MAHONING COUNTY

2018 Multi-Jurisdictional
Hazard Mitigation Plan

MAHONING COUNTY
MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN UPDATE 2018

PREPARED BY

JH CONSULTING, LLC OF WEST VIRGINIA

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1.0 INTRODUCTION

PURPOSE

The purpose of the mitigation plan is to identify risks and vulnerabilities from hazards that affect Mahoning County, Ohio to prevent or reduce the loss of life and injury and to limit future damage costs by developing methods to mitigate or eliminate damage from various hazards.

SCOPE

The *Mahoning County Hazard Mitigation Plan* follows a planning methodology that includes public involvement, a risk assessment for various identified hazards, an inventory of critical facilities and at-risk residential areas, a mitigation strategy for high-risk hazards, and a method to maintain and update the plan.

PLAN AUTHORITY

The Mahoning County Hazard Mitigation Plan is a multi-jurisdictional plan meaning that it includes several jurisdictions within the plan. The plan has been prepared in accordance with federal requirements outlined in the Disaster Mitigation Act of 2000 (DMA, 2K) which requires counties to formulate a hazard mitigation plan in order to be eligible for mitigation funds made available by the Federal Emergency Management Agency (FEMA). Section 322 of the Robert T. Stafford Act requires that all states and local jurisdictions develop and submit mitigation plans designed to meet the criteria outlined in 44 CFR Parts 201 and 206.

When the content of this plan is a requirement under 44 CFR 201.6 (the local mitigation planning section), it is identified with a description of the guidance. The following table describes the relevant requirements under 44 CFR 201.6 and the sections in the plan where the fulfillment of the guidance can be found.

44 CFR 201.6 REQUIREMENTS IN THIS PLAN		
Section	*Description*	*Section in plan*
§ 201.6	Local Mitigation Plans. The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.	Section 1.0 Introduction

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44 CFR 201.6 REQUIREMENTS IN THIS PLAN		
Section	*Description*	*Section in plan*
§ 201.6(a)(4)	Multi-jurisdictional plans (e.g. watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan. State-wide plans will not be accepted as multi-jurisdictional plans.	Section 1.1 The Planning Process
§ 201.6(b)(1)	An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;	Section 1.1 The Planning Process Section 4.3 Continued Public Involvement
§ 201.6(b)(2)	An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and	Section 1.1 The Planning Process
§ 201.6(b)(3)	Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.	Section 1.3 Capabilities Section 4.2 Plan Integration
§ 201.6(c)	Plan content. The plan shall include the following:	N/A
§ 201.6(c)(1)	Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.	Section 1.1 The Planning Process
§ 201.6(c)(2)	A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:	Section 2.0 Risk Assessment
§ 201.6(c)(2)(i)	A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	Section 2.4 Profile Hazards
§ 201.6(c)(2)(ii)	A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:	Section 2.4 Profile Hazards
§ 201.6(c)(2)(ii)(A)	The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;	Section 2.4 Profile Hazards
§ 201.6(c)(2)(ii)(B)	An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;	Section 2.4 Profile Hazards
§ 201.6(c)(2)(ii)(c)	Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	Section 1.4 Trends and Predictions
§ 201.6(c)(2)(iii)	For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.	Section 2.4 Profile Hazards
§ 201.6(c)(3)	A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:	Section 3.0 Mitigation Strategy
§ 201.6(c)(3)(i)	A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	Section 3.1 Mitigation Goals

44 CFR 201.6 REQUIREMENTS IN THIS PLAN		
Section	*Description*	*Section in plan*
§ 201.6(c)(3)(ii)	A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.	Section 3.2 Mitigation Actions and Action Plan
§ 201.6(c)(3)(iii)	An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	Section 3.2 Mitigation Actions and Action Plan
§ 201.6(c)(3)(iv)	For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.	Section 3.2 Mitigation Actions and Action Plan
§ 201.6(c)(4)	A plan maintenance process that includes:	N/A
§ 201.6(c)(4)(i)	A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	Section 4.1 Monitoring, Evaluating, and Updating the Plan
§ 201.6(c)(4)(ii)	A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	Section 4.2 Plan Integration
§ 201.6(c)(4)(iii)	Discussion on how the community will continue public participation in the plan maintenance process.	Section 4.2 Continued Public Involvement
§ 201.6(c)(5)	Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.	Section 5.0 Appendix 6
§ 201.6(d)(1)	Plans must be submitted to the State Hazard Mitigation Officer (SHMO) for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval. Where the State point of contact for the FMA program is different from the SHMO, the SHMO will be responsible for coordinating the local plan reviews between the FMA point of contact and FEMA.	Section 5.0 Appendix 6
§ 201.6(d)(2)	The Regional review will be completed within 45 days after receipt from the State, whenever possible.	N/A
§ 201.6(d)(3)	A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.	Section 3.1 Mitigation Goals Section 3.2 Mitigation Actions and Action Plan Section 5.0 Appendix 3

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1.1 THE PLANNING PROCESS

§ 201.6(c)(1)	Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

1.1.1 The Planning Team

The full team that participated in the update of this plan included various groups of people. The main group is the *steering committee*; this group was in charge of establishing the goals for the plan, developing and reviewing content, and reaching out to the other groups. The second group of people included the *jurisdictional representatives* of the cities, villages, and townships; this group was responsible for providing background information on hazards specific to their area as well as status narratives for previous projects and new mitigation projects for the plan. The third group included *other stakeholders* (institutions, organizations, and agencies) that would have an interest in the content of the plan and included surrounding emergency management agencies, large employers, and higher education institutions. The last group was *the public* which participated by attending meetings and completing online surveys to provide their input. The jurisdictional representatives, other stakeholders, and the public provided valuable information for the development of this plan to the steering committee.

The Steering Committee

The planning organization for the update of this plan consisted of forming a steering committee; the steering committee had representatives of various organizations within the planning area, Mahoning County. The steering committee was responsible for making the overall decisions for the plan and guiding the process; they also had input from jurisdictional representatives, other stakeholders, and the public. The following table identifies the steering committee and their organization.

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HAZARD MITIGATION PLAN STEERING COMMITTEE MEMBERS		
Contact	*Title*	*Affiliation*
Dennis O'Hara	Director	Mahoning County Emergency Management Agency
Anna DeAscentis	Deputy Director Special Projects Coordinator	Mahoning County Emergency Management Agency Mahoning County Commissioners
Bob McCracken	Trustee	Goshen Township Mahoning County Township Association
Justin Mondock	Environmental Planner	Eastgate Regional Council of Governments
Chrystaline Speidel	Floodplain Manager	Mahoning County

Jurisdictional Representatives

Jurisdictional representatives for the cities, villages, and townships of Mahoning County gathered together several times throughout the process to provide valuable information for the plan. This group consists of the townships represented via the Mahoning County Township Association, and the cities and villages, which provided one or two people to represent the jurisdiction. The following table outlines the representatives from each jurisdiction who participated in the update of this plan through attendance at meetings and phone calls or by speaking to a steering committee member or the consultant to provide information regarding their jurisdiction.

HAZARD MITIGATION PLAN JURISDICTIONAL REPRESENTATIVES		
Jurisdiction	*Contact(s)*	*Title(s)*
Cities		
Campbell	Nick Hrelec	Fire Chief
Canfield	Wade Calhoun	City Manager
Struthers	Tim Roddy Ed Wildes Bill Simcox, Jr.	Police Chief Safety Service Director Fire Chief
Youngstown	Silverio Caggiano	N/A
Villages		
Beloit	Eric Augustein	Mayor
Craig Beach	Sherman Yeager Brian Gordon	Fire Chief Firefighter
Lowellville	Jeff Wildes Elrico Alli	Fire Chief Police Chief
New Middletown	Vincent D'Egidio	Police Chief
Poland	Russell Beatty	Police Chief
Sebring	Ray Harris	Police Chief

Other Stakeholders

The steering committee involved other stakeholders within and outside the county for their input for the plan. Committee members or the consultant contacted each of the agencies or organizations directly to ask a few questions about hazards that related to them. Refer to Appendix 1 Planning Documentation for detailed information.

HAZARD MITIGATION PLAN JURISDICTIONAL REPRESENTATIVES			
Agency/Organization	*Type*	*Contact*	*Received Response*
Trumbull County, OH	EMA	Linda Beil, Director	Yes
Portage County, OH	EMA	Ryan Shackelford, Director	Yes
Stark County, OH	EMA	Tim Warstler, Director	Yes
Lawrence County, PA	Public Safety	Jeff Parish, Director	Yes
Columbiana County, OH	EMA	Peggy Clark, Director	No
YSU Environmental and Occupational Health and Safety	Higher Education	Dan Sahli, Director	Yes
YSU Department of Geological and Environmental Sciences	Higher Education	Jeff Dick, Chairman	Yes
Catholic Diocese of Youngstown, Department of Social Concerns	Large employer	Stephen Carattini, Director	No
Youngstown City School District, Security Department	Large employer	William Morvay, Chief	No

The Public

The public also provided input for the plan; the steering committee reached out through other scheduled public meetings as well as online surveys to ask for comment. The following section describes public meeting participation in more detail.

The committee distributed two online public surveys. The first one was made available to the public in February of 2018 via social media postings on a variety of Mahoning County agency websites; as of the end of August of 2018, it had received 78 responses from the public. The second survey was made available to the public in April of 2018 via social media postings on a variety of Mahoning County agency websites; as of the end of August of 2018, it had received 18 responses from the public. The surveys will be open to the public throughout the revision process.

A summary of the first public survey is as follows; for detailed responses, refer to Appendix 2 Public Survey Data.

- The public's level of concern, from highest to lowest, is as follows: severe wind and tornado, severe thunderstorm and hail, severe winter storm, temperature extremes and terrorism (tied), flood, land and mine subsidence, earthquake, drought, and dam failure.
- The public's recollection of hazardous events occurring, from most to least frequent, is as follows: severe thunderstorm and hail, severe wind and tornado, severe winter storm, extreme temperatures, earthquake, flood, land and mine subsidence, drought, and dam failure. Terrorism received no responses.
- In general, the public things the community's ability to handle a hazard event is good (44.16%) or average (35.06%); the same percentage of people thought the ability

was excellent or poor (10.39% each); no respondents thought their ability was horrible.

