects

Priority Level	Proposed Mitigation Activity	Number of Goals Addressed	Number of Hazards Addressed	Life Safety Affected	Protection of Property	Affected Area	Cost	Urgency to Implement	TOTAL
1	Implement remote lockdown of all exterior doors on campus	3	2	5	3	5	1	3	22
2	Flood proofing of sensitive equipment or buildings having routine issues, as identified in the 2024 Critical Vulnerability Assessment.	4	2	1	4	4	2	4	21
3	Hardwire smoke detectors in Daniell Heights to alert Public Safety	2	2	5	3	2	2	4	20
4	Complete a CCTV inspection and hydrologic analysis and develop a campus stormwater master plan addressing stormwater flow and volume and action needed to be taken to improve and maintain the system.	3	3	1	3	4	2	4	20
5	Install fire suppression/sprinkler system - Daniell Heights	2	2	5	4	2	1	3	19
6	Install dry pump system for fire combat	2	2	3	4	3	4	1	19
7	Install fire suppression/sprinkler system - Chem-Sci	2	2	4	4	2	1	2	17
8	Install storm sewer outtakes and address other flooding issues in problem parking lots	2	1	1	4	4	2	3	17
9	Install fire suppression/sprinkler system - Admin Building	2	2	3	4	2	2	1	16
10	Install fire suppression/sprinkler system - Forestry Building	2	2	3	4	2	2	1	16
11	Cybersecurity: 24x7 Security Operations Center (SOC)	2	2	1	2	5	1	3	16
12	Install fire suppression/sprinkler system - Fisher Hall	2	2	3	4	2	1	1	16
13	Install fire suppression/sprinkler system - ME-EM Building	2	2	3	4	2	1	1	15

MITIGATION ACTION PRIORITY RANKINGS

Planning/Outreach-Based Projects

Priority Level	Proposed Mitigation Activity	Number of Goals Addressed	Number of Hazards Addressed	Life Safety Affected	Protection of Property	Affected Area	Cost	Urgency to Implement	TOTAL
1	Review and Revise the Multi-Hazard Mitigation Plan to reflect changes in development, progress in mitigation efforts, and changes in priorities annually. Resubmit to the State and FEMA every 5 years.	5	5	2	3	5	4	4	28
2	Integrate the Crisis Management Plan with Hazard Mitigation Plan	2	5	2	1	5	5	4	24
3	Develop University-wide business continuity plan	2	5	2	2	5	5	3	24
4	Creation of university/community Hazardous Materials Response Team	2	2	3	2	5	5	3	22
5	Continue to invest in Cybersecurity Tools and Technology	2	1	1	2	5	2	5	18
6	Implement the use of an enterprise-grade Security Information and Events Management (SIEM) tool	2	1	1	1	5	2	4	16
7	Complete an Invasive Species Assessment and Management Plan	3	1	1	3	1	3	3	15
8	Investigate securing and sealing telecommunication manholes on campus	2	1	1	3	3	3	2	15

Appendix D: Building Vulnerability Assessment

A full listing of university structures is listed below, including facilities on the Main Campus, Ford Center, Keweenaw Research Center, APRSC, Portage Lake Golf Club, and several holdings located outside of these areas of evaluation. The hazard profiles detailed in Section 6 of this plan help determine **where** hazards can affect the university, while the building inventory helps determine **what** could be afflicted.

Table D.1 - Michigan Tech Holdings Overview

Building #	Building Name	Location	Sq. Footage	Build Year
1	Administration Building	Main Campus	73,389	1969
2	Electrical Substation	Main Campus	786	1967
3	Michigan Tech Lakeshore Center	Main Campus	61,365	1991
4	ROTC Building	Main Campus	21,584	1904
5	Academic Offices Building	Main Campus	27,405	1908
6	Annex Building	Main Campus	10,956	1936
7	Electrical Energy Resources Center	Main Campus	162,140	1976
8	DOW Environmental Sciences & Engineering Building	Main Campus	184,180	1998
9	Alumni House	Main Campus	7,784	1916
10	Rozsa Performing Arts & Educ	Main Campus	80,000	2000
11	Walker - Arts & Humanities	Main Campus	87,094	1986
12	Minerals & Materials Engr Bldg	Main Campus	263,671	1955
13	Center for Diversity and Inclusion	Main Campus	4,259	1960
14	Grover C. Dillman Hall	Main Campus	90,959	1957
15	Fisher Hall	Main Campus	112,100	1964
16	Public Safety & Police Services Building	Main Campus	2,755	1955
17	J. Robert Van Pelt and John and Ruanne Opie Library	Main Campus	130,031	1966
18	U.J.Noblet Forestry Building	Main Campus	95,337	1967
19	Chemical Sciences & Engineering Building	Main Campus	162,500	1968
20	R. L. Smith (MEEM) Building	Main Campus	162,500	1971
24	Student Development Complex	Main Campus	343,393	1972
25	Kearly Stadium Press Box	Main Campus	4,416	2020
26	MTN Uplink Equipment Bldg	Main Campus	265	1991
28	Kanwal and Ann Rekhi Hall	Main Campus	51,439	2005

30	Little Huskies Child Care	Main Campus	4,600	2007
31	Douglass Houghton Hall	Main Campus	92,500	1938
32	Daniell Heights Apartments	Main Campus	220,700	1960
33	Daniell Heights Maintenance	Main Campus	1,152	1967
34	Memorial Union Building	Main Campus	92,935	1952
35	Daniell Heights Nursery	Main Campus	2,400	1964
36	21725 Woodland Road House	Main Campus	2,452	1950
37	Wadsworth Hall	Main Campus	300,239	1955
38	West McNair Hall	Main Campus	51,522	1966
39	McNair Hall Food Services	Main Campus	18,000	1966
40	East McNair Hall	Main Campus	71,300	1968
41	Central Energy Plant	Main Campus	12,780	1951
42	Facilities Management Storage	Main Campus	5,680	1942
44	Facilities Building	Main Campus	21,176	1952
45	Kettle-Gundlach House	Main Campus	5,620	1979
46	Tech Trails Waxing Center	Main Campus	4,536	1979
47	217 East Street House	Main Campus	3,191	1903
48	Hillside Place	Main Campus	77,926	2010
49	Property Storage	Main Campus	4,872	1981
50	Gates Tennis Center	Main Campus	29,610	1975
51	207 East Street House	Main Campus	2,972	1910
56	Daniell Heights Storage 56	Main Campus	1,261	2002
57	209 East Street House	Main Campus	2,891	1945
65	Daniell Heights Storage 65	Main Campus	3,200	2008
66	Tech Trails Timing Building	Main Campus	192	2005
67	Tech Trails Warming Building	Main Campus	280	2004
68	SDC Storage	Main Campus	1,800	2009
81	Power Generation Building	Main Campus	3,432	2006
82	21610 Woodland Road House	Main Campus	5,702	1961
84	Harold Meese Center	Main Campus	15,020	1973
88	DPSPS/EMS Building	Main Campus	1,000	1981
89	Tech Trails Maintenance	Main Campus	1,200	2001

90	Sands Pilot Plant	Main Campus	11,520	1975
92	Advanced Energy Research Building	Main Campus	4,128	1979
94	AMJOCH Observatory	Main Campus	433	1978
95	Advanced Technology Development Complex	Main Campus	27,380	2004
96	SDC Annex Building	Main Campus	2,786	1945
100	Great Lakes Research Center	Main Campus	54,778	2012
101	Tech Trails Storage	Main Campus	672	2009
103	A.E. Seaman Mineral Museum	Main Campus	9,000	2011
104	Mineral Museum Storage	Main Campus	2,200	2011
106	Sands Storage	Main Campus	576	2011
107	212 East Street House	Main Campus	2,630	1900
110	214 East Street House	Main Campus	2,756	1900
111	46645 US-41 House	Main Campus	5,721	
112	Facilities Storage	Main Campus	6,600	2015
113	Salt Storage Building	Main Campus	1,932	2018
114	H-STEM Engineering & Health Technologies Complex	Main Campus	64902	2024
115	Nara Family Maple Center	Main Campus	557	2022
118	Ambulance Garage	Main Campus	1055	2024
119	East Hall	Main Campus	125,039	2025
120	20688 Royce Road House	Main Campus		2024
52	PLGC Clubhouse	Portage Lake Golf Course	4,465	1985
58	PLGC Maintenance -1	Portage Lake Golf Course	3,276	1979
59	PLGC Maintenance -2	Portage Lake Golf Course	625	1995
60	PLGC Cart Storage -A	Portage Lake Golf Course	4,500	1986
61	PLGC Cart Storage - B	Portage Lake Golf Course	3,600	1995
62	PLGC Cart Storage -C	Portage Lake Golf Course	4,500	1996
63	PLGC Maintenance - 3	Portage Lake Golf Course	1,048	2010
64	PLGC Pump House	Portage Lake Golf Course	144	1989
53	Mont Ripley Ski Hill	Mont Ripley	2,100	2005
54	Mont Ripley Ski Chalet	Mont Ripley	4,600	1965
55	Mont Ripley Storage	Mont Ripley	4,080	1981
109	Mont Ripley Pump House	Mont Ripley	570	2000