- 82% of people who took the survey received information or warnings from local public officials or emergency management officials.
- The majority of the public taking this survey said that they received warning notifications via the television (78%).
- Only 37% of people who took this survey follow the Mahoning County Emergency Management Agency on social media, mainly on Facebook (87%).
- 72% of the respondents do not have a 72-hour emergency kit in their homes.
- 49% of the respondents have performed improvements to their homes to reduce their risk from a hazard; the majority of those have performed tree maintenance or removal and roof repair or replacement. Other comments received included purchasing a backup generator and sump pumps.

A summary of the second public survey is as follows; for detailed responses, refer to Appendix 2 Public Survey Data.

- The majority of the respondents would be very supportive (54%) or supportive (31%) of additional regulatory efforts to encourage or require mitigation actions.
- 85% of the people who answered this survey would be supportive of the use of tax dollars for grant programs, construction of mitigating infrastructure, etc.
- Approximately 16% of the respondents would strongly oppose or would not support upgrading water systems to eliminate breaks and leaks.
- All respondents would support or be very supportive of grant programs or regulatory efforts to address stormwater problems.
- 8% would not support regulatory-driven water conservation during drought conditions.
- 17% of respondents would not support grants or incentives to encourage tree planting in or along parking areas, streets, etc. and 8% would not support grant or incentives to residents to encourage elevation of flood-prone homes.

1.1.2 The Process

In total, the steering committee held five meetings to update the plan, the jurisdictional representatives attended two meetings, and the public had four opportunities to

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attend a meeting that addressed the hazard mitigation plan. Each meeting is described below in more detail.

MEETINGS HELD FOR THE PLAN UPDATE			
Date	*Format*	*Location*	*Participants*
February 12, 2018	In-person	Mahoning County EOC	Steering Committee Members
February 15, 2018	In-person	Canfield Town Hall	Mahoning County Township Association
March 12, 2018	Teleconference	Online	Steering Committee Members
March 22, 2018	In-Person	Mahoning County Commissioners Hearing Room	Public meeting in conjunction with Community Development Block Grant meeting
May 3, 2018	In-Person	Mahoning County EOC	Steering Committee Members
May 3, 2018	In-Person	Eastgate Regional Council of Governments	Public meeting in conjunction with Eastgate meeting
May 17, 2018	In-Person	Canfield Town Hall	Mahoning County Township Association
June 27, 2018	In-Person	Eastgate Regional Council of Governments	Steering Committee Members Jurisdictional Representatives
July 17, 2018	Teleconference	Online	Steering Committee Members
July 17, 2018	Teleconference	Online	Steering Committee Members Jurisdictional Representatives

Steering Committee Meetings

The following is a brief description of the topics of conversation and elements that the committee worked on during their meetings. For full details about each meeting, refer to the meeting minutes and presentations in Appendix 1 Planning Documentation.

- The *first steering committee meeting* took place on February 12, 2018 at the Mahoning County Emergency Operations Center. Topics of conversation included the mitigation process, the layout of the plan document, project timeline for completion, projects/strategies from the 2011 plan, goals and objectives for the new plan, strategies for public involvement, and setting criteria for updating the asset inventory for the county.
- The *second steering committee meeting* took place on March 12, 2018 via a web conference call. Topics discussed included the following. The committee reviewed the updated projects from 2011, discussed goals and objectives for the plan, and published the public survey online on several websites.
- The Mahoning County Hazard Mitigation Plan committee members met in-person for their *third meeting* at the Mahoning County EOC on Thursday, May 3, 2018, at 4:00 p.m. The committee thoroughly reviewed section 1.2 Planning Area during the meeting and made changes and observations that the consultant will incorporate into the plan. After the review of the draft, the committee discussed new goals for the

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plan, the new hazard list, and ranked the hazards by probability and severity utilizing the risk assessment matrix. The consultant presented the results of the first public survey thus far and mentioned that the second public survey was currently available.

- The Mahoning County Hazard Mitigation Plan steering committee members met for their *fourth meeting* in-person at the Mahoning County EOC on Thursday, May 17, 2018, at 5:00 p.m. The committee talked about ongoing and planned development in the county. The consultant asked about existing plans in the county that could apply to hazard mitigation. The committee strategized about how to get all the jurisdictions involved in ways that would utilize existing frameworks.
- The *fifth steering committee meeting* was held via teleconference on Tuesday, July 17, 2018, at 2:00 p.m. The committee briefly spoke about the asset and the project lists; the committee reviewed the new list of updated mitigation projects that the consultant had sent prior to the meeting. The committee discussed the strategy to maintain the plan in the next five years after the official adoption and before the next update as well as continued public involvement.

Jurisdictional Meetings

The steering committee reached out to each jurisdiction to request representation at the planning meetings. The following is a description of the two jurisdictional meetings that were held during the process.

- The *first jurisdictional meeting* was held on Wednesday, June 27, 2018; the Mahoning County jurisdictional representatives and steering committee met at the Eastgate conference room. The consultant presented an overview of the plan, and the attendees were asked to complete a worksheet that identified hazards, specific occurrences of them, the types of impacts, if anything had been done to address the impacts in the past, and what could be done in the future. These worksheets served as a base for new hazard mitigation projects for the jurisdictions. The attendees completed the status of the 2011 projects to the best of their knowledge.
- The *second jurisdictional meeting* was held on Tuesday, July 17, 2018; jurisdictions had the opportunity to join a conference call regarding the update process for the Mahoning County Hazard Mitigation Plan. The jurisdictions in attendance reviewed and commented on their project lists, distributed prior to the meeting by JHC.

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Public Meetings

The steering committee recognized the lack of public participation early on in the process; for this reason, they decided to utilize four pre-established public meeting structures to reach the public. One was the CDBG public hearing, another was the Citizens Advisory Board, and the third venue was two Mahoning County Township Association meetings. All meetings were open to the public.

- On February 15, 2018, The Mahoning County Township Association met at the Canfield Township Hall. A member of the planning committee, also president of the association, attended the meeting and gave a brief overview of the hazard mitigation plan.
- On March 22, 2018, there was the first public hearing for the Community Development Block Grant at the Mahoning County Commissioners' Hearing Room in the courthouse basement. Prior to the meeting, Ms. DeAscentis, one of the steering committee members, provided quarter sheets with a link for county stakeholders to take a survey in regards to the County Mitigation Plan. She explained the process and the functionality of the plan to those in attendance and asked them for their support by taking the survey.
- On May 3, 2018, the Eastgate Regional Council of Governments held their Citizens Advisory Board at the Eastgate conference room. The consultant gave a brief presentation of the planning process, the hazard list, and regulatory drivers of the plan. The consultant then fielded questions from the attendees who expressed concerns regarding a variety of hazards addressed in the plan.
- On May 17, 2018, the Mahoning County Township Association met at the Canfield Township Hall. The consultant gave a brief presentation of the planning process, the hazard list, and regulatory drivers of the plan. Attendees then filled out worksheets that described their hazard experiences in their townships and were given the opportunity to ask questions and voice concerns regarding the hazards.

1.1.3 Timeline

The timeline for completion of this plan was short; it began in January of 2018 with the signing of the contract between Mahoning County Emergency Management Agency and JH Consulting, the firm hired to complete this plan update. The process formally ended in August of 2018 with the submission of the plan to the Ohio Emergency Management Agency (OEMA) for approval and subsequently to the Federal Emergency Management

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Agency (FEMA). The following table outlines the main accomplishments for each month of the entire process.

January 2018	• Initial contract signing with JH Consulting and Mahoning County EMA • Kick off meeting to establish planning team
February 2018	• First steering committee meeting • First public survey available online • Plan research (continued through July 2018)
March 2018	• Second steering committee meeting • Public meeting with CDBG hearing • Plan document development (continued through August 2018)
April 2018	• Reach out to other stakeholders • Second public survey available online • Established list of hazards
May 2018	• Third and fourth steering committee meetings • Township Association meeting • Public meeting at Eastgate • Steering committee reviewed introduction section
June 2018	• First jurisdictional meeting • Plan document development • Development of new hazard mitigation projects
July 2018	• Fifth steering committee meeting • Second jurisdictional meeting • Reach out to other stakeholders • Steering committee reviewed draft hazard profiles
August 2018	• Complete jurisdictional projects • Complete jurisdictional surveys • Finish document draft
September 2018	• Steering committee review and approval • Submittal to Ohio EMA for approval

1.1.4 Plan Update Process of 2003 and 2011

In 2011, at the direction of the then Youngstown-Mahoning County Disaster Services and Emergency Management Agency (Y-MCDS & EMA), now Mahoning County Emergency Management Agency, Mahoning County and its municipalities developed and conducted the first update to their Multi-Jurisdictional All-Hazards Mitigation Plan supported by JH Consulting, LLC of West Virginia. This update was a continuing effort to identify probable hazard risks, profile future hazard events, estimate damage and losses as a result of future hazard events, and advocate mitigation projects to reduce the effects of the identified hazards on the communities within the county. The plan aims to create safer, more disaster-

resistant communities. The planning process utilized to update the plan included the following steps:

- Step 1: Establishment of a Core Planning Committee (CPC),
- Step 2: Conducting an update to the Hazard Risk Assessment (HRA),
- Step 3: Development of an updated to the Action Plan (AP), and
- Step 4: Re-adopting and implementing the updated plan.

To guide the completion of the plan update at the local level, a multi-jurisdictional core planning committee (CPC) was established to examine the community's risks and vulnerabilities to natural and technological hazards. This committee was comprised of key officials representing state, county, municipal, and private entities with a stake in mitigation, and included the following.

MAHONING COUNTY CORE PLANNING COMMITTEE (CPC) 2011			
Name	*Organization*	*Name*	*Organization*
Amy Ferns, Inspector	Building Inspection Mahoning County	John Dill Mayor	City of Campbell
Andy D'Apolito, Engineer	Mahoning County Engineering Dept.	Joseph Diorio, Director-Lead Abat.	Mahoning County Board of , Health
Charles Coleman, Sales Director	Linde Hydraulics Corp	Michael Wilson, President	Home Builders Assoc.
Clark Jones, Director	Mahoning County EMA	Michele Varso, Fiscal Agent	Mahoning County EMA
David Turner, General Mgr.	FirstEnergy	Mike Ianazone, Traffic Engineer,	Mahoning County Highway Engineers
Dennis O'Hara, Deputy Director	Mahoning County EMA	Mike O'Shaughnessy, Board Chair	Mahoning County Planning Commission
Donald Garver, Engineer	Mahoning County Soil & Water Conservation District	Paul Harkey, Retired Gen. Mgr.	Ohio Edison
Don Hall, Director	Mahoning County Building Inspections,	Sarah Gartland, Director	MCPC
Doug Britvec, Consultant	JH Consulting, LLC	Tom Humphries, President	Youngstown Warren Regional Chamber of Commerce
Fred Kirven, President	Youngstown -Columbiana Assoc. of Realtors	Tony Leone Naturalist	Mill Creek Metro Park
James Dorman, Fire Chief, Ret	Mahoning Valley Fire Chief's Association	William Dorman, Supervisor	Dominion East Ohio Gas
Jeffrey Uroseva, Director	MCBD		

The original process in 2003 was led by the Mitigation Advisory Team and supported by URS Corporation. The Mahoning County Commission compiled a Mitigation Advisory Team, to be responsible for the development and implementation of the original plan. The

team included primarily representatives from the county, cities, villages, and the emergency services organizations within the county (i.e., fire, police, etc.). Other organizations that were involved in the process included utility providers, and county engineering staff.