69	KRC Engineering Design Center	Keweenaw Research Center	13,988	2010
70	KRC Scientific & Admin Offices	Keweenaw Research Center	10,037	1963
71	KRC Machine & Vehicle Shops	Keweenaw Research Center	4,000	1951
72	KRC Vehicle Service Bldg T3	Keweenaw Research Center	5,538	1951
73	KRC Vehicle Storage Bldg T4	Keweenaw Research Center	4,000	1951
74	KRC Engineering Laboratories	Keweenaw Research Center	4,610	1951
75	KRC Special Projects Facility	Keweenaw Research Center	1,000	1951
76	KRC Support Services Facility	Keweenaw Research Center	1,000	1951
77	KRC Water Truck Storage	Keweenaw Research Center	1,600	2007
78	KRC Eng Support Facil Bendix	Keweenaw Research Center	5,152	1990
79	KRC Chrysler Support Fac II	Keweenaw Research Center	4,000	2000
80	KRC Cold Storage Building	Keweenaw Research Center	4,000	2004
105	KRC Cold Chamber	Keweenaw Research Center	1,600	2011
108	KRC Inspection Pit	Keweenaw Research Center	416	2013
116	KRC Cold Room	Keweenaw Research Center	5,526	2023
117	KRC High Bay Building	Keweenaw Research Center	21,680	2025
121	KRC Engineering Support 4	Keweenaw Research Center	4,224	2000
201	FCF Hemlock Residence	Ford Center	1,326	1938
202	FCF Sassafras Residence	Ford Center	1,200	1938
203	FCF Elm Residence	Ford Center	1,348	1938
204	FCF Birdseye Residence	Ford Center	1,581	1938
205	FCF Spruce Residence	Ford Center	1,462	1938
206	FCF Tamarack Residence	Ford Center	1,779	1938
207	FCF Birch Residence	Ford Center	1,392	1938
208	FCF Basswood Residence	Ford Center	1,515	1938
209	FCF Cedar Residence	Ford Center	1,470	1938
210	FCF Beech Residence	Ford Center	1,269	1938
211	FCF Ash Residence	Ford Center	2,114	1938
212	FCF Balsam Residence	Ford Center	864	1938
213	FCF Pump House	Ford Center	1,070	1938
214	FCF Sawmill Museum	Ford Center	6,720	1936
215	FCF 8-Car Garage	Ford Center	1,872	1938

216	FCF Dorm 2	Ford Center	2,428	1937
217	FCF Classroom 1	Ford Center	2,480	1954
218	FCF Sauna Building	Ford Center	864	1938
219	FCF Classroom 2	Ford Center	1,125	1957
220	FCF Recreation	Ford Center	1,178	1957
221	FCF Computer Lab	Ford Center	1,487	1957
222	FCF Classroom 3	Ford Center	1,305	1957
223	FCF Dorm 1	Ford Center	11,250	1978
224	FCF Carriage House	Ford Center	2,501	1956
225	FCF Storage 3	Ford Center	255	1990
226	FCF Storage 2	Ford Center	2,320	1965
227	FCF Storage 1	Ford Center	260	1972
229	FCF Lumber Storage	Ford Center	2,520	1957
230	FCF 9-Car Garage	Ford Center	4,180	1975
231	FCF Maintenance	Ford Center	9,355	1971
233	FCF Main Office	Ford Center	3,273	1970
235	FCF Wellhouse	Ford Center	228	1989
236	FCF Reservoir Shelter	Ford Center	768	1969
102	Advanced Power Systems Research Center	APSRC	56,332	1999

Buildings are an important asset to the university and their vulnerability depends on several characteristics including size, age, building materials, and construction quality. Additional factors to take into consideration when considering vulnerability are building value, content value, historic value, occupancy levels, hazardous materials levels, and the level of critical need the building provides for university business continuity.

Identified Critical Facilities

Campus critical facilities are those facilities and services that the university depends on to maintain daily operations and are crucial to business continuity in the face of disaster. The Michigan Tech Disaster Resistant University Advisory Committee (DRUAC) grouped facilities and services in regard to the function they serve and their contribution to university operations. The following criteria were used to determine which facilities were deemed critical:

- Facilities essential to university wide operations (i.e. public safety, administrative, maintenance, etc.);
- Facilities designated (or that could be designated) as temporary shelters for displaced university community and/or Houghton County residents;
- Facilities that provide essential utilities or serve as communications nodes for buildings;
- Facilities that serve as repositories of critical documents or collections and those also containing unique records;
- Student and on-campus housing;
- High traffic, high occupancy buildings;
- Facilities housing research functions which by their nature would have a low level of tolerance for disruption;
- Instances where a facility would be cited under multiple criteria elements reinforced the critical nature of the facility.

The Michigan Tech DRUAC identified the university structures displayed in Table D.2 as critical facilities and grouped them into the following four categories:

- Group A: Administration, Emergency Operations, Communications
- Group B: Student Residences, High Occupancy Buildings
- Group C: Research Labs, Hazardous Materials, Collections
- Group D: Critical Support, Infrastructure Facilities

Table D.2: Critical Facilities Buildings

Group A: Administration, Emergency Operations, Communications	**Group B:** Student Residences, High Occupancy Buildings	**Group C:** Research Labs, Hazardous Materials, Collections	**Group D:** Critical Support and Infrastructure Facilities
1. Administration Building	1. Wadsworth Hall	1. Electrical Energy Resource Center (AE Seaman Mineral Museum)	1. Widmaier House (Public Safety)
2. Widmaier House (Public Safety)	2. McNair Hall (East & West)	2. Dow Building	2. Central Heating
3. Student Development Complex Center	3. Douglass Houghton Hall	3. Forestry Building	3. Electrical Energy Resource Center (Network Operations Center)

4. Gates Tennis Center	4. Daniell Heights Apartments	4. Minerals & Materials Engineering Building	4. Facilities Building
5. Electrical Energy Resource Center (Network Operations Center)	5. Fisher Hall	5. Civil-Geology Building (Dillman)	5. Oil Storage Tanks
	6. Memorial Union Building	6. Library Building (Archives/ Collections)	6. Electric Substation
	7. Rozsa Performing Arts Center	7. Chemical Sciences & Engineering	7. Minerals & Materials Engineering Building
	8. Walker Arts & Humanities	8. ME-EM Building	
		9. Advanced Technology Development Center	

Estimating Losses

The last step in performing the vulnerability assessment for Michigan Tech includes the estimation of the potential losses the university could face from a specific hazard event. Likely hazard scenarios were developed and the structure, content and function loss for vulnerable critical facilities were quantified.

Following the guidelines of Worksheet 7 of the FEMA 443 *Building a Disaster Resistant University* publication, Tables D.3 to D.8 display the potential loss estimates for the critical facilities as a result of the "high" risk hazards anticipated to potentially impact Michigan Tech University. The following assumptions were made in order to quantify the loss estimates and are based on available information regarding the impacts of past hazard events on Michigan Tech, the impacts of hazard events on similar facilities in other geographically nearby areas, and the current condition of critical infrastructure.

- Operational costs for each critical facility were calculated in terms of: a) the operational costs of the university, and b) the relative size of the facility to the overall size of facilities.
- Displacement costs were based on the following factors:
    - Due to the rural nature of the area, the availability of office space is limited; however, market price for the university in an area building suitable for university operations was estimated per square foot and included rent, furniture rental, and utilities.
    - The university has business interruption coverage which provides for loss of revenue if an event prevents the Performing Arts Center, Student Development

Complex, or other faculties to hold revenue collecting events. Therefore, these potential losses were not included in the displacement costs.

- Structural Fires: A fire can strike anywhere at any time: therefore, it is difficult to predict which campus facility a fire will affect. For the purpose of providing one example that quantifies losses from a Major Structural Fire Hazard, the Electrical Energy Resource Center (EERC) was selected. This building was selected based on its criticality to university operations and business continuation.
- Hazardous Materials Incidents: This type of incident can result in a fire, explosion, spill or release. Although difficult to quantify the losses of such a variable hazard, one possible example was provided. The M & M Building was selected as an example, based on the high levels of hazardous materials located in the building. The scenario assumes the incident involves an explosion and fire.

It was too difficult to determine monetary losses for all identified highest ranking hazards due to the numerous variables attached to each hazard. Narrative summaries of loss estimations for Infrastructure Failure & Secondary Technological Hazards, Sabotage/ Terrorism, and Public Health Emergencies are provided at the end of this section. Numerical monetary losses are presented for Major Structural Fires, Urban Flooding, and Hazardous Material Incident: Fixed Site Incident.

Table D.3: Part A of DRU Worksheet 7 for Major Structural Fire

	Structure Loss					Contents Loss				
Name /Description of Structure	Structure Replacement Value ($)	x	Percent Damage (%)	=	Loss to Structure ($)	Replacement Value of Contents ($)	x	Percent Damage (%)	=	Loss to Contents ($)
Main Campus (Houghton)										
Administration	8,662,664	x	0	=	0	9,572,821	x	0	=	0
EERC	25,577,733	x	40	=	10,231,093	15,698,739	x	40	=	6,279,496
Dow	43,143,813	x	0	=	0	9,587,514	x	0	=	0
Performing Arts Center	22,770,346	x	0	=	0	1,198,439	x	0	=	0
Walker Arts & Humanities	9,457,197	x	0	=	0	512,620	x	0	=	0
M & M	42,665,803	x	0	=	0	8,805,671	x	0	=	0
Dillman	9,650,950	x	0	=	0	2,881,129	x	0	=	0
Fisher Hall	15,573,743	x	0	=	0	6,032,669	x	0	=	0
Public Safety	74,101	x	0	=	0	24,248	x	0	=	0
Library	21,595,318	x	0	=	0	26,110,109	x	0	=	0
Forestry	18,163,829	x	0	=	0	2,751,380	x	0	=	0
Chem-Sci	23,562,929	x	0	=	0	8,446,690	x	0	=	0
ME-EM	24,762,167	x	0	=	0	8,511,269	x	0	=	0
SDC	35,965,901	x	0	=	0	2,801,454	x	0	=	0
Rekhi Hall	15,271,260	x	0	=	0	3,079,343	x	0	=	0
DHH Dorm	13,975,786	x	0	=	0	187,074	x	0	=	0
Daniell Heights Apartments	19,531,710	x	0	=	0	179,913	x	0	=	0
Memorial Union Building	8,994,648		0		0	458,387		0		0
Wadsworth Hall Dorm	45,808,789	x	0	=	0	1,619,072	x	0	=	0
West McNair Dorm	5,417,588	x	0	=	0	27,040	x	0	=	0
East McNair Dorm	8,533,094	x	0	=	0	60,673	x	0	=	0
Central Heating	14,766,531	x	0	=	0	57,759	x	0	=	0
Facilities	2,358,377	x	0	=	0	1,782,882	x	0	=	0
Gates Tennis Center	1,887,765	x	0	=	0	16,944	x	0	=	0
ATDC	3,421,492	x	0	=	0	3,421,492	x	0	=	0
Oil Storage Facility	2,220,611	x	0	=	0	n/a	x	0	=	0
Total Loss to Structure					**10,231,093**	**Total Loss to Contents**				**6,279,496**

If the EERC Building caught fire and the Network Operations Center became damaged due either to the fire or to water damage from the sprinkler system, the university would most likely close until the Network Operations Center (or some alternative) became operable, which could take several days. The daily cost of university closure has been added to the totals from Table D.3 and D.4 for three days (assuming that the fire would occur on a business day).

Table D.4: Part B of DRU Worksheet 7 for Major Structural Fire

Name /Description of Structure	**Structure Use and Function Loss**								
	Average Daily Operating Budget ($)	x	Functional Downtime (# of Days)	+	Displacement Cost per Day ($)	x	Displacement Time in days ($)	=	Structure Use & Function Loss ($)
Main Campus (Houghton)									
Administration	$9,442	x	0	+	$2,844	x	0	=	0
EERC	$21,545	x	5	+	$6,338	x	30	=	$297,865
Dow	$22,092	x	0	+	$6,680	x	0	=	0
Performing Arts Center	$12,783	x	0	+	$3,096	x	0	=	0
Walker Arts & Humanities	$13,819	x	0	+	$3,324	x	0	=	0
M & M	$28,373	x	0	+	$8,688	x	0	=	0
Dillman	$11,454	x	0	+	$3,452	x	0	=	0
Fisher Hall	$13,905	x	0	+	$4,484	x	0	=	0
Public Safety	$479	x	0	+	$93	x	0	=	0
Library	$21,066	x	0	+	$5,201	x	0	=	0
Forestry	$11,416	x	0	+	$3,813	x	0	=	0
Chem-Sci	$20,925	x	0	+	$6,500	x	0	=	0
ME-EM	$20,392	x	0	+	$6,500	x	0	=	0
SDC	$49,716	x	0	+	$9,400	x	0	=	0
Rekhi Hall	$6,888	x	0	+	$2,828	x	0	=	0
DHH Dorm	$18,181	x	0	+	$3,700	x	0	=	0
Daniell Heights Apartments	$47,450	x	0	+	$8,828	x	0	=	0
Memorial Union Building	$12,949	x	0	+	$3,240	x	0	=	0
Wadsworth Hall Dorm	$53,927	x	0	+	$12,010	x	0	=	0
West McNair Dorm	$10,546	x	0	+	$2,880	x	0	=	0
East McNair Dorm	$9,943	x	0	+	$2,852	x	0	=	0
Central Heating	$2,636	x	0	+	$476	x	0	=	0
Facilities Building	$3,910	x	0	+	$744	x	0	=	0
Gates Tennis Center	$5,841	x	0	+	$1184	x	0	=	0
ATDC	$4,527	x	0	+	$960	x	0	=	0
Oil Storage Facility	-	x	0	+	-	x	0	=	0
Loss to Structure Use & Function									**$297,865**

Daily Operating Costs	x	University Closure in Days	Cost	
$700,000	x	3	$2,100,000	**$2,100,000**
TOTAL Loss to Structure Use & Function				**$2,397,865**

Structure Loss + Content Loss + Function Loss = Total Potential Loss for Hazard			
$10,231,0193	**$6,279,496**	**$2,397,865**	**$18,908,454**

URBAN FLOODING

Table D.5: Part A of DRU Worksheet 7 for Urban Flooding Hazard

Name /Description of Structure	**Structure Loss**					**Contents Loss**				
	Structure Replacement Value ($)	x	Percent Damage (%)	=	Loss to Structure ($)	Replacement Value of Contents ($)	x	Percent Damage (%)	=	Loss to Contents ($)
Main Campus (Houghton)										
Administration	8,662,664	x	2	=	173,253	9,572,821	x	3	=	287,185
EERC	25,577,733	x	2	=	511,555	15,698,739	x	10	=	1,569,874
Dow	43,143,813	x	0	=	0	9,587,514	x	0	=	0
Performing Arts Center	22,770,346	x	3	=	683,110	1,198,439	x	1	=	11,984
Walker Arts & Humanities	9,457,197	x	2	=	189,144	512,620	x	1	=	5,126
M & M	42,665,803	x	0	=	0	8,805,671	x	0	=	0
Dillman	9,650,950	x	0	=	0	2,881,129	x	0	=	0
Fisher Hall	15,573,743	x	0	=	0	6,032,669	x	0	=	0
Public Safety	74,101	x	0	=	0	24,248	x	0	=	0
Library	21,595,318	x	0	=	0	26,110,109	x	0	=	0
Forestry	18,163,829	x	0	=	0	2,751,380	x	0	=	0
Chem-Sci	23,562,929	x	0	=	0	8,446,690	x	0	=	0
ME-EM	24,762,167	x	0	=	0	8,511,269	x	0	=	0
SDC	35,965,901	x	0	=	0	2,801,454	x	0	=	0
Rekhi Hall	15,271,260	x	0	=	0	3,079,343	x	0	=	0
DHH Dorm	13,975,786	x	0	=	0	187,074	x	0	=	0
Daniell Heights Apartments	19,531,710	x	0	=	0	179,913	x	0	=	0
Memorial Union Building	8,994,648		0		0	458,387		0		0
Wadsworth Hall Dorm	45,808,789	x	0	=	0	1,619,072	x	0	=	0
West McNair Dorm	5,417,588	x	0	=	0	27,040	x	0	=	0
East McNair Dorm	8,533,094	x	0	=	0	60,673	x	0	=	0
Central Heating	14,766,531	x	0	=	0	57,759	x	0	=	0
Facilities	2,358,377	x	0	=	0	1,782,882	x	0	=	0
Gates Tennis Center	1,887,765	x	0	=	0	16,944	x	0	=	0
ATDC	3,421,492	x	0	=	0	3,421,492	x	0	=	0
Oil Storage Facility	2,220,611	x	0	=	0	n/a	x	0	=	0
Total Loss to Structure					**$1,557,062**	**Total Loss to Content**				**$1,874,169**

Table D.6: Part B of DRU Worksheet 7 for Urban Flooding Hazard

Name /Description of Structure	**Structure Use and Function Loss**								
	Average Daily Operating Budget ($)	x	Functional Downtime (# of Days)	+	Displacement Cost per Day ($)	x	Displacement Time in days($)	=	Structure Use & Function Loss ($)
Main Campus (Houghton)									
Administration	$9,442	x	2	+	$2,844	x	5	=	$33,104
EERC	$21,545	x	5	+	$6,338	x	10	=	$171,105
Dow	$22,092	x	0	+	$6,680	x	0	=	0
Performing Arts Center	$12,783	x	5	+	$3,096	x	10	=	$94,875
Walker Arts & Humanities	$13,819	x	5	+	$3,324	x	10	=	$102,335
M & M	$28,373	x	0	+	$8,688	x	0	=	0
Dillman	$11,454	x	0	+	$3,452	x	0	=	0
Fisher Hall	$13,905	x	0	+	$4,484	x	0	=	0
Public Safety	$479	x	0	+	$93	x	0	=	0
Library	$21,066	x	0	+	$5,201	x	0	=	0
Forestry	$11,416	x	0	+	$3,813	x	0	=	0
Chem-Sci	$20,925	x	0	+	$6,500	x	0	=	0
ME-EM	$20,392	x	0	+	$6,500	x	0	=	0
SDC	$49,716	x	0	+	$9,400	x	0	=	0
Rekhi Hall	$6,888	x	0	+	$2,828	x	0	=	0
DHH Dorm	$18,181	x	0	+	$3,700	x	0	=	0
Daniell Heights Apartments	$47,450	x	0	+	$8,828	x	0	=	0
Memorial Union Building	$12,949	x	0	+	$3,240	x	0	=	0
Wadsworth Hall Dorm	$53,927		0		$12,010		0		0
West McNair Dorm	$10,546	x	0	+	$2,880	x	0	=	0
East McNair Dorm	$9,943	x	0	+	$2,852	x	0	=	0
Central Heating	$2,636	x	0	+	$476	x	0	=	0
Facilities Building	$3,910	x	0	+	$744	x	0	=	0
Gates Tennis Center	$5,841	x	0	+	$1,184	x	0	=	0
ATDC	$4,527	x	0	+	$960	x	0	=	0
Oil Storage Facility	n/a	x	0	+	-	x	0	=	0
Total Loss to Structure Use & Function									**$401,419**

Structure Loss + Content Loss + Function Loss = Total Potential Loss for Hazard			
$1,557,062	**$1,874,169**	**$401,419**	**$3,832,650**

HAZARDOUS MATERIALS: FIXED SITE INCIDENT

Table D.7: Part A of DRU worksheet 7 for Hazardous Materials: Fixed Site Incident