Public involvement was an integral part of the development of the original plan. Public involvement consisted of four parts:

- Appointment of an Advisory Team by the Mahoning County Commissioners to assist the Y-MCDS & EMA in development of the plan,
- Public Meeting to review the draft plan,
- Community review and adoption of the plan, and
- Adjacent county coordination.

The planning process to complete the first five-year update of the plan was similar to the process used to originally develop the document. The consultant provided an objective perspective to ensure that the CPC was achieving the goals that the Advisory Team had intended to achieve in 2003.

Many of the same resources used for research during the original development of the plan were again utilized to update the plan. The consultant compiled all project documents and forwarded them to the Y-MCDS & EMA for draft distribution to CPC members. As such, the CPC could comment on the plan as it was being developed. Further, this allowed participating jurisdictions an on-going opportunity to be engaged as participants and to provide input to affect the plan's content, which expedited the adoption process.

Following the compilation of the updated/revised plan, the Y-MCDS & EMA invited the public to review the revised Mahoning County Multi-Jurisdictional All-Hazards Mitigation Plan as well as neighboring communities, local and regional agencies involved in hazard mitigation activities, businesses representative, academia, nonprofit organizations, and other interested parties a chance to view and comment on the plan. Following FEMA approval and the formal adoption of the plan, the Y-MCDS & EMA notified neighboring county emergency managers of the plans completion via a letter.

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1.2 THE PLANNING AREA

The geographical planning area for this plan includes the cities and villages, as well as the townships within the borders of Mahoning County, Ohio. The following pages describe Mahoning County's geography, climate, demographics, economy, education, health, transportation, utilities, media, tourism, and attractions in an effort to completely describe the characteristics of the county. The cities and villages within the county are briefly described and a list of disaster declarations affecting Mahoning County is included.

1.2.1 Geography

Location

Mahoning County is one of 88 counties in the State of Ohio and is located in the northeastern portion of the state. It is bordered on the north by Trumbull County, OH; on the northeast by Mercer County, PA; on the east by Lawrence County, PA; on the south by Columbiana County, OH; on the southwest by Stark County, OH; and on the northwest by Portage County, OH.

Rivers and Lakes

Rivers and streams are prominent features in the Mahoning County landscape. All of the streams flow generally north or south through the county. The Mahoning River flows through the northeast corner of the county passing near or through Youngstown, Campbell, Struthers, and Lowellville. Yellow Creek and Mill Creek are major tributaries of the Mahoning River in the eastern half of the county. Meander Creek and Little Beaver Creek drain the middle portion of the county.

Mahoning County also has several lakes; some of the largest include the Berlin Lake, the Meander Creek Reservoir, Lake Milton, Evans Lake, and Pine Lake. The Berlin Lake is mostly in Portage County to the west, and the Meander Creek Reservoir is partly in Trumbull County to the north.

Terrain

According to the U.S. Census, the county has a total area of 423 square miles, with approximately 415 square miles of land area and eight square miles of water. Mahoning County varies in elevation from a low of 796 feet above sea level, to a high of 1,318 feet above sea level, yielding a maximum relief of 522 feet.

The topography of Mahoning County is characterized as gently rolling with occasional water gaps. The county is located in an area known as the Glaciated Allegheny Plateaus; glaciers

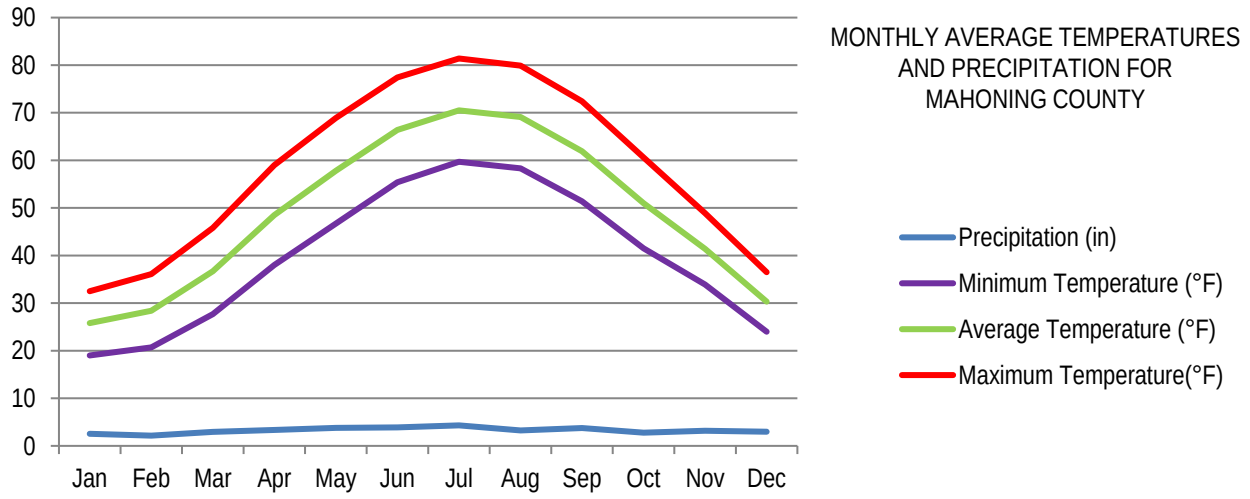
covered northeast Ohio during the Wisconsinan glaciations, and as the glaciers receded approximately 14,000 years ago they formed the current landscape.

1.2.2 Climate

A large portion of Mahoning County's land area is forested: nearly 41% of the total land cover is that of forest. Agricultural cropland makes up another 23% of the land cover. Mahoning County's topography is that of flat and open to gently sloping, offering limited protection against strong straight-line winds or tornadoes. These high winds can be damaging to both structural and agricultural assets.

Mahoning County has a continental-type climate, predominantly influenced by air from the west. There is considerable variation in seasonal temperatures, with none of the temperatures being considered severe. The climate of Mahoning County is seasonal in nature, with wet stormy springs, warm summers, colorful falls, and cold snowy winters. The average temperature in January is 25.8°F; the July average temperature is 7.05°F. Precipitation is evenly distributed throughout the year, with an annual average of approximately 39 inches. Data from the National Weather Service (NWS) indicate that the area experiences approximately 64 inches of snowfall per year, usually during the December to March winter season.

The following graph shows the monthly minimum, average, and maximum temperatures for the weather station at the Youngstown-Warren Regional Airport (NOAA, n.d.).



1.2.3 Demographics

Planning for incidents or events requires knowledge of the area's population; because the inhabitants of the county are constantly changing, it is necessary to have base-line data about the diversity in the location. For example, different ethnicities which practice certain traditions,

international or migrant populations that speak different languages, visitors who are unfamiliar with the area, elderly populations who have difficulties with mobility, poor or unemployed populations who may have additional hardships preparing or responding to incidents, etc. are important to know. All of these aspects can influence how the population receives and understands general information or warnings about events or incidents.

Population Influx and Variables

There are many events that can bring outside populations to Mahoning County. One of those types of events are the festivals which take place typically during the summer and fall months.

FESTIVALS IN MAHONING COUNTY		
Festival	*Location*	*Time of Year*
Boardman Rotary Oktoberfestival	Boardman Township Park	Fall
Canfield Fairgrounds	7265 Columbiana-Canfield Rd.	Late summer to early fall
Greater Youngstown Italian Fest	Downtown Youngstown	Summer
Pride Youngstown Festival	3135 Belmont Ave.	Summer
Various Religious and Ethnic Festivals	Various locations throughout the county	Summer
Steel Valley Super Nationals	Canfield Fairgrounds	Summer
Summer Festival of the Arts	Youngstown State University	Summer

Source: The Public Library of Youngstown and Mahoning County

Another constant yet changing population in Mahoning County is the student and faculty population at Youngstown State University (YSU). YSU has a student population of over 12,500 with a 14:1 student-faculty ratio, which puts the total university population at around 13,600. International students represent at least 34 countries at YSU and make up about 2.2% of the student body. Since 2011, the number of international students has increased annually (College Factual, 2018).

The following page contains a table that includes the demographic information for Mahoning County and its municipalities. The U.S. Census Bureau does not have updated 2017 information for the jurisdictions but does for the county. The most up-to-date data available for each jurisdiction is presented in the table.

DEMOGRAPHIC DATA FOR MAHONING COUNTY											
Description	*Mahoning County*	*Campbell*	*Canfield*	*Struthers*	*Youngstown*	*Beloit*	*Craig Beach*	*Lowellville*	*New Middletown*	*Poland*	*Sebring*
Population*	229,796	7,923	7,284	10,293	64,312	978	1,180	1,155	1,621	2,555	4,420
Median Age	43.4	40.8	49.3	40.7	39	42.1	41.3	41.3	49.6	45.4	46.3
Educational attainment: Percent high school graduate of higher*	90.10%	83.00%	97.60%	90.20%	83.00%	89.30%	90.00%	89.60%	92.10%	97.80%	84.20%
Total housing units*	111,833	3,974	3,306	4,886	33,123	496	606	515	702	1,185	2,161
Median household income*	$41,872	$28,952	$66,716	$37,431	$24,448	$29,091	$44,643	$34,167	$41,154	$71,321	$34,566
Foreign-born population	6,637	357	395	131	2,046	3	12	4	7	35	218
Individuals below poverty level*	18.70%	29.20%	5.70%	15.60%	38.00%	12.00%	11.10%	18.50%	12.50%	4.00%	15.90%
Veterans*	17,449	666	497	523	4,432	61	103	88	143	165	332
White alone	186,987	5,568	6,845	10,144	31,981	1,008	1,116	1,136	1,529	2,666	4,276
Black or African American	36,102	1,721	0	121	28,443	15		12	0	0	18
American Indian or Alaska Native	661	81	37	5	341	0	4	3	0	0	0
Two or more races	5,822	560	174	144	3,036	22	3	6	7	5	0
Hispanic or Latino	12,442	1,462	66	300	6,944	20	3	26	24	56	205
Asian alone	1,867	0	320	12	337	0	0	0	0	0	0
Other	1,576	110	37	19	1,023	0	0	4	0	0	0
Land area (square miles)	425	3.7	4.6	3.7	34.2	0.8	1.7	1.4	0.9	1.2	2.1

* County data from 2017 and city data from 2016estimates; village data from 2010

Sources: US Census (2016 & 2017) and US Census American Fact Finder (2010)

1.2.4 Economy

Mahoning County has a diverse employment sector. According to 2009 Economic Census information from the Ohio Department of Development (2017), the largest areas of employment are service, transportation/utilities, and education and health services. Total employment is currently 105,700 persons. The county's unemployment rate is approximately 6.3%. In 2016, a total of 282 new businesses opened while 448 other businesses closed. The total active businesses are 4,650, a decline of 10.8% from 2012.