Name /Description of Structure	**Structure Loss**					**Contents Loss**				
	Structure Replacement Value ($)	x	Percent Damage (%)	=	Loss to Structure ($)	Replacement Value of Contents ($)	x	Percent Damage (%)	=	Loss to Contents ($)
Main Campus (Houghton)										
Administration	8,662,664	x	0	=	0	9,572,821	x	0	=	0
EERC	25,577,733	x	0	=	0	15,698,739	x	0	=	0
Dow	43,143,813	x	0	=	0	9,587,514	x	0	=	0
Performing Arts Center	22,770,346	x	0	=	0	1,198,439	x	0	=	0
Walker Arts & Humanities	9,457,197	x	0	=	0	512,620	x	0	=	0
M & M	42,665,803	x	30	=	12,799,741	8,805,671	x	30	=	2,641,701
Dillman	9,650,950	x	0	=	0	2,881,129	x	0	=	0
Fisher Hall	15,573,743	x	0	=	0	6,032,669	x	0	=	0
Public Safety	74,101	x	0	=	0	24,248	x	0	=	0
Library	21,595,318	x	0	=	0	26,110,109	x	0	=	0
Forestry	18,163,829	x	0	=	0	2,751,380	x	0	=	0
Chem-Sci	23,562,929	x	0	=	0	8,446,690	x	0	=	0
ME-EM	24,762,167	x	0	=	0	8,511,269	x	0	=	0
SDC	35,965,901	x	0	=	0	2,801,454	x	0	=	0
Rekhi Hall	15,271,260	x	0	=	0	3,079,343	x	0	=	0
DHH Dorm	13,975,786	x	0	=	0	187,074	x	0	=	0
Daniell Heights Apartments	19,531,710	x	0	=	0	179,913	x	0	=	0
Memorial Union Building	8,994,648	x	0	=	0	458,387	x	0	=	0
Wadsworth Hall Dorm	45,808,789	x	0	=	0	1,619,072	x	0	=	0
West McNair Dorm	5,417,588	x	0	=	0	27,040	x	0	=	0
East McNair Dorm	8,533,094	x	0	=	0	60,673	x	0	=	0
Central Heating	14,766,531	x	0	=	0	57,759	x	0	=	0
Facilities	2,358,377	x	0	=	0	1,782,882	x	0	=	0
Gates Tennis Center	1,887,765	x	0	=	0	16,944	x	0	=	0
ATDC	3,421,492	x	0	=	0	3,421,492	x	0	=	0
Oil Storage Facility	2,220,611	x	0	=	0	n/a	x	0	=	0
TOTAL Loss to Structure					**12,799,741**	**Total Loss to Contents**				**2,641,701**

Table D.8: Part B of DRU worksheet 7 for Hazardous Materials: Fixed Site Incident

Name /Description of Structure	Structure Use and Function Loss								
	Average Daily Operating Budget ($)	x	Functional Downtime (# of Days)	+	Displacement Cost per Day ($)	x	Displacement Time ($)	=	Structure Use & Function Loss ($)
Main Campus (Houghton)									
Administration	$9,442	x	0	+	$2,844	x	0	=	0
EERC	$21,545	x	0	+	$6,338	x	0	=	0
Dow	$22,092	x	0	+	$6,680	x	0	=	0
Performing Arts Center	$12,783	x	0	+	$3,096	x	0	=	0
Walker Arts & Humanities	$13,819	x	0	+	$3,324	x	0	=	0
M & M	$28,373	x	5	+	$8,688	x	10	=	$228,745
Dillman	$11,454	x	0	+	$3,452	x	0	=	0
Fisher Hall	$13,905	x	0	+	$4,484	x	0	=	0
Public Safety	$479	x	0	+	$93	x	0	=	0
Library	$21,066	x	0	+	$5,201	x	0	=	0
Forestry	$11,416	x	0	+	$3,813	x	0	=	0
Chem-Sci	$20,925	x	0	+	$6,500	x	0	=	0
ME-EM	$20,392	x	0	+	$6,500	x	0	=	0
SDC	$49,716	x	0	+	$9,400	x	0	=	0
Rekhi Hall	$6,888	x	0	+	$2,828	x	0	=	0
DHH Dorm	$18,181	x	0	+	$3,700	x	0	=	0
Daniell Heights Apartments	$47,450	x	0	+	$8,828	x	0	=	0
Memorial Union Building	$12,949	x	0	+	$3,240	x	0	=	0
Wadsworth Hall Dorm	$53,927	x	0	+	$12,010	x	0	=	0
West McNair Dorm	$10,546	x	0	+	$2,880	x	0	=	0
East McNair Dorm	$9,943	x	0	+	$2,852	x	0	=	0
Central Heating	$2,636	x	0	+	$476	x	0	=	0
Facilities Building	$3,910	x	0	+	$744	x	0	=	0
Gates Tennis Center	$5,841	x	0	+	$1184	x	0	=	0
ATDC	$4,527	x	0	+	$960	x	0	=	0
Oil Storage Facility	n/a	x	0	+	-	x	0	=	0
Total Loss to Structure Use & Function									**$228,745**

Structure Loss + Content Loss + Function Loss = Total Potential Loss for Hazard			
$12,799,741	**$12,799,741**	**$12,799,741**	**$12,799,741**

INFRASTRUCTURE FAILURE & SECONDARY TECHNOLOGICAL HAZARDS

An infrastructure failure could include a variety of incidents ranging from power outages, water loss, and communication loss to a central heating failure as explored in Section 5, *Hazard Identification & Risk Analysis*. Due to the broad nature of this type of event, it is difficult to quantify the monetary impact that would occur. However, loss estimates for this hazard would be based on lost operating costs at $810,000 per day, if the failure necessitated university closure.

SABOTAGE/TERRORISM

This type of hazard could affect any part of the university at any given time of day, any day of the year. The losses from this type of hazard are difficult to quantify as the type of sabotage event could range from a bomb explosion, fire, water or food contamination, to a school shooting. Additionally, losses depend on the type of event (to determine the extent of potential damages) and which part of the university could be impacted. There are too many variables to appropriately estimate and quantify losses. In light of recent nation-wide events, the threat of these types of incidents persists. Losses could include lives, safety, research, structures, property, reputation, and interrupted university operations.

PUBLIC HEALTH EMERGENCIES

It is highly unlikely that a Public Health Emergency would damage the physical components of the university. Calculations for Parts A & B of the DRU worksheet were not performed due to the unique nature of this event and the difficulty in quantifying the losses of structure, content and function. However, loss estimates for this hazard would be based on costs due to closure at $810,000 per day. It is understood that additional costs to be considered include the cost of sending students to their respective homes if such a need was realized

2024 Building Vulnerability Assessment

The following 93-page report was provided by OHM Consultants based on their assessment of Michigan Technological University facilities, hazards, and vulnerabilities. Parts of the report have been redacted for reasons pertaining to campus security and safety.

Michigan Technological University

Facility Hazard Assessments

Prepared by OHM Advisors

Executive Summary

This document summarizes the findings of the hazard assessments that were performed in the spring of 2024 by OHM Advisors with the assistance of MTU staff. Assessments were performed on all University buildings that are regularly occupied and aren't scheduled to be replaced in the near future. This includes buildings on the Main Campus, the Keweenaw Research Center, the Alberta Ford Center, Mont Ripley Ski Hill, and the Portage Lake Golf Course.

The goal of the assessments was to identify vulnerabilities in the building designs that could pose a health and or safety risk to users in the event of a natural disaster. This included visual inspections of the building's structure, egress paths, fire suppression, electrical, and mechanical systems. Deferred maintenance items were not captured in the reports.

Michigan Technological University Hazard Assessment

A.E. Seaman Mineral Museum

Year Constructed: 2011

Main Campus

Assessed on: 05/02/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	CMU, Concrete, Steel
• Building Exterior	Yes	CMU
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	
• Elevator(s)	No	
• Roof Drains	Yes	
• Sprinkler System	Yes	
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	
• Mass Notification	Yes	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- None

Michigan Technological University Hazard Assessment

Academic Offices Building
Year Constructed: 1908
Main Campus
Assessed on: 04/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	Single ply PVC - info provided by building maintenance employee
• Building Egress Paths	Yes	Multiple exits and stairwells
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Partially ventilated, steam heat, upper floor cooling
• Elevator(s)	Yes	One Freight Elevator
• Roof Drains	Yes	
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Administration Building (Admin)
Year Constructed: 1969
Main Campus
Assessed on: 04/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	EPDM – Info provided by building maintenance employee
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Steam heat, selective DX cooling, air handler/ exhaust fan ventilation, hot water storage tank domestic service
• Elevator(s)	Yes	
• Roof Drains	Yes	No emergency drains
• Sprinkler System	No	Standpipes
Electrical		
• Generator	Yes	Natural Gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

[redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Advanced Technology Development Complex (ATDC)

Year Constructed: 2004

Main Campus

Assessed on: 05/02/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry, Metal Paneling
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, Condenser, Boilers, Water Heater
• Elevator(s)	No	Single Level
• Roof Drains	Yes	
• Sprinkler System	Yes	Entire Building has Sprinkler System
Electrical		
• Generator	Yes	Backed by Campus Wide Diesel Generators
• Fire Alarm	Yes	EST3
• Security/Access Control	Yes	Has Access Control and Security Cameras
• Mass Notification	Yes	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- None

Assessed by:	Riley McKay, Peyton Larson

Michigan Technological University Hazard Assessment

Advanced Power Systems Research Center (BLDG 102)
Year Constructed: 1999
Keweenaw Research Center
Assessed on: 5/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	CMU, Masonry Veneer, Metal Paneling
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits, stairways
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, unit heaters, furnaces, exhaust fans, radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Yes	
Electrical		
• Generator	Yes	Natural Gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	Receptionist/RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]
- [redacted]
- [redacted]

Assessed by:	Allison Haataja, Justin Moyle, Peyton Larson, Treven Pennala, Lance Meyette

Michigan Technological University Hazard Assessment

Alternative Energy Research Building
Year Constructed: 1979
Hancock, MI

Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple exits, stairwells.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU, Gas Furnace, Water Heater
• Elevator(s)	No	No Elevator or Lift present
• Roof Drains	No	Sloped Shingled Roof – No drains needed
• Sprinkler System	Yes	Entire Building has Sprinkler System
Electrical		
• Generator	No	No Emergency Generator
• Fire Alarm	Yes	EST FireShield
• Security/Access Control	Yes	No Security Cameras, Has Access Control
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- None

Assessed by:	Riley McKay, Peyton Larson, Treven Pennala

Michigan Technological University Hazard Assessment

Alumni House
Year Constructed: 1916
Main Campus
Assessed on: 04/17/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry and Wood
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple exits, interior stairwell, and walkout basement
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Boiler, AHU, Water Heater
• Elevator(s)	No	
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Annex Building
Year Constructed: 1936
Main Campus
Assessed on: 04/17/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Steel, Concrete
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits, 1 stairwell, and steel exterior fire escape stairway
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU – 2nd floor service.
• Elevator(s)	No	
• Roof Drains	Yes	
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Central Energy Plant
Year Constructed: 1951
Main Campus
Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer/Metal Paneling
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits and stairwells
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	4 Steam Boilers that serve entire campus (1950-1970)
• Elevator(s)	No	
• Roof Drains	Yes	
• Sprinkler System	No	No Sprinkler System
Electrical		
• Generator	Yes	Diesel Generators, located in adjacent building #81
• Fire Alarm	Yes	EST 3
• Security/Access Control	Yes	No security cameras identified, some access control
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]
- [redacted]

Assessed by:	Riley McKay, Peyton Larson

Michigan Technological University Hazard Assessment

Chemical Sciences & Engineering Building (Chem-sci)
Year Constructed: 1968
Main Campus
Assessed on: 04/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	EPDM - replaced in last few years.
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, radiation, hot water storage tanks
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Partial	
Electrical		
• Generator	Yes	Natural Gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]
- [redacted]

Assessed by: Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Daniell Heights Apartments
Year Constructed: 1960
Main Campus
Assessed on: 06/17/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Wood
• Building Exterior	Yes	Masonry Veneer, Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple exits, stairwells
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	One Boiler & BoilerMate Storage Tank per Building
• Elevator(s)	No	No Elevator Access to Second Floor Units
• Roof Drains	Yes	Gutter Systems
• Sprinkler System	Yes	Only Upper Heights in Laundry Rooms
Electrical		
• Generator	No	
• Fire Alarm	No	Smoke Detectors & Strobes. No Main Fire Panels.
• Security/Access Control	Yes	Exterior Security Cameras, Access Control
• Mass Notification	Yes	
• Lighting System	Yes	LED
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]
- [redacted].

Assessed by:	Riley McKay, Peyton Larson

Michigan Technological University Hazard Assessment

Douglass Houghton Hall
Year Constructed: 1938
Main Campus
Assessed on: 07/29/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel, Clay tile
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	Asphalt Shingle & Copper - in rough condition
• Building Egress Paths	Yes	Multiple stairwells and exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, Water Heaters, Heat Pump
• Elevator(s)	Yes	Has one freight elevator
• Roof Drains	Yes	Sloped Roof & PVC over kitchen
• Sprinkler System	Yes	Entire Building Sprinklered
Electrical		
• Generator	Yes	Exterior backup generator for building lights
• Fire Alarm	Yes	
• Security/Access Control	Yes	Keycard access. Security cameras.
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	Exit signage and emergency lighting
• Main Electrical Service	Yes	
• IT Server Room	Yes	Various equipment in lounge areas

Hazards Identified

- [redacted]

Assessed by: Peyton Larson

Michigan Technological University Hazard Assessment

DOW Environmental Sciences & Engineering Building
Year Constructed: 1998
Main Campus
Assessed on: 04/17/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer, Curtain Wall
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators. Walkout basement floor.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Chillers, Radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	No Emergency Drains
• Sprinkler System	Yes	Mechanical rooms equipped
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]
- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

East McNair Hall
Year Constructed: 1968
Main Campus
Assessed on: 07/25/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, Radiation, Storage Tank, Water Heater
• Elevator(s)	Yes	2 Elevators
• Roof Drains	Yes	
• Sprinkler System	Yes	Sprinklers, fire extinguishers, standpipes
Electrical		
• Generator	No	Campus wide generator to power lights
• Fire Alarm	Yes	
• Security/Access Control	Yes	Some security cameras, RFID keycard
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Peyton Larson

Michigan Technological University Hazard Assessment

Electrical Energy Resources Center (EERC)
Year Constructed: 1974
Main Campus
Assessed on: 03/13/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU, Storage Tank, Louvers, Water Heater, Basement sumps
• Elevator(s)	Yes	Recently rebuilt
• Roof Drains	Yes	If the main roof drains plug, no secondary drains, so the water will flow into louvers and doors.
• Sprinkler System	Yes	
Electrical		
• Generator	Yes	Two; 1 for IT server room, 1 for an elevator and some lighting, natural gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Jared Hyrkas, Riley McKay, Peyton Larson, Allison Haataja, Justin Moyle

Michigan Technological University Hazard Assessment Report

Facilities Building
Year Constructed: 1952
Main Campus
Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	Single Ply PVC
• Building Egress Paths	Yes	Multiple exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU, Unit Heaters, Condensing Unit, Fin Tube
• Elevator(s)	No	Single Level
• Roof Drains	Yes	No secondary/emergency drains
• Sprinkler System	No	No sprinkler system
Electrical		
• Generator	Yes	
• Fire Alarm	No	Not identified in walkthrough
• Security/Access Control	Yes	
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]
- [redacted]

Assessed by:	Riley McKay, Peyton Larson

Michigan Technological University Hazard Assessment

8-Car Garage (Building 15)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Timber on Concrete Piers, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	No water, no heat
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	No	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

8-Car Garage (Building 30)
Year Constructed: 1975
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Ash Residence (Building 11)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits, Basement bedrooms have larger windows for egress.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Balsam Residence (Building 12)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Basswood Residence (Building 8)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified
- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Beech Residence (Building 10)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Michigan Technological University Hazard Assessment

Birch Residence (Building 7)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Birdseye Residence (Building 4)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Carriage House (Building 24)
Year Constructed: 1956
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Masonry, Wood/ Timber Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Cedar Residence (Building 9)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Michigan Technological University Hazard Assessment

Classroom 1 (Building 17)
Year Constructed: 1954
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Stone/Masonry, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted].

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Classroom 2 (Building 19)
Year Constructed: 1957
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Classroom 3 (Building 22)
Year Constructed: 1957
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by: Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Computer Lab (Building 21)
Year Constructed: 1957
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- None.

Michigan Technological University Hazard Assessment

Dorm 1 (Building 23)
Year Constructed: 1978
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Boilers, hot water storage tank, exhaust fans
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	Yes	Propane
• Fire Alarm	Yes	Faraday brand control panel
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Dorm 2 (Building 16)
Year Constructed: 1937
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Stone/Masonry, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Metal Panel
• Building Egress Paths	Yes	Multiple Exits, Direct egress from basement via cellar doors
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Elm Residence (Building 3)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Michigan Technological University Hazard Assessment

Hemlock Residence (Building 1)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Stone, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Lumber Storage (Building 29)
Year Constructed: 1957
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Garage Half – Slab on Grade, Masonry, Wood Framed Lumber Storage Half – Timber on CMU Piers
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Garage Half – Single Ply EPDM Roof Lumber Storage Half – Tin
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Main Office (Building 33)
Year Constructed: 1970
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Boiler, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Maintenance (Building 31)
Year Constructed: 1971
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Masonry
• Building Exterior	Yes	Masonry, Wood Gables
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Wood Boiler, Oil furnace, exhaust fans
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent
• Emergency Lighting & Exit Signs	Yes	Emergency lighting
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Pump House (Building 13)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, on demand water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Recreation (Building 20)
Year Constructed: 1957
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Reservoir Shelter (Building 34)
Year Constructed: 1969
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Propane Unit Heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	Fire Extinguisher
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted].

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Sassafras Residence (Building 2)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Stone, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by: Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Sauna Building (Building 18)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Stone, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, Water Heater, Sauna Stove
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted].

Michigan Technological University Hazard Assessment

Sawmill (Building 14)
Year Constructed: 1936
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood/Timber Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Metal Panel
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	No water, no heat, large chimney in good condition
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	No	Not identified, not sure where it's fed from
• IT Server Room	No	

Hazards Identified

- [redacted].

Michigan Technological University Hazard Assessment

Spruce Residence (Building 5)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	CMU, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Storage 1 (Building 27)
Year Constructed: 1972
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	No	
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	No	
• IT Server Room	No	

Hazards Identified

- None

Michigan Technological University Hazard Assessment

Storage 2 (Building 26)
Year Constructed: 1965
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Masonry, Wood Framed
• Building Exterior	Yes	Wood Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Storage 3 (Building 25)
Year Constructed: 1990
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Masonry
• Building Exterior	Yes	Masonry
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	No	
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	No	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Tamarack Residence (Building 6)
Year Constructed: 1938
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Paths of Egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified
- None.

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Wellhouse (Building 35)
Year Constructed: 1989
Ford Center and Forest
Assessed on: 05/22/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Masonry
• Building Exterior	Yes	Masonry/Stucco
• Building Roof	Yes	Asphalt Shingle/Aluminum Eaves
• Building Egress Paths	Yes	
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Unit heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Fire Extinguisher
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None

Michigan Technological University Facility Assessment

Fisher Hall
Year Constructed: 1964
Main Campus
Assessed on: 04/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer, Curtain Wall
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's (Original), RTU's, Chiller, Condensers
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	No	No sprinkler system
Electrical		
• Generator	Yes	
• Fire Alarm	Yes	EST3
• Security/Access Control	Yes	
• Mass Notification	Yes	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted].

Assessed by:	Peyton Larson, Riley McKay

Michigan Technological University Hazard Assessment

Gates Tennis Center

Year Constructed: 1975

Main Campus

Assessed on: 05/02/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer, Metal Paneling
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Boilers (Gas), AHU's
• Elevator(s)	No	Single Level
• Roof Drains	Yes	Drains on flat section of roof
• Sprinkler System	No	No Sprinkler system
Electrical		
• Generator	Yes	Backed by Campus Wide Diesel Generators
• Fire Alarm	Yes	Panel is Original to Building. 4 Pull Stations
• Security/Access Control	Yes	Access Control
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Riley McKay, Peyton Larson

Michigan Technological University Hazard Assessment

Great Lakes Research Center
Year Constructed: 2012
Main Campus
Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer, Metal Panel, Curtain Wall
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators. Exterior stairwell for direct egress from second floor.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Chillers, AHU's
• Elevator(s)	Yes	
• Roof Drains	Yes	Pooling around Overflow Drains
• Sprinkler System	Yes	Entire Building has Sprinkler System
Electrical		
• Generator	Yes	Multiple Generac Generators
• Fire Alarm	Yes	EST3
• Security/Access Control	Yes	Security Cameras and Access Control
• Mass Notification	Yes	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- None.