In 2012 (the earliest available record), the Ohio Development Services Agency considered Mahoning County to be distressed economically. Since 2013, the entire county has no longer been considered in distress, but the City of Youngstown continues to be. Distressed means that a city or county meets one or more of the following three criterion (Ohio Development Services Agency, 2018).

1. Unemployment of 125% or greater than the most recent U.X. 5-year average rate.
2. Per capita income is at or below 80% of the U.S. per capita income.
3. Poverty is defined for counties as a percentage of transfer payment income to total county income equal to or greater than 25%. For cities, it is 20% or greater of persons with incomes below the federal poverty level.

Since 2012 the unemployment rate has decreased from 8.3% to 6.3% in 2016 possibly explaining why the entire county was taken off the distressed list in 2013. According to the Youngstown-Warren Regional Chamber, the major employers in Mahoning County include the Diocese of Youngstown (church/school), InfoCision (call center), Mahoning County Government (government), Mercy Health (hospital services), U.S. Postal Service (mail services), ValleyCare Health System (hospital services), Youngstown City Schools (educational services), Youngstown State University (higher education), AT&T call center (call center), and Austintown Local Schools (educational services).

1.2.5 Education

The education system in Mahoning County consists of approximately 70 public schools as well as Youngstown State University. The graduation rate is currently at 81.2%. The school dropout rate is at 10%, lower than the Ohio average (11%) and the national average (13%) (Town Charts, 2017). There are 13 school districts in Mahoning County.

As previously mentioned, there is also higher education in the county. The most notable is Youngstown State University in Youngstown with an enrollment of around 12,500

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students. There are also two other colleges or universities in the county: University of Mount Union in Alliance with an enrollment of around 2,200 students, and Eastern Gateway Community College in Youngstown with an enrollment of around 2,300 students (Collegeboard.org, n.d.). TDDS Technical Institute is also located within the county near Craig Beach and Lake Milton.

1.2.6 Health

Several health care facilities are located in Mahoning County. Evacuation of these facilities during an emergency situation could be a concern due to the large number of vulnerable populations that fill them. The Mahoning County Health Department is a public health agency that serves most of the communities and townships in the county. The following table lists these health care facilities.

HEALTH CARE IN MAHONING COUNTY	
Hospitals	*Nursing Homes*
Akron Children's Hospital – Mahoning Valley	Hampton Woods Nursing Center
Greenbriar Rehabilitation Hospital	Heritage Manor
Mercy Health – Saint Elizabeth Boardman Hospital	Park Vista Retirement Community
Mercy Health – Saint Elizabeth Youngstown Hospital	Beeghly Oaks Center for Rehabilitation
Select Specialty Hospital – Youngstown	Oasis Center for Rehab and Healing
Surgical Hospital at Southwoods	Masternick Memorial Health Care Center
Vibra Hospital of Mahoning Valley	Greenbriar Center
Northside Regional Medical Center (Steward Health Care)	Omni Manor Nursing Home
Youngstown Community Health Center (One Health Ohio at Youngstown)	Shepherd of the Valley – Boardman
	Humility House
	Caprice Health Care Center
	Campus Health Care Center
	Briarfield Manor
	Assumption Village
	Ivy Woods Manor
	Vista Center of Boardman
	Center for Rehabilitation at Hampton Woods
	Windsor Health Care Center
	Crandall Medical Center
	Meridian Arms Living Center
	Shepherd of the Valley – Poland
	Austinwoods Rehab Health Care
	Camelot Arms Care Center
	Briarfield at Ashley Circle

As is the makeup of the county's demographics, so too is the overall health of the population important. There are instances where the health of an individual can hinder their ability to remain safe or find safety during an emergency. For a more detailed analysis of how health can affect a population during disasters, see Section 2.3 Vulnerability.

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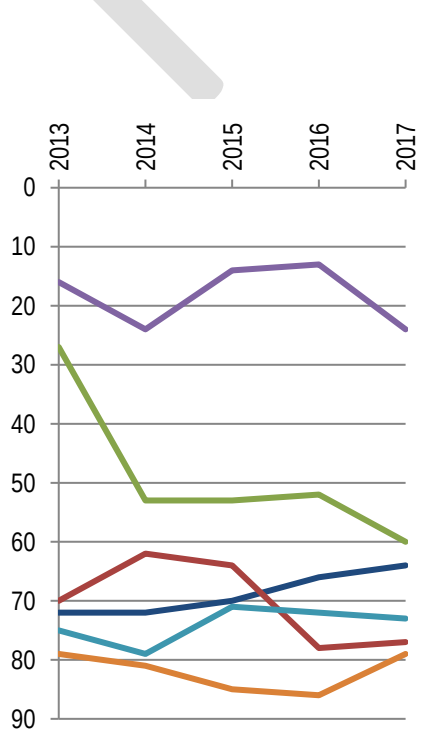
The following table and graph show the overall health of Mahoning County over the past five years. There are 88 counties in the State of Ohio; different indicators of health rate each of these counties against each other and they receive a place ranking among the other counties in the state. The table presents the ranking of Mahoning County's indicators for length of life, quality of life, health behaviors, clinical care, social and economic factors, and physical environment that can influence overall health. The aspects taken into consideration for each of these topics are included as a bullet list under each heading in the first column. The last column shows the trend for the particular indicator in corresponding colors. For example, dark blue is for length of life, red is for quality of life, etc.

MAHONING COUNTY HEALTH RANKING						
Indicator	*Mahoning County Ranking by Year (of 88)*					*Graphic Trend*
	2013	*2014*	*2015*	*2016*	*2017*	
Length of Life • Premature death	72	72	70	66	64	
Quality of Life • Poor or fair health • Poor physical health days • Poor mental health days • Low birthweight	70	62	64	78	77	
Health Behaviors • Adult Smoking • Adult Obesity • Excessive drinking • Motor vehicle crash deaths • Sexually transmitted infections • Teen births	27	53	53	52	60	
Clinical Care • Uninsured • Preventable hospital stays • Diabetes monitoring • Mammography screening	16	24	14	13	24	
Social & Economic Factors • High school graduation • Unemployment • Children in poverty • Violent crime	75	79	71	72	73	
Physical Environment • Air pollution • Drinking water violations • Access to recreational facilities • Limited access to health foods • Fast food restaurants	79	81	85	86	79	



Source: County Health Rankings & Roadmaps annual county reports

As the graph shows, the overall health in Mahoning County has declined over the years; the social and economic factors (which include high school graduation,

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unemployment, children in poverty, and violent crime) have only slightly increased since 2013.

1.2.7 Transportation

Highway infrastructure

Mahoning County's transportation infrastructure is comprised of highway, railway, and air elements. The county contains approximately 55 miles of interstate highway, 25 miles of turnpike highway, 58 miles of U.S. Highway, and 175 miles of state highway. Interstates 76, 80, 680; U.S. Routes 62, 224, 422; and State Routes 11 and 14 are the principal arterial routes through the county. Many sections of these roadways are four-lane, divided highways. There are several bridges and culverts located throughout Mahoning County, which are vital components of the transportation infrastructure. Other components of Mahoning County's highway infrastructure include State Routes 165, 173, 617, 625 and 630 all of which travel east and west, and State Routes 7, 45, 46, 164, 170, 534 and 616 which travel north and south.

Highway	*Approximate Route/Location*
Interstate 76	East/West – Interstate 76 (I-76) stretches 435 miles from an interchange with Interstate 71 west of Akron, Ohio, east to Interstate 295 near Camden, New Jersey. Just west of Youngstown, I-76 joins the Ohio Turnpike and heads around the south side of Youngstown. Once numbered Interstate 80S, Interstate 76 now comprises the easternmost leg of the Ohio Turnpike. Interstate 76 has exits to Youngstown, Mahoning Avenue, I-80, State Route 7, and I-680.
Interstate 80	East/West – Interstate 80 (I-80) runs across the northern part of the state. Most of the route is part of the Ohio Turnpike, with only an 18.78-mile stretch not being on the toll road. That stretch of road is the feeder route to the Keystone Shortway, a shortcut through northern Pennsylvania that provides access to New York City. Just northwest of Youngstown, the Ohio Turnpike continues southeast onto Interstate 76, while I-80 runs east to the north of Youngstown, entering Pennsylvania south of Sharon, Pennsylvania.
Interstate 680	North/South – Interstate 680 (I-680) is the primary Interstate Highway passing through Youngstown, Ohio. Its northern terminus is at Interstate 80 and its southern terminus is at Interstate 76, the Ohio Turnpike. The entire 16.43 miles of I-680 is in Mahoning County. Interstate 680 has exits to Austintown Township, Youngstown, Struthers, Canfield, Poland, Boardman Township, and Beaver Township.
U.S. Route 62	East/West – U.S. Route 62 runs from the US-Mexico border at El Paso, Texas to Niagara Falls, New York, near the United States-Canada border. It is the only east-west US Route that connects Mexico and Canada. U.S. 62 enters Ohio from Kentucky, crossing the Ohio River at Aberdeen. It crosses southwest Ohio before entering the cities of Columbus, Canton, Alliance, and Youngstown. It leaves Ohio near Hubbard and enters Pennsylvania near the interchange for Interstate 80. U.S. 62 is planned to be rerouted onto divided highway from Alliance to Salem, part of a larger relocation of both U.S. 62 and SR-14, then from downtown Youngstown to Interstate 80 as part of the "Hubbard Arterial".

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U.S. Route 224	East/West – U.S. Route 224 is a spur of U.S. Route 24. It currently runs for 289 miles from New Castle, Pennsylvania at Pennsylvania Route 18 to Huntington, Indiana at U.S. Route 24. It passes through the states of Pennsylvania, Ohio and Indiana. It goes through the cities of Youngstown, Ohio, Akron, Ohio, and Findlay, Ohio. In Northeast Ohio, US 224 is located a short distance north of the Western Reserve's southern boundary.
Highway	*Approximate Route/Location*
U.S. Route 422	East/West – U.S. Route 422 is a 271-mile long spur route of U.S. Route 22 split into two segments in Ohio and Pennsylvania. The western spur begins in downtown Cleveland, Ohio, and ends at Ebensburg, Pennsylvania. The eastern spur, located entirely within Pennsylvania, begins in Hershey and ends at King of Prussia, near Philadelphia. U.S. Route 422 enters Youngstown, before entering Pennsylvania
State Route 11	North/South – State Route 11 is in the eastern portion of Ohio. Its southern terminus is on U.S. Route 30 in East Liverpool at the West Virginia state line on the Jennings Randolph Bridge over the Ohio River; its northern terminus is at State Route 531 in Ashtabula. The route is concurrent with U.S. Route 30 through East Liverpool and with Interstate 80 near Youngstown. Exits off of State Route 11 in Mahoning County include; Columbiana, Canfield, Poland, Austintown and Youngstown.
State Route 14	East/West – State Route 14 has a total length of approximately 81 miles, it is located in northeastern Ohio, runs from U.S. Route 6/U.S. Route 42/State Route 3 in Downtown Cleveland southeasterly to the Pennsylvania state line near East Palestine; Pennsylvania Route 51 continues southeasterly from there. State Route 14 provides access to Goshen Township in Mahoning County.

Railway Infrastructure

Railway lines are also a part of the county's transportation infrastructure. There are a variety of railroad companies that operate in and through Mahoning County. These rails pass through or near the municipalities of Beloit, Campbell, Sebring, Struthers and Youngstown.

- CSXT
- Genesee & Wyoming
- Mahoning Valley Railway
- Norfolk Southern
- Ohio & Pennsylvania Railroad
- Youngstown & Austintown Railroad
- Youngstown & Southeastern Railroad
- Youngstown Belt Railroad

Airway / Waterway Infrastructure

Airways also play a part in the county's transportation infrastructure. There are several international and regional airports within close proximity to Mahoning County Cleveland Hopkins International Airport (CLE),

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- Pittsburgh International Airport (PIT),
- Youngstown-Warren Regional Airport (YNG),
- Akron-Canton Regional Airport (CAK), and
- Erie International Airport (ERI).

The Youngstown-Warren Regional Airport is located in Vienna Township in neighboring Trumbull County and is home to the 910th Airlift Wing (AW) of the US Air Force. There are three heliports in the county. There are also several small public and private airstrips throughout the county.

Mahoning County is approximately 50 miles south of the Lake Erie ports of Ashtabula and Conneaut, and 60 miles north of the Ohio River ports of Wellsville and Yellow Creek.

Public Transportation

The Western Reserve Transit Authority (WRTA) has fixed-route bus service in the north eastern part of the county that includes the City of Youngstown into the neighboring townships of Austintown, Canfield, Boardman, Beaver, Poland, and Campbell.

1.2.8 Utilities

Utilities are an important element that influences the quality of life; access to these can sometimes be critical to survival, especially during long-lasting emergencies causing outages. For more detailed information about utility outages and their effects on the population, refer to Section 2.3.1 Complicating Variables.

UTILITIES IN MAHONING COUNTY	
Utility Type	*Utility Name*
Cable/Internet	AT&T Armstrong Level 3 Communications Time Warner Spectrum Viasat Xfinity
Electric	Ohio Edison
Gas	Dominion
Telephone	AT&T Ohio UTO dba Century Link
Water/Sewer	Aqua Ohio - Struthers

Sources: Ohio Public Utilities Commission, www.highspeedinternet.com, Just Energy

1.2.9 Media

There are a variety of media outlets in and near Mahoning County; they include radio stations, newspapers, and television stations, based mainly in Youngstown. The following table outlines the variety of stations and newspapers.

MEDIA IN MAHONING COUNTY		
Radio Stations		
Station	*Frequency*	*City*
WDJQ	92.5 FM	Alliance
WDPN	1310 AM	Alliance
WRMU-FM	91.1 FM	Alliance
WGFT	1330 AM	Campbell
WQXK	105.1 FM	Salem
WSOM	600 AM	Salem
WKTL	90.7 FM	Struthers
WBBW	1240 AM	Youngstown
WHOT-FM	101.1 FM	Youngstown
WKBN	570 AM	Youngstown
WMXY	98.9 FM	Youngstown
WNCD	93.3 FM	Youngstown
WNIO	1390 AM	Youngstown
WYSU	88.5 FM	Youngstown
WYTN	91.7 FM	Youngstown
Newspapers		
Newspaper Name	*Frequency*	*City*
Austintown Neighbors	Weekly	Youngstown
Austintown Town Crier	Weekly	Warren
Boardman Neighbors	Weekly	Youngstown
Boardman News	Weekly	Boardman
Boardman Town Crier	Weekly	Warren
Buckeye Review	Weekly	Youngstown
Business Journal	Daily	Youngstown
Canfield Neighbors	Weekly	Youngstown
Canfield Town Crier	Weekly	Warren
Catholic Exponent	Bi-weekly	Youngstown
Daily Legal News	Daily	Youngstown
Hometown Journal	Weekly	Struthers
Jambar (YSU newspaper)	Twice a week	Youngstown
Mahoning Valley Parent	Monthly	Warren
Metro Monthly	Monthly	Youngstown
The News Outlet		Youngstown
Poland Neighbors	Weekly	Warren
Poland Town Crier	Weekly	Niles
Review Newspapers	Weekly	Niles
Senior News	Weekly	Youngstown
Shale Sheet	Online	Youngstown
Youngstown Vindicator	Daily	Youngstown
Television Stations		
Station	*Channel*	*City*
WFMJ Channel 21	NBC	Youngstown
WKBN Channel 27	CBS	Youngstown

MEDIA IN MAHONING COUNTY		
Radio Stations		
Station	*Frequency*	*City*
WYFX	Fox	Youngstown
WYTV Channel 33	ABC	Youngstown
MyYTV	MyNetworkTV	Youngstown

Sources: Wikipedia & The Public Library of Youngstown & Mahoning County

1.2.10 Tourism and Attractions

Mahoning County is the home of several tourist attractions, including the Arms Family Museum, Berlin Reservoir, Boardman Park, Canfield Fairgrounds, Covelli Centre, Edward W. Powers Auditorium, Greater Youngstown Italian Fest, Lake Milton State Park, McDonough Museum of Art, Mill Creek Metro Parks, Noah's Lost Ark Exotic Animal Sanctuary, Poland Forest, Stambaugh Auditorium, TP Auto Collection, War Vet Museum, Western Reserve Village/Canfield Fair, Tyler History center, the Butler Museum, Hollywood Gaming at Mahoning Valley, and the Youngstown Historical Center of Industry and Labor.

1.2.11 Jurisdictions

The following subheadings outline the characteristics of the jurisdictions in Mahoning County. However, some jurisdictions that are partially within Mahoning County limits are not outlined herein because they are included in other counties' mitigation plans. The excluded jurisdictions are the city of Alliance (contemplated in the Stark County Hazard Mitigation Plan), and the cities of Columbiana, Salem, and Washingtonville (considered in Columbiana County). In addition to the cities and villages, Mahoning County has 14 townships.

JURISDICTIONS IN MAHONING COUNTY	
Name	*Type*
Alliance (part)*	City
Campbell	City
Canfield	City
Columbiana (part)*	City
Salem (part)*	City
Struthers	City
Youngstown	City
Beloit	Village
Craig Beach	Village
Lowellville	Village
New Middletown	Village
Poland	Village
Sebring	Village
Washingtonville (part)*	Village
Austintown	Township
Beaver	Township
Berlin	Township
Boardman	Township
Canfield	Township
Coitsville	Township
Ellsworth	Township
Goshen	Township
Green	Township
Jackson	Township
Milton	Township
Poland	Township
Smith	Township
Springfield	Township

* Not included in the Mahoning County Hazard Mitigation Plan

<u>Mahoning County</u>

The county was established in March of 1846 and named for a Native American word meaning "at the salt

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licks." The county contains ten incorporated municipalities including the Villages of Beloit, Craig Beach, Lowellville, New Middletown, Poland, and Sebring as well as the Cities of Campbell, Canfield, Struthers, and Youngstown which functions as the county seat. Mahoning County has a total population of 238,823 (2010 U.S. Census estimate) and is part of the Youngstown-Warren-Boardman, OH-PA Metropolitan Statistical Area (MSA) along with all its jurisdictions. Metropolitan cities located within proximity to Mahoning County include Cleveland, OH (65 miles) and Pittsburgh, PA (61 miles).

Campbell City

The City of Campbell is located in northeastern Mahoning County in Coitsville Township between the Cities of Youngstown and Struthers approximately five miles from the Pennsylvania border. The City of Campbell was formerly known as the village of East Youngstown, and this designation still appears on real estate deeds for the city. The city was renamed for local industrialist James A. Campbell, then chairman of the Youngstown Sheet and Tube Company. The form of what was to become the City of Campbell began in 1902 when the Youngstown Iron, Sheet, and Tube Company established operations on the banks of the Mahoning River in Coitsville Township. The character of the city came from the young immigrants who poured into the Mahoning Valley to work in the growing steel industry. The original boom town ultimately matured and officially became known as the City of Campbell in 1926, and was officially incorporated in 1970. Residents generally pronounce the city's name as "camel," with a silent "PB." Campbell is sometimes referred to as the "City of Churches," because of the wide variety of religious structures found throughout the community.

Recent years have pointed to a transition in the industrial makeup of Campbell and the Mahoning Valley. The City of Campbell, along with the communities of Struthers and Lowellville and the Townships of Poland and Coitsville have formed a community improvement organization, the CASTLO CIC, to encourage other types of manufacturing and service-oriented industries to locate in the valley.

Community residents and businesses enjoy the excellent commercial and industrial services afforded by the close relationship of Campbell to the Greater Youngstown area. Campbell is outlined by State Routes 289, 616, and U.S. Route 422, with easy access to Interstate 680 (I-680) which, in turn, provides access to State Route 11, I-80, I-76, and the Beaver Valley Expressway. Rail services are provided by the Mahoning Valley Railway Company, Chessie, and Three Rivers Railroads.