Assessed by:	Riley McKay, Peyton Larson, Treven Pennala

Michigan Technological University Hazard Assessment

Grover C. Dillman Hall
Year Constructed: 1957
Main Campus
Assessed on: 04/17/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer, Curtain Wall
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	No	
Electrical		
• Generator	Yes	Small, emergency lights only per building mechanic
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by: Justin Moyle, Peyton Larson

Michigan Technological University Facility Assessment Report

Harold Meese Center
Year Constructed: 1973
Main Campus
Assessed on: 04/17/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	EIFS
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits, stairwells, and one elevator
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	RTUs, MUA, Radiation, Boilers
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Yes	
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	LED, Incandescent
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Michigan Technological University Hazard Assessment

Hillside Place – Student Apartment Building
Year Constructed: 2010
Main Campus
Assessed on: 03/21/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel
• Building Exterior	Yes	Masonry Veneer, Metal Siding
• Building Roof	Yes	PVC, Standing Seam
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU, Storage Tank, Water Heater, Basement sumps
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Yes	
Electrical		
• Generator	Yes	Natural gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID keycard
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Riley McKay, Peyton Larson, Allison Haataja, Justin Moyle

Michigan Technological University Hazard Assessment

J. Robert Van Pelt and John and Ruanne Opie Library
Year Constructed: 1966
Main Campus
Assessed on: 04/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Concrete, curtainwall
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits, stairs, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, Chiller
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Yes	Fully Sprinklered – Fireproofed
Electrical		
• Generator	Yes	
• Fire Alarm	Yes	EST3
• Security/Access Control	Yes	
• Mass Notification	Yes	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by: Peyton Larson, Riley McKay

Michigan Technological University Facility Assessment

Kanwal and Ann Rekhi Hall (Rekhi)
Year Constructed: 2005
Main Campus
Assessed on: 04/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Block Masonry, Steel Panels
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, Condensers
• Elevator(s)	Yes	ThyssenKrupp
• Roof Drains	Yes	
• Sprinkler System	Yes	Fully Sprinklered – Fireproofed
Electrical		
• Generator	Yes	
• Fire Alarm	Yes	EST3
• Security/Access Control	Yes	Access Control & Good Camera Coverage
• Mass Notification	Yes	
• Lighting System	Yes	LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by: Peyton Larson, Riley McKay

memorandum

Date: June 4, 2024
To: Gregg Richards
cc: Peyton Larson, Jared Hyrkas, Michael Lehman
From: Alice Roache, P.E.
Re: Rekhi Hall – Structural Assessment Summary

On March 19th, OHM Advisors (OHM) received an email from Michigan Technological University (MTU) with regards to a large crack located on campus in Rekhi Hall. The concern was initially brought to the attention of Michigan Tech Facilities by way of a student recognizing the potential hazard and notifying the schoo[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Alice L Roache

[redacted]

[redacted]

[redacted]

Michigan Technological University Hazard Assessment

Kettle-Gundlach House
(Sustainability House)
Year Constructed: 1954
Main Campus
Assessed on: 05/02/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Wood, Steel, Concrete
• Building Exterior	Yes	Masonry Veneer, Panelboard
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits and stairs
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Boiler, Water Heater
• Elevator(s)	No	
• Roof Drains	Yes	
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	Smoke Detectors
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	Original to Building
• IT Server Room	No	

Hazards Identified

- [redacted]

[redacted]	Riley McKay, Peyton Larson

Michigan Technological University Hazard Assessment

KRC Chrysler Support Facility II (BLDG 79)
Year Constructed: 2000
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, PEMB
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater, unit heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Incandescent, Florescent
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Allison Haataja, Justin Moyle, Peyton Larson, Treven Pennala, Lance Meyette

Michigan Technological University Hazard Assessment

KRC Cold Storage Building (BLDG 80)
Year Constructed: 2004
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Pre-Engineered Metal Building
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Unit Heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	Multiple Fire Extinguishers
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Michigan Technological University Hazard Assessment

KRC Eng Support Facility Bendix (BLDG 78)
Year Constructed: 1990
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on grade, Pre Engineered Metal Building
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple exits, but only 1 from breakroom
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnace, water heater, unit heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

[redacted]

Michigan Technological University Hazard Assessment

KRC Engineering Design Center (BLDG 69)
Year Constructed: 2010
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry, Metal Paneling
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits, stairwells.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU, water heater, radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Yes	
Electrical		
• Generator	Yes	Natural Gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	Receptionist / RFID keycard
• Mass Notification	Yes	
• Lighting System	Yes	LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	Building has the backup server room for the main Campus.

Hazards Identified

- [redacted]

Assessed by:	Allison Haataja, Justin Moyle, Peyton Larson, Treven Pennala, Lance Meyette

Michigan Technological University Hazard Assessment

KRC Engineering Laboratories (BLDG 74)
Year Constructed: 1951
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Pre-Engineered Metal Building
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	Unit heaters, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Allison Haataja, Justin Moyle, Peyton Larson, Treven Pennala, Lance Meyette

Michigan Technological University Hazard Assessment

KRC Machine & Vehicle Shops (BLDG 71)
Year Constructed: 1951
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Wood Foundations Suspected, Steel Framed
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Unit heater, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Allison Haataja, Justin Moyle, Peyton Larson, Treven Pennala, Lance Meyette

Michigan Technological University Hazard Assessment

KRC Scientific & Admin Offices (BLDG 70)
Year Constructed: 1963
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on grade, Wood framed, Prefab Trailer on CMU
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Unit Heaters, furnaces, boiler, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID keycard
• Mass Notification	No	
• Lighting System	Yes	Incandescent, fluorescent
• Emergency Lighting & Exit Signs	No	Improper exit signage
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Michigan Technological University Hazard Assessment

KRC Vehicle Service Building T3 (BLDG 72)
Year Constructed: 1951
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Steel Framed. Addition is wood framed on CMU foundation.
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Unit heaters, water heater
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	Yes	RFID keycard
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Michigan Technological University Hazard Assessment

KRC Vehicle Storage Building T4 (BLDG 73)
Year Constructed: 1951
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Wood Substructure, Steel Framed Superstructure
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	No	Unheated, no domestic
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Allison Haataja, Justin Moyle, Peyton Larson, Treven Pennala, Lance Meyette

Michigan Technological University Hazard Assessment

KRC Water Truck Storage (BLDG 77)
Year Constructed: 2007
Keweenaw Research Center
Assessed on: 05/16/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Slab on Grade, Wood Framed
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	Metal Paneling
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Unit heater, pumps
• Elevator(s)	No	
• Roof Drains	No	Sloped Roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Incandescent
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Allison Haataja, Justin Moyle, Peyton Larson, Treven Pennala, Lance Meyette

Michigan Technological University Hazard Assessment

Michigan Tech Lakeshore Center
Year Constructed: 1991
City of Houghton
Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer/ EIFS
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits, stairwells, 1 elevator. Has exterior walkway that provides direct egress from second floor.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Water Heaters, Chiller, ERV, Heat Pumps, Humidifier
• Elevator(s)	Yes	OTIS
• Roof Drains	Yes	
• Sprinkler System	Yes	Entire Building & Fireproofed
Electrical		
• Generator	Yes	Two 450 KW Generators
• Fire Alarm	Yes	EST 3
• Security/Access Control	Yes	Interior/Exterior Cameras, Access Control
• Mass Notification	Yes	
• Lighting System	Yes	LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	Air Conditioned

Hazards Identified

- [redacted]

Assessed by:	Riley McKay, Peyton Larson, Treven Pennala

Michigan Technological University Hazard Assessment

McNair Hall Food Services
Year Constructed: 1966
Main Campus
Assessed on: 07/25/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple Exits and Stairwells
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU, Water Heater
• Elevator(s)	Yes	Only has a freight elevator
• Roof Drains	Yes	
• Sprinkler System	Yes	
Electrical		
• Generator	Yes	Has a dedicated exterior generator
• Fire Alarm	Yes	
• Security/Access Control	Yes	Some security cameras
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- None.

Assessed by:	Peyton Larson

OHM Advancing Communities®

Michigan Technological University Hazard Assessment

Memorial Union Building
Year Constructed: 1952
Main Campus
Assessed on: 04/17/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple exits and stairwells
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Radiation, hot water storage tanks
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Yes	Mechanical Rooms
Electrical		
• Generator	Yes	Natural gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Minerals & Materials Engineering Building
Year Constructed: 1989
Main Campus
Assessed on: 04/25/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete & Steel
• Building Exterior	Yes	Masonry Veneer & Concrete
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple stairwells and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Chillers, Radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	No Emergency Drains
• Sprinkler System	Yes	Mechanical Rooms Equipped
Electrical		
• Generator	Yes	Natural gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	Partial, not all signs lit
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]
- [redacted]
- [redacted]
- [redacted]

Assessed by:	Justin Moyle, Allison Haataja

Michigan Technological University Hazard Assessment

Mont Ripley Ski Chalet
Year Constructed: 1965
Ripley, MI
Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood framed
• Building Exterior	Yes	Vinyl Siding
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple exits and one stairwell
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Water Heater, Unit Heaters
• Elevator(s)	No	No Elevator or Lift present
• Roof Drains	No	Sloped Shingled Roof – No Drains
• Sprinkler System	No	No Sprinkler System
Electrical		
• Generator	No	No Emergency Generator
• Fire Alarm	Yes	Only Strobe Located in Kitchen
• Security/Access Control	Yes	Security System for Ski Rental Equipment
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	Older Laminated signs on lower level
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Riley McKay, Peyton Larson, Treven Pennala

Michigan Technological University Hazard Assessment

Mont Ripley Ski Warmup
Year Constructed: 2005
Ripley, MI
Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood framed
• Building Exterior	Yes	Wood Paneling
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Unit Heaters, Fireplace, No Water Service
• Elevator(s)	No	Single Level
• Roof Drains	No	Sloped Shingled Roof
• Sprinkler System	No	No Water Service to Building
Electrical		
• Generator	Yes	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Riley McKay, Peyton Larson, Treven Pennala

Michigan Technological University Hazard Assessment

Portage Lake Golf Course Club House
Year Constructed: 1985
Houghton, MI
Assessed on: 05/02/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Wood, Concrete
• Building Exterior	Yes	Wood Paneling, Stone Veneer
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	Multiple Exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Well, Water Heater, Furnace, Exhaust fans
• Elevator(s)	No	Single Level
• Roof Drains	Yes	Gutter System
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	Yes	Siren to warn golfers of inclement weather.
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	Does not have dedicated space – Located on ground in office.