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Roosevelt Park, located in the northeast quadrant of the city, offers Campbell residents 64 acres of park for picnicking and ice skating. Facilities are also available for baseball, softball, soccer, and tennis. Other recreational opportunities in or near Campbell include Gordon Park, the Mahoning River, and McKelvey Lake. An Industrial Park is being created at the site of the former Youngstown Sheet & Tube Struthers Works that includes 120 acres and eleven buildings totaling 600,000 square feet. Currently space at the park is being utilized by 17 companies.

Canfield City

Canfield is an affluent suburban city located in central Mahoning County in Canfield Township at the intersection of U.S. Route 224 and State Route 46/U.S. Route 62, about ten miles southwest of Youngstown. Canfield, in 1798, became Township No. 1 in range No. 3 by the purchase from the Connecticut Land Company. This 16,324-acre tract was located on the southeastern border of the Connecticut Western Reserve Territory. It was purchased by six gentlemen; most of the land was owned by Judson Canfield. Canfield was originally a part of Trumbull County until 1846, when the counties in the area were redefined and Mahoning County emerged as a new county. Canfield made plans to be the county seat, and because of it being the geographical center it was made such in 1846, while Youngstown grumbled that it should have had that honor. Thus a fierce issue was raised and it began a debate that would last three decades. The bill for removal of the county seat from Canfield to Youngstown was voted upon by the legislature in Columbus in 1874 and upheld.

Canfield is a relatively affluent suburb of Youngstown, with strict zoning regulations that prohibit large signage and overgrown lawns. A tree-lined “Village Green” sits at the heart of the New England-style village, which resembles many communities established in the days of the Connecticut Western Reserve. Canfield continues to grow; new housing developments are spreading throughout the city.

The Canfield Fairgrounds have existed at their present location on State Route 46 since 1851. Every year in late August for six days the Canfield Fair “Ohio’s largest county fair” takes place, the fair attracts many Ohio citizens. Canfield is also home to several light manufacturing companies including; Canfield Metal Coating, Converse All Steel Services, Star Extruded Aluminum Shapes, Lifetime Truck Products, Canfield Manufacturing Company, and United Extrusion.

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Struthers City

The City of Struthers is located in northeastern Mahoning County in Poland Township just to the south of Campbell and Youngstown. The city is located 60 miles from both Cleveland and Pittsburgh. Struthers can be accessed utilizing Interstates 680, 80 (Ohio Turnpike) 76; and State Routes 11, 170, and 616. The Youngstown-Warren Regional Airport, Cleveland Hopkins Airport, and Pittsburgh International Airport are all nearby.

John Struthers, from Washington County, Pennsylvania, purchased 400 acres of Poland Township land in 1798. This land would later be known as the present day City of Struthers. In 1800 Struthers built a grist mill on his property, the first in Poland Township and later added a sawmill to this. The community's early history centers on Yellow Creek, which was the site for the first iron blast furnace built west of Pittsburgh. The furnace was built in 1803 by Daniel Eaton. Several furnaces were built along the creek during the first decade of the 1700s. The land on the Yellow Creek would lay dormant for more than 50 years until 1865 when Thomas Struthers, son of John Struthers, bought back the land his father had lost following the War of 1812. Thomas Struthers laid out the village that year and gave it his family's name. With the steel industry booming in the early part of the 1900s, immigrants from throughout Europe flooded into Struthers. A village in 1902 when it was officially incorporated, Struthers quickly became a city in 1920. The steel industry allowed the city to flourish until 1977 when several area plants closed their doors for good. The city padded the loss of thousands of jobs by using its industrial infrastructure to lure non-steel making jobs, but population losses have continued throughout the start of the new century. The CASTLO Industrial Park, a nonprofit Community Improvement Corporation, offers commercial and industrial space in Struthers.

Youngstown City

The City of Youngstown is located in the northeastern portion of Mahoning County and extends into Trumbull County. The city is situated along the Mahoning River, approximately 65 miles southeast of Cleveland, 61 miles northwest of Pittsburgh, and is midway between New York City and Chicago via Interstate 80 (I-80). Youngstown is in the Mahoning Valley on the Glaciated Allegheny Plateau. At the end of the last Ice Age, the glaciers left behind a uniform plain with valleys caused by the Mahoning River crossing the plain. Youngstown has its own metropolitan area but is often included in commercial and cultural depictions of the Pittsburgh Tri-State area and Greater Cleveland. The city functions as the county seat of Mahoning County. The Youngstown-Warren-Boardman Metropolitan

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Statistical Area contains 558,206 people (7,567 less than five years ago) (Federal Reserve Bank of Cleveland, 2014) and includes Mahoning and Trumbull counties in Ohio, and Mercer County in Pennsylvania.

The city was named for John Young, an early settler from Whitestown, New York, who surveyed the area in 1796, and established the community's first sawmill and gristmill. Youngstown was founded in 1796, incorporated as a village in 1848, and chartered as a city in 1867. The area constituting present-day Youngstown was part of the Connecticut Western Reserve, a section of the Northwest Territory reserved for settlers from the State of Connecticut.

The discovery of coal by the community in the early 19th century paved the way for the Youngstown area's inclusion on the network of the famed Erie Canal. The Pennsylvania and Ohio Canal Company was organized in 1835, and the canal was completed in 1840. The arrival of the railroad in 1856 smoothed the path for further economic growth. Endowed with large deposits of coal and iron as well as "old growth" hardwood forests needed to produce charcoal, the Youngstown area eventually developed a thriving steel industry. The area's first blast furnace was established on the east of town in 1803 by James and Daniel Heaton. In time, the availability of fossil fuels contributed to the development of other coal-fired mills, including the Youngstown Rolling Mill Company, which was established in 1846. By the mid-19th century, Youngstown was the site of several iron industrial plants, notable David Tod's Brier Hill Iron & Coal Company. Between the 1920s and 1960s, the city was known as an important hub that featured the massive furnaces and foundries of such companies as Republic Steel and U.S. Steel. At the same time, Youngstown never became economically diversified, as did larger industrial cities such as Chicago, Pittsburgh, Akron, or Cleveland. Hence, when economic changes forced the closure of plants throughout the 1970s, the city was left with few substantial economic alternatives. The September 19, 1977, announcement of the closure of a large portion of Youngstown Sheet and Tube, an event still remembered by many Youngstowners as "Black Monday," is widely regarded as the death knell of the old area steel industry.

Youngstown is still the site of several steel and metalworking operations, though nothing on the scale seen during the "glory days" of the "Steel Valley." The largest current employer in the city is Youngstown State University (YSU), an urban public campus that serves about 15,000 students, located just north of downtown. The largest industrial employers within the Youngstown city limits are Vallourec Star Steel Company and Exal Corporation.

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Attractions in the Youngstown area include the Covelli Centre, the Butler Institute of American Art, the McDonough Museum of Art, The Clarence R. Smith Mineral Museum, Arms Family Museum of Local History, the Youngstown Historical Center of Industry and Labor, Mill Creek Park, Fellows Riverside Gardens, and a long tradition of semi-professional sports.

Village of Beloit

The Village of Beloit is located in the southwestern corner of Mahoning County in Smith Township, just to the east of Sebring Village. The village can be accessed using State Route 165 and 173. The Youngstown Belt Railroad which is owned by Norofolk Southern passes near the village.

Village of Craig Beach

The Village of Craig Beach is located in the northwestern corner of Mahoning County in Milton Township. The village has a total area of 1.7 square miles, of which, 0.9 square miles (55%) of it is land, and 0.8 square miles (45%) of it is water. Craig Beach Village along with Milton Township are known as the community of Lake Milton which is also an Ohio State Park. Craig Beach borders the lake on the northwest corner and includes the area known as the swim beach, the Lake Milton Dam, a boat ramp at Robinson Point, a large picnic/recreation area, a children's playground, basketball and volleyball courts, and the newest addition to the area the lake Milton Nature Arts amphitheater.

The City of Youngstown used the Mahoning River in the early 1900's as both an industrial and domestic water supply. However around 1906 the city started experiencing water shortages. They decided to create a reservoir upstream thus enabling them to have some control over the flow of the Mahoning River. Between 1911 and 1913, Youngstown was able to acquire 3,416 acres that would eventually become Lake Milton. The venture worked for Youngstown until 1925 when the water of the Mahoning River was labeled as unsafe for human consumption. In 1931 a group decided to form a municipality that would become known as Craig Beach Village. During WWII a guard was posted at the dam to ensure the nation's steel production was not interrupted. Over the next 40 years the United States Army Corp of Engineers and later the Ohio Department of Natural Resources (ODNR) oversaw inspections and upgrades to the dam to ensure its stabilization. In 1984 there was little doubt the dam was failing. The dam was breached in 1986 and lush green growth began to fill its bed. Youngstown relinquished control of the dam to the ODNR. They

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began construction of a new dam that was completed in 1988. Lake Milton was officially named Ohio's 72nd State Park in June of 1988.

Craig Beach can be accessed using Interstate 76 which runs east west to the south of the village, and State Route 534 which runs north south to the east of the village.

Village of Lowellville

Lowellville Village is located in eastern Mahoning County in Poland Township in the "Steel Valley" area of the northeast part of Ohio, southeast of Youngstown. The Village is an older, predominantly Italian-American, working-class community built along the banks of the Mahoning River in the foothills of the Alleghenies, and centered around the once productive Sharon Steel works.

Although settlers from the eastern United States arrived in Lowellville as early as 1800, the village was not platted until the 1830s, when talk of a canal in the Mahoning Valley inspired action. The Pennsylvania & Ohio Canal did not arrive until the 1840s, but it was modern transportation for its day and Lowellville was in place to make use of it. In the 1850s, limestone from Lowellville quarries was being used extensively throughout he Mahoning Valley thanks to the canal, and later to the railroad. Coal and iron ore were also abundant in the Lowellville hills and in the 1840s a blast furnace arrived from Pittsburgh, the first stack in the valley to burn bituminous coal as fuel. By 1900 the local supplies of coal and iron ore were fairly well depleted, but now Lowellville, which was not incorporated until 1890, could import the raw materials necessary for making iron via the railroad. After the 1900, the village's population grew markedly due both to the influx of immigrants to man the new Youngstown Sheet & Tube steel-making operation upstream in East Youngstown and to the new interurban electric line from Youngstown, thus connecting the village's industries with those of the rest of the valley's growing industrial district.