Hazards Identified

- None.

Assessed by:	Riley McKay, Peyton Larson

Michigan Technological University Hazard Assessment

Power Generation Building
Year Constructed: 2006
Main Campus
Assessed on: 05/08/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Metal Paneling
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Louvers, Unit Heaters, Exhaust Fans
• Elevator(s)	N/A	One Level
• Roof Drains	No	Sloped EPDM Roof
• Sprinkler System	Yes	Entire Building
Electrical		
• Generator	Yes	4 Diesel Caterpillar Generators, 2,250 kw output each
• Fire Alarm	Yes	EST 3
• Security/Access Control	Yes	Poor Security Camera Coverage
• Mass Notification	No	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- None.

Assessed by:	Riley McKay, Peyton Larson, Treven Pennala

Michigan Technological University Facility Assessment

R.L. Smith MEEM
Year Constructed: 1971
Main Campus
Assessed on: 04/03/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	EPDM, replaced in 2024
• Building Egress Paths	Yes	Multiple exits, stairwells, and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's, hot water storage tanks, radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	No emergency drains
• Sprinkler System	Partial	
Electrical		
• Generator	Yes	Natural gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

ROTC Building
Year Constructed: 1904
Main Campus
Assessed on: 04/03/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Wood Framed
• Building Exterior	Yes	Masonry Veneer/ EIFS
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	1 Stairwell. Exterior fire escape from second floor.
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Steam heat, gas water heater domestic service
• Elevator(s)	No	
• Roof Drains	No	Pitched Roof
• Sprinkler System	Yes	
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	Partial
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Rozsa Center for the Performing Arts
Year Constructed: 2000
Main Campus
Assessed on: 04/25/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete & Steel
• Building Exterior	Yes	Metal Paneling, Curtain Wall & Masonry
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple stairwells and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Chillers, Radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	No Emergency Drains
• Sprinkler System	Yes	Partially Sprinklered
Electrical		
• Generator	Yes	Natural Gas
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Allison Haataja

Michigan Technological University Hazard Assessment

Sands Pilot Plant
Year Constructed: 1975
Houghton, MI
Assessed on: 07/12/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Steel Structure
• Building Exterior	Yes	Metal Panel
• Building Roof	Yes	Metal Panel
• Building Egress Paths	Yes	Multiple paths of egress
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Furnaces, Exhaust fans, Electric water heater, unit heater
• Elevator(s)	No	
• Roof Drains	No	
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	Yes	Smoke Alarms
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University y Hazard Assessment

SDC Annex Building
Year Constructed: 1945
Main Campus
Assessed on: 07/12/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Wood Framed Roof
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	Asphalt Shingle
• Building Egress Paths	Yes	1 Stairwell. Multiple Doors
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	Floor drains
• Elevator(s)	No	
• Roof Drains	No	Pitched roof
• Sprinkler System	No	
Electrical		
• Generator	No	
• Fire Alarm	No	
• Security/Access Control	No	
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent
• Emergency Lighting & Exit Signs	No	
• Main Electrical Service	Yes	Residential style overhead service & meter
• IT Server Room	No	

Hazards Identified

- [redacted]

Assessed by:	Justin Moyle, Peyton Larson

Michigan Technological University Hazard Assessment

Student Development Complex (SDC)
Year Constructed: 1972
Main Campus
Assessed on: 05/02/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Steel, Concrete
• Building Exterior	Yes	Masonry Veneer, EIFS
• Building Roof	Yes	PVC/ EPDM & Cobblestone
• Building Egress Paths	Yes	Multiple Exits, Stairwells, & Elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHU's
• Elevator(s)	Yes	OTIS
• Roof Drains	Yes	
• Sprinkler System	Yes	Fully Sprinklered – Fireproofed
Electrical		
• Generator	Yes	Two Emergency Generators (1970 & 1975)
• Fire Alarm	Yes	EST3
• Security/Access Control	Yes	Access Control & Good Camera Coverage
• Mass Notification	Yes	
• Lighting System	Yes	
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	Original to Building
• IT Server Room	Yes	Air Conditioned

Hazards Identified

- [redacted]

Assessed by: Peyton Larson, Riley McKay

memorandum

Date: May 23, 2024
To: Gregg Richards
cc: Peyton Larson, Jared Hyrkas, Michael Lehman
From: Alice Roache, P.E.
Re: Student Development Complex – Structural Assessment Summary

On May 2nd, 2024, OHM Advisors (OHM) conducted a site visit at the Student Development Complex (SDC) as part of a campus-wide facility assessment for the ongoing Vulnerability Analysis that's part of updating the Multi-Hazard Mitigation Plan. During this site visit four structural hazards were identified as needing additional investigation by a structural engineer in order to determine the magnitude of each hazard. [redacted]

[redacted]

[redacted]

- [redacted]

[redacted]

OHM Advisors
424 HANCOCK STREET
HANCOCK, MICHIGAN 49930
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OHM-Advisors.com

Memorandum
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[redacted]

[redacted]

[redacted] Alice L Roache
[redacted]

Michigan Technological University Hazard Assessment

U.J. Noblet Forestry Building
Year Constructed: 1967/2000
Main Campus
Assessed on: 04/25/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel & Wood
• Building Exterior	Yes	Concrete, Wood Siding & Window Wall
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple stairwells, elevators, and ramps
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Radiation, DX cooling
• Elevator(s)	Yes	
• Roof Drains	Yes	
• Sprinkler System	Yes	Partially Sprinklered
Electrical		
• Generator	Yes	
• Fire Alarm	Yes	
• Security/Access Control	Yes	RFID Keycard
• Mass Notification	Yes	
• Lighting System	Yes	LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

[redacted] [redacted]

Michigan Technological University
Hazard Assessment

Wadsworth Hall
Year Constructed: 1955
Main Campus
Assessed on: 07/29/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	EPDM
• Building Egress Paths	Yes	Multiple elevators, stairwells, and exits
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, RTU's, PRVs, Condensers
• Elevator(s)	Yes	Multiple passenger elevators. Freight elevator.
• Roof Drains	Yes	
• Sprinkler System	Yes	Fully sprinklered, fire extinguishers, stairwell standpipes
Electrical		
• Generator	Yes	For elevators, emergency lighting, & walk in cooler
• Fire Alarm	Yes	
• Security/Access Control	Yes	Security cameras
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by: Peyton Larson

Michigan Technological University Hazard Assessment

Walker Arts and Humanities Center
Year Constructed: 1959
Main Campus
Assessed on: 04/25/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Masonry, Concrete, & Steel
• Building Exterior	Yes	Masonry Veneer & EIFS
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple stairwells and elevators
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Hot water storage tank, radiation
• Elevator(s)	Yes	
• Roof Drains	Yes	No Emergency Drains
• Sprinkler System	Yes	
Electrical		
• Generator	Yes	Connected to Rozsa Generator
• Fire Alarm	Yes	
• Security/Access Control	Yes	
• Mass Notification	Yes	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by: Justin Moyle, Allison Haataja

Michigan Technological University :y Hazard Assessment

West McNair Hall
Year Constructed: 1966
Main Campus
Assessed on: 07/25/2024

Component Assessed	Component Identified	Component Type / Comments
Structural/Architectural		
• Building Structure	Yes	Concrete, Masonry, Steel
• Building Exterior	Yes	Masonry Veneer
• Building Roof	Yes	PVC
• Building Egress Paths	Yes	Multiple Exits and Stairwells
Plumbing/Mechanical		
• Plumbing/Mechanical Systems	Yes	AHUs, Radiation, Water Heater
• Elevator(s)	No	
• Roof Drains	Yes	
• Sprinkler System	Yes	Sprinklers, fire extinguishers, and standpipes
Electrical		
• Generator	No	
• Fire Alarm	Yes	
• Security/Access Control	Yes	Some security cameras, RFID Keycard
• Mass Notification	No	
• Lighting System	Yes	Fluorescent, incandescent, LED
• Emergency Lighting & Exit Signs	Yes	
• Main Electrical Service	Yes	
• IT Server Room	Yes	

Hazards Identified

- [redacted]

Assessed by:	Peyton Larson

Stormwater Assessment Potential Problem Areas

Michigan Tech contracted with OHM Advisors in January 2024 to conduct a stormwater assessment of the drainage across the Main Campus. As part of this assessment, OHM provided the following list of potential problem areas. They also provided a proposed action plan to properly assess the University's stormwater system in order to improve and better maintain the systems as our campus grows.

Michigan Tech Stormwater Assessment Potential Problem Areas

1

Area 1 – Administration Building Visitor Parking Lot

1. Area has been addressed with other projects.

Area 2 – Academic Office Building

1. It appears that water is running toward the building from the southeast. Is there anything in place to divert this water away from the building?