Village of New Middletown

The Village of New Middletown is located in southeastern Mahoning County in Springfield Township. New Middletown has a unique history that can be traced back nearly 200 years to 1820, the village was incorporated in 1972. The large class I dam of Evans Lake is located just to the west of the village. New Middletown can be accessed via Interstates 680, and 76, as well as U.S. Route 224; and State Routes 170 and 630.

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Village of Poland

The Village of Poland is located in eastern Mahoning County in Poland Township. The village can be accessed via I-680, U.S. Route 224, and State Routes 170 and 616. A large recreational lake, Lake Hamilton, is located just to the north and east of the village.

In 1796, Poland Township was the first charted township in the Connecticut Western Reserve. It was settled by people from Connecticut, who were given land grants in the northeastern portion of Ohio, of which Poland Township was the southeastern most portion, or Town One, Range One. The township was founded by Jonathan Fowler, who fell in love with Yellow Creek which flows through Poland. The Village of Poland was founded in 1866.

Village of Sebring

The Village of Sebring is located in the south western portion of Mahoning County in Smith Township, just to the west of Beloit Village. The main transportation routes that can be utilized to access Sebring include U.S. Route 62, and State Routes 165, and 173.

The Village of Sebring was founded by the Sebring brothers, a family from East Liverpool, Ohio. They owned and operated many pottery businesses. The Sebring family dreamed of building their own pottery town, one that would bear their name and stand as a memorial to their work and ideals. The Sebrings made frequent excursions through Ohio, Indiana, and Pennsylvania in search of a desirable site to build not only potteries but a new town. They finally decided upon an area in Mahoning County, 80 miles west of Pittsburgh and five miles east of Alliance. In April of 1898, work began on the factories, stores, and homes that would become known as “Sebring”.

The five beginning potteries employed approximately 3,300 workers. The pottery industry flourished for many years, and at one time Sebring was known as the “Pottery Capital of The World.” In 1912, Sebring became the site of a factory which produced a motor car, far ahead of its time. The Sebring Six was one of the first automobiles to be manufactured. The F.A. Sebring Community Center is maintained by the Parks and Recreation Board. It offers a wide range of activities and programs for young and old alike.

1.2.10 Asset Inventory

§201.6(c)(2)(ii)	[The risk assessment shall include a] description of the jurisdiction’s vulnerability of the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

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§201.6(c)(2)(ii)(A)	The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

This plan identifies potentially-vulnerable community assets such as critical facilities, critical infrastructure, historic properties, commercial/industrial facilities, etc. "Assets" contribute directly to the quality of life in the community as well as ensure its continued operation

Methodology

The assets on the inventory are types of facilities recommended for consideration in the *Local Hazard Mitigation Planning Handbook* (FEMA, 2013). The list of assets herein is the most current version of the initial asset inventory included in Mahoning County's original hazard mitigation plan. Thus, the methodology used to generate this version was simply via committee review and comment.

The steering committee categorized the facilities considered to be "assets" under the following headings (FEMA, 2013).

- **People:** Areas of greater population density as well as populations with unique vulnerabilities or diminished response and recovery capabilities. Examples include areas of concentrated populations, areas catering to tourist (i.e., visiting) populations, facilities housing or serving functional and access needs populations and facilities that provide health or social services.
- **Economy:** Important economic drivers specific to the community. Examples include major employers and commercial centers.
- **Built Environment:** Existing structures, infrastructure systems, critical facilities, and cultural resources. The following table includes examples of built environment categories.

BUILT ENVIRONMENT ASSETS				
High Potential Loss Facilities	*Infrastructure*	*Critical Facilities*	*Cultural Resources*	*Existing Structures*
• Nuclear power plants • Dams • Military & civil defense installations • Locations housing hazardous materials	• Water & wastewater • Power utilities • Transportation (roads, railways, waterways) • Communications systems/centers • Energy pipelines & storage	• Hospitals & medical facilities • Police & fire stations • Emergency operations centers • Evacuation shelters • Schools • Airport/heliports	• Historic assets • Museums • Unique geologic sites • Concert halls • Parks • Stadiums	• Commercial buildings • Industrial buildings • Single and multi-family residential buildings

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- **Natural Environment:** Resources that are important to community identity and quality of life in the community, as well as those that support the local economy through agriculture, tourism, and recreation. Examples include areas that can provide protective functions that reduce the magnitude of hazard events and critical habitat areas and other environmental features that are important to protect.

Asset Inventory

The following table lists Mahoning County's community assets, and the following map shows their locations graphically. Hazard profiles in Section 2.0 Risk Assessment reference the facilities from the table located in various hazard susceptibility areas.

MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Mahoning County Courthouse	120 Market Street	Youngstown	Government Bldg.	Critical Facility
Mahoning County Administrative Bldg.	21 West Boardman Street	Youngstown	Government Bldg.	Critical Facility
Mahoning County EMA	700 Industrial Road	Youngstown	Government Bldg.	Critical Facility
Austintown Twp. Hall	82 Ohltown Road	Austintown	Government Bldg.	Critical Facility
Beaver Twp. Hall	11999 South Avenue	North Lima	Government Bldg.	Critical Facility
Beloit Village Hall	17893 5th Street	Beloit	Government Bldg.	Critical Facility
Boardman Twp. Hall	8299 Market Street	Boardman	Government Bldg.	Critical Facility
Campbell City Hall	351 Tenney Avenue	Campbell	Government Bldg.	Critical Facility
Canfield City Hall	104 Lisbon Street	Canfield	Government Bldg.	Critical Facility
Canfield Twp. Hall	21 South Broad Street	Canfield	Government Bldg.	Critical Facility
Coitsville Twp. Hall	3737 McCartney Road	Lowellville	Government Bldg.	Critical Facility
Craig Beach Village Hall	2538 Grandview Road	Lake Milton	Government Bldg.	Critical Facility
Ellsworth Twp. Hall	11125 West Akron Canfield Road	Ellsworth	Government Bldg.	Critical Facility
Goshen Twp. Hall	14003 West South Range Road	Salem	Government Bldg.	Critical Facility
Green Twp. Hall	12184 Lisbon Road	Greenford	Government Bldg.	Critical Facility
Jackson Twp. Hall	10613 Mahoning Avenue	North Jackson	Government Bldg.	Critical Facility
Lowellville Village Hall	140 East Liberty Street	Lowellville	Government Bldg.	Critical Facility
Milton Twp. Hall	15992 Milton Avenue	Lake Milton	Government Bldg.	Critical Facility
New Middletown Village Hall	10711 Main Street	New Middletown	Government Bldg.	Critical Facility
Poland Village & Township Hall	308 South Main Street	Poland	Government Bldg.	Critical Facility
Sebring Village Hall	135 East Ohio Avenue	Sebring	Government Bldg.	Critical Facility
Smith Twp. Hall	846 North Johnson Road	Sebring	Government Bldg.	Critical Facility
Springfield Twp. Hall	3475 East South Range Road	Springfield	Government Bldg.	Critical Facility

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Struthers City Hall	6 Elm Street	Struthers	Government Bldg.	Critical Facility
Youngstown City Hall	26 South Phelps Street	Youngstown	Government Bldg.	Critical Facility
Austintown, Elementary School	245 Idaho Road	Austintown	Educational Facility	Critical Facility
Austintown, Intermediate School	225 Idaho Road	Austintown	Educational Facility	Critical Facility
Austintown, Middle School	700 South Raccoon Road	Austintown	Educational Facility	Critical Facility
Austintown, Fitch High School	4560 Falcon Drive	Austintown	Educational Facility	Critical Facility
Boardman, Market Street Elementary	5555 Market Street	Boardman	Educational Facility	Critical Facility
Boardman, Robinwood Elementary	835 Indianola Road	Boardman	Educational Facility	Critical Facility
Boardman, Stadium Drive Elementary	111 Stadium Drive	Boardman	Educational Facility	Critical Facility
Boardman, West Boulevard Elementary	6125 West Boulevard	Boardman	Educational Facility	Critical Facility
Boardman, Center Middle School	7410 Market Street	Boardman	Educational Facility	Critical Facility
Boardman, Glenwood Middle School	7635 Glenwood Avenue	Boardman	Educational Facility	Critical Facility
Boardman, Hight School	7777 Glenwood Avenue	Boardman	Educational Facility	Critical Facility
Campbell, Elementary School	2002 Community Circle	Campbell	Educational Facility	Critical Facility
Campbell, High School	280 Sixth Street	Campbell	Educational Facility	Critical Facility
Canfield, C.H. Campbell Elementary	300 Moreland Drive	Canfield	Educational Facility	Critical Facility
Canfield, Hilltop Elementary	400 Hilltop Boulevard	Canfield	Educational Facility	Critical Facility
Canfield, Middle School	42 Wadsworth Street	Canfield	Educational Facility	Critical Facility
Canfield, High School	100 Cardinal Drive	Canfield	Educational Facility	Critical Facility
Diocese of Ygn, St. Charles	7325 Westview Drive	Boardman	Educational Facility	Critical Facility
Diocese of Ygn, Holy Family	2731 Center Road	Poland	Educational Facility	Critical Facility
Diocese of Ygn, St. Nicholas	762 Fifth Street	Struthers	Educational Facility	Critical Facility
Diocese of Ygn, St. Christine	3125 South Schenley Avenue	Youngstown	Educational Facility	Critical Facility
Diocese of Ygn, St. Joseph the Provid	1145 Turin Avenue	Youngstown	Educational Facility	Critical Facility
Diocese of Ygn, Cardinal Mooney	2545 Erie Street	Youngstown	Educational Facility	Critical Facility
Diocese of Ygn, Ursuline High School	750 Wick Avenue	Youngstown	Educational Facility	Critical Facility
Diocese of Ygn, Ursuline Pre-School	4300 Shields Road	Canfield	Educational Facility	Critical Facility
Diocese of Ygn, ECLC-St. Joseph	4565 New Road	Austintown	Educational Facility	Critical Facility
Diocese of Ygn, ECLC-St. Luke	5225 South Avenue	Boardman	Educational Facility	Critical Facility
Jackson-Milton, Elementary School	14110 Mahoning Avenue	North Jackson	Educational Facility	Critical Facility
Jackson-Milton, Middle/High School	13910 Mahoning Avenue	North Jackson	Educational Facility	Critical Facility