Area 3 – Northwest Shoreline

1. It appears that water is running toward the buildings and fuel storage tanks from the south. Is there anything in place to divert this water away from the building?

Area 4 – Parking Lots Behind Wadsworth Hall

1. Are there pipes and structures there that are not shown on the map?
2. Storm Sewer design is unclear, how is this area draining?

Proposed Stormwater Assessment Plan

MTU - Proposed Stormwater Assessment Plan

The following list of tasks are a recommendation outlining the steps necessary to properly assess the Michigan Tech University stormwater system and create an action plan to improve and maintain the system. The anticipated costs for performing these steps are listed at the end of the document.

Task 1 – Asset Inventory Survey

Under this task Michigan Tech University along with OHM Advisors will obtain locations and gather any existing information about catch basins, culverts, manholes, and other system appurtenances. Specific work efforts include:

1. The University will assist their consultant in locating storm sewer appurtenances during or prior to data collection of storm sewer infrastructure.
2. We already know the locations of 481 catch basins, 117 culverts, and 219 manholes. The locations of any other stormwater appurtenance will need to be surveyed.
3. The University will meet with their consultant to review original construction plans to assist in locating existing structures and identify problem areas. During this time, they will also determine size and material of as many pipes as possible.
4. The consultant will process survey and create a GIS plan of the system. This will include obtaining an aerial of the storm water districts and overlaying surveyed information on the aerial.
5. The University will review the plan and provide comments to the consultant.
6. The final information collected will be provided to the University so they can incorporate it into their overall GIS database.
7. The University's consultant will prepare a list of assets for use in the Condition Assessment, Criticality of Assets, and Revenue Structure. The plan will be finalized based on comments from the University.

Task 2 – CCTV Inspection

Under this task, the consultant will assess the storm sewer system through cleaning and televising pipes and manholes. The CCTV inspection will be to NASSCO PACP/MACP requirements and by PACP/MACP certified personnel. This information will be used as part of the information used in the condition assessment task (Task 3). Specific work efforts include:

1. There are approximately 634 manholes and catch basins in the University's storm water system and inspection has not been performed on any of them. A MACP certified

contractor will be contracted with to inspect manholes utilizing MACP technology and certified MACP personnel. Once the inspection is completed, the MACP coding will be processed to determine manhole condition and manholes that are structurally deficient. The results will then be used as part of the condition assessment. Based on the codes and review of inspection video, alternative rehabilitation methods will be listed along with the associated cost estimate for each.

2. Most of the University's storm sewer collection system has never been inspected. Therefore, a certified PACP contractor will be contracted with to perform the CCTV inspection and cleaning for the entire system. It is estimated that this will include almost 70,000 lineal feet of storm sewer, 13,500 feet of underdrain, and about 5,600 feet of culverts. Once the inspection is completed, the PACP coding will be processed to determine storm sewers with excessive failure designation contributing to structural deficiencies. The results will then be used as part of the condition assessment. Based on the codes and review of inspection video, alternative rehabilitation methods will be listed along with the associated cost estimate for each.

Task 3 – Condition Assessment

Under this task, the consultant will estimate the condition based on input from the University, field investigation, and industry data. Specific work efforts include:

1. Using the created Storm Asset Plan, the consultant will meet with the University to identify existing original pipe/structures and replacement year for pipe/structures that have been replaced.
2. The consultant will estimate replacement costs based on recent bid tabulations for similar projects in the area, industry standards, and other available information.

Task 4 – Hydrologic Analysis

Hydrologic data will obtained from EGLE for the watersheds with a drainage area greater than 2 square miles if there are any of that size on the campus. For smaller watersheds/sub-watersheds, hydrologic computations will be performed in HEC-HMS or SWMM to obtain 2, 10, and 100-year recurrence interval event flow rates. We will divide the campus into drainage areas with several sub-districts for each to properly analyze individual systems. Specific work efforts include:

1. The consultant will delineate each watershed using the GIS topographic information. The delineation will be checked in the field using hand held GPS receivers and corrected based on the field verification. Sub- watershed boundaries will be

determined based on key hydraulic components (i.e. culverts and open channels) that will require separate peak flow calculations. Additional consideration will be made for potential hydraulic improvements and additional sub-watersheds will be delineated as necessary.

2. The consultant will visually inspect drainage district boundaries to confirm GIS delineations. A handheld GPS receiver will be used for locating points that are different from the current drainage district boundaries.
3. The consultant will develop a preliminary drainage area map for each of the watersheds/sub-watersheds.
4. The consultant will calculate times of concentration and curve numbers for the delineated sub-watersheds.
5. Utilizing watershed information and SCS Type II rainfall distribution the consultant will determine 1, 2, 10 and 100-year recurrence interval flow rates and volumes for each subarea using EGLE's program SCS UD-21, HEC-HMS or SWMM as applicable.
6. The consultant will obtain flow rates from EGLE for watersheds with drainage areas greater than 2 square miles if applicable.
7. The consultant will prepare a technical memorandum outlining their hydrologic analysis findings.

Task 5 – Hydraulic & Alternative Analysis

A hydraulic analysis will be performed using a storm sewer analysis program or HY-8 to determine capacity issues for the existing storm sewer and culvert system. This will include an existing condition analysis of major culverts and storm sewer systems and a proposed condition analysis for culverts/storm sewers which are deemed to be under capacity. Specific work efforts include:

1. The consultant will perform a backwater analysis for the major storm system components under University jurisdiction. Pipe invert, size, type and length data will be input into the programs based on the GPS survey data obtained. The lowest top of road or nearest low-lying building structure elevation will be used to evaluate capacity and freeboard. Tailwater elevations will be based on the nearest downstream control for each culvert/storm sewer.
2. The consultant will prepare a table listing each culvert and/or storm sewer system, capacity, actual flow rate, water surface elevation, and freeboard for applicable recurrence interval events.

3. The consultant will perform a proposed conditions hydraulic analysis to evaluate alternatives for culverts which have inadequate capacity. Prepare a table summarizing under sized culverts and the proposed size of each.
4. The consultant will prepare a technical memorandum outlining hydraulic and alternative analysis findings. This will include preparing a construction cost estimate for each recommended alternative.

Task 6 – Level of Service Determination

The level of service is determined through a series of meetings between the University and the consultant. Minimum level of service is ensuring the storm collection system is compliant with EGLE and federal regulations. Specific work efforts are as follows:

1. The University will meet with the consultant to develop asset management plan goals and a mission statement. The consultant will outline questions to be answered and information that needs to be provided relating to regulatory compliance and related issues, training, customer complaint response and tracking procedures, asset maintenance schedules and process, critical system assets, funding availability and how O&M is related to the current Level of Service (LOS). The consultant will draft a goals and mission statement based on University input.
2. The consultant will prepare a meeting summary and meet with the University to finalize goals, mission, statement and LOS.

Task 7 – Criticality of Assets Determination

After the storm water system has been inventoried and the condition assessed, information prioritization can occur. A numerical rating will be applied to each system element based on condition. A second numerical rating will be applied to each element based on the consequence of failure and desired level of service. These two criteria will then be used in combination to calculate a business risk factor by multiplying the probability of failure by the criticality rating. Deterioration forecasting will be performed to "age" the infrastructure so an analysis can be developed based on current conditions. The most critical assets will be included in the subsequent capital improvement plan. Specific work efforts to determine asset criticality are outlined below:

1. The consultant will develop a condition assessment, probability of failure and asset criticality ranking systems. The ranking systems will be developed by using a system used for a similar sized community and/or EGLE's guidance and modifying it to suit the University's needs.

2. Based on information collected, the consultant will determine the condition, probability of failure, and asset criticality rating of each asset and input data in the State Asset Inventory database to obtain a Business Risk Factor for each asset.

Task 8 – Long-term Funding & Capital Improvement Planning

Under this task, the engineering consultant will develop a 5 to 20 year capital improvement program (CIP) based on projects identified in the asset inventory database. Capital improvements will be identified for projects related to future/upcoming regulations, major asset replacement, system expansion, improved technology, changes in operations (additional O&M costs, regulatory changes and efficiencies) and the project's impact on the LOS. Specific work efforts include:

1. Based on the collected information, the consultant will prepare an initial list of capital projects along with the year of anticipated replacement/construction and the cost of each. Information on each project will be obtained and summarized including project description, project need statement, year that the project is needed, flexibility in replacement year, cost, method of cost estimating, and potential funding sources (grants, loans, other).
2. The consultant will develop a draft CIP. This will include creating a list of capital projects, prioritizing projects based on criticality, remaining life expectancy, estimated cost, annual anticipated revenue, and other factors.
3. Based on University input, the consultant will finalize CIP program and input data in the Capital Improvement Project Plan spreadsheet.
4. The consultant will develop and outline a process for updating the CIP on an annual basis.

Task 9 – Asset Management Plan Report

Under this task, the engineering consultant will compile information from the tasks noted above and develop the Asset Management Plan Report. Specific work efforts include:

1. The consultant will compile the information from the above tasks into a draft asset management report for review by the University.
2. Based on comments, the final asset management system report will be finalized by the consultant and forwarded to the University.

Anticipated Costs to Perform Tasks 1-9:	
CCTV Inspection and Pipe Cleaning	**$275,000 – $350,000**
Subconsultant Fee	**$100,000 – $150,000**
Total Expenses	**$375,000 – $500,000**

Conclusion

In summary, there are several natural, technological, and man-made hazards that could afflict Michigan Tech University. Whereas, the high priority hazards were assessed in terms of estimating losses, all hazards should be considered for mitigation actions, with focus on the high priority hazards.

The impacts of hazard events vary considerably and regardless of the type of hazard event, losses will occur. Hazard mitigation activities will focus on mitigating losses of identified high-priority hazards at Michigan Tech while also considering activities that may mitigate losses due to lower ranking hazards.

Appendix E: Resources

The following resources were used in the development of the Michigan Tech Multi- Hazard Mitigation Plan.

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