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Lowellville, Elementary/Middle/High	52 Rocket Place	Lowellville	Educational Facility	Critical Facility
MCCTC	7300 North Palmyra Road	Canfield	Educational Facility	Critical Facility
MCESC	7320 North Palmyra Road	Canfield	Educational Facility	Critical Facility
Poland, McKinley Elementary	7 Elm Street	Poland	Educational Facility	Critical Facility
Poland, Dobbins Elementary	3030 Dobbins Road	Poland	Educational Facility	Critical Facility
Poland, North Elementary	361 Johnston Place	Poland	Educational Facility	Critical Facility
Poland, Union Elementary	30 Riverside Drive	Poland	Educational Facility	Critical Facility
Poland, Middle School	47 College Street	Poland	Educational Facility	Critical Facility
Poland, High School	3199 Dobbins Road	Poland	Educational Facility	Critical Facility
Sebring, Elementary School	506 West Virginia	Sebring	Educational Facility	Critical Facility
Sebring, Jr./Sr. High School	225 East Indiana Avenue	Sebring	Educational Facility	Critical Facility
South Range, Elementary/Middle/High	11300 Columbiana-Canfield Road	Canfield	Educational Facility	Critical Facility
Springfield, Elementary School	10580 Main Street	New Middletown	Educational Facility	Critical Facility
Springfield, Middle/High School	11335 Youngstown-Pittsburgh Road	New Middletown	Educational Facility	Critical Facility
Struthers, Elementary School	520 Ninth Street	Struthers	Educational Facility	Critical Facility
Struthers, Middle School	800 Fifth Avenue	Struthers	Educational Facility	Critical Facility
Struthers, High School	111 Euclid Avenue	Struthers	Educational Facility	Critical Facility
West Branch, Damascus Elementary	14405 Pricetown Road	Salem	Educational Facility	Critical Facility
West Branch, Knox Elementary	2900 Knox School Road	Alliance	Educational Facility	Critical Facility
West Branch, Middle School	14409 Beloit-Snodes Road	Beloit	Educational Facility	Critical Facility
West Branch, High School	14277 Main Street	Beloit	Educational Facility	Critical Facility
Western Reserve, Elem/Middle/High	13850 Akron-Canfield Road	Berlin Center	Educational Facility	Critical Facility
Youngstown, Paul C. Bunn Elem.	1825 Sequoya Drive	Youngstown	Educational Facility	Critical Facility
Youngstown, Harding Elementary	1903 Cordova Avenue	Youngstown	Educational Facility	Critical Facility
Youngstown, MLK Elementary	2725 Mariner Avenue	Youngstown	Educational Facility	Critical Facility
Youngstown, Kirkmere Elementary	2851 Kirk Road	Youngstown	Educational Facility	Critical Facility
Youngstown, McGuffey Elementary	310 South Schenley	Youngstown	Educational Facility	Critical Facility
Youngstown, Taft Elementary	730 East Avondale Avenue	Youngstown	Educational Facility	Critical Facility
Youngstown, Williamson Elementary	58 Williamson	Youngstown	Educational Facility	Critical Facility
Youngstown, Volney Middle School	2400 South Schenley	Youngstown	Educational Facility	Critical Facility
Youngstown, Wilson Middle School	2725 Gibson Street	Youngstown	Educational Facility	Critical Facility
Youngstown, Chaney High School	731 South Hazelwood Avenue	Youngstown	Educational Facility	Critical Facility

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Youngstown, East High School	474 Bennington Avenue	Youngstown	Educational Facility	Critical Facility
Youngstown, Choffin Career & Tech.	200 East Wood Street	Youngstown	Educational Facility	Critical Facility
Youngstown State University	One University Plaza	Youngstown	Educational Facility	Critical Facility
Calex Corporation	2415 Wilson Avenue	Campbell	Industry	Existing Structures
International Plastic Components	75 McCartney Road	Campbell	Industry	Existing Structures
Canfield Manufacturing Company	244 Railroad Street	Canfield	Industry	Existing Structures
Canfield Plastics	10670 Lisbon Road	Canfield	Industry	Existing Structures
Converse All Steel Services	450 West Main Street	Canfield	Industry	Existing Structures
Globex Corporation	3620 Stutz Drive	Canfield	Industry	Existing Structures
Mahoning County Sanitary Engineer	11020 North Kiwatoni Trail	Canfield	Industry	Existing Structures
Profile Energy Inc.	535 North Broad Street	Canfield	Industry	Existing Structures
Star FAB Inc.	6764 State Route 446	Canfield	Industry	Existing Structures
Steel FAB System	430 West Main Street	Canfield	Industry	Existing Structures
Industrial Welding & Installation Inc.	270 State Street	Struthers	Industry	Existing Structures
Youngstown Die Development Inc.	137 Walton Avenue	Struthers	Industry	Existing Structures
Canfield Industries	8510 Foxwood Court	Youngstown	Industry	Existing Structures
Covelli Centre	229 East Front Street	Youngstown	Industry	Existing Structures
Exal Corporation	1 Performance Plaza	Youngstown	Industry	Existing Structures
InfoCision Management	5740 Interstate Boulevard	Youngstown	Industry	Existing Structures
LabCorp Co.	1570 South Canfield Niles Road	Youngstown	Industry	Existing Structures
Mahoning Valley Economic Development	4319 Belmont Avenue	Youngstown	Industry	Existing Structures
Mahoning Valley Fabrications	3697Oakwood Avenue	Youngstown	Industry	Existing Structures
Norandex Inc.	519 North Meridian Road	Youngstown	Industry	Existing Structures
Paragon Plastics	5503 Tracy Drive	Youngstown	Industry	Existing Structures
Petrox Inc.	67 Poland Manor	Youngstown	Industry	Existing Structures
Salvation Army	6431 Mahoning Avenue	Youngstown	Industry	Existing Structures
V&M Star	2669 Martin Luther King Jr. Boulevard	Youngstown	Industry	Existing Structures
Wal-Mart	1300 Doral Drive	Youngstown	Industry	Existing Structures
Wesco Distribution Inc.	8431 South Avenue	Youngstown	Industry	Existing Structures
Youngstown Iron & Metal	100 Division Street	Youngstown	Industry	Existing Structures
Conti Corporation	527 West Wood Street	Lowellville	Industry	Existing Structures
Corcon Inc.	3763 McCartney Road	Lowellville	Industry	Existing Structures
Brunie Industrial Tooling	129 West Ohio Avenue	Sebring	Industry	Existing Structures
Austintown Police Department	92 Ohltown Road	Austintown	Law Enforcement	Critical Facility

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Beaver Police Department	601 West South Range Road	North Lima	Law Enforcement	Critical Facility
Boardman Police Department	8299 Market Street	Boardman	Law Enforcement	Critical Facility
Campbell Police Department	351 Tenney Avenue	Campbell	Law Enforcement	Critical Facility
Canfield Police Department	104 Lisbon Street	Canfield	Law Enforcement	Critical Facility
Coitsville Police Department	3711 McCartney Road	Lowellville	Law Enforcement	Critical Facility
Craig Beach Police Department	2538 Grandview Road	Lake Milton	Law Enforcement	Critical Facility
Goshen Police Department	14003 West South Range Road	Salem	Law Enforcement	Critical Facility
Jackson Police Department	10613 Mahoning Avenue	North Jackson	Law Enforcement	Critical Facility
Lowellville Police Department	140 East Liberty Street	Lowellville	Law Enforcement	Critical Facility
Mahoning County Sheriff's office	110 Fifth Avenue	Youngstown	Law Enforcement	Critical Facility
Mill Creek MetroPark Police	810 Glenwood Avenue	Youngstown	Law Enforcement	Critical Facility
Milton Police Department	15992 Milton Avenue	Lake Milton	Law Enforcement	Critical Facility
New Middletown Police Department	10711 Main Street	New Middletown	Law Enforcement	Critical Facility
Ohio State Highway Patrol, Canfield	500 South Broad Street	Canfield	Law Enforcement	Critical Facility
Poland Twp. Police Department	3339 Dobbins Road	Poland	Law Enforcement	Critical Facility
Poland Village Police Department	308 South Main Street	Poland	Law Enforcement	Critical Facility
Sebring Police Department	135 East Ohio Avenue	Sebring	Law Enforcement	Critical Facility
Smith Police Department	846 North Johnson Road	Sebring	Law Enforcement	Critical Facility
Springfield Police Department	3475 East South Range Rd	Springfield	Law Enforcement	Critical Facility
Struthers Police Department	6 Elm Street	Struthers	Law Enforcement	Critical Facility
Youngstown Police Department	116 West Boardman Street	Youngstown	Law Enforcement	Critical Facility
Youngstown State Police Department	266 West Wood Street	Youngstown	Law Enforcement	Critical Facility
Austintown Fire Dept, Station 1	384 North Niles-Canfield Road	Austintown	Fire	Critical Facility
Austintown Fire Dept, Station 2	4102 Mahoning Avenue	Austintown	Fire	Critical Facility
Austintown Fire Dept, Station 3	2650 South Raccoon Road	Austintown	Fire	Critical Facility
Austintown Fire Dept, Station 4	1690 South Turner Road	Austintown	Fire	Critical Facility
Beaver Fire Department	601 West South Range Road	North Lima	Fire	Critical Facility
Beloit Fire Dept, Station 1	17893 East 5th Street	Beloit	Fire	Critical Facility
Beloit Fire Dept, Station 2	13758 Beloit Snodes Road	Beloit	Fire	Critical Facility
Berlin Fire Department	15801 West Akron Canfield Road	Berlin Center	Fire	Critical Facility
Boardman Fire Dept, Station 71	136 Boardman-Poland Road	Youngstown	Fire	Critical Facility
Boardman Fire Dept, Station 73	1200 Shields Road	Boardman	Fire	Critical Facility
Boardman Fire Dept, Station 74	6169 South Avenue	Boardman	Fire	Critical Facility
Campbell Fire Department	351 Tenney Avenue	Campbell	Fire	Critical Facility
Cardinal Joint Fire District, Station 1	104 Lisbon Street	Canfield	Fire	Critical Facility

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Cardinal Joint Fire District, Station 2	7075 Herbert Road	Canfield	Fire	Critical Facility
Cardinal Joint Fire District, Station 3	500 Messerly Road	Canfield	Fire	Critical Facility
Coitsville Fire Department	424 North Hubbard Road	Lowellville	Fire	Critical Facility
Craig Beach Fire Department	1797 Grandview Road	Lake Milton	Fire	Critical Facility
Damascus Fire Dept, Station 1	14860 S.R. 534	Damascus	Fire	Critical Facility
Damascus Fire Dept, Station 2	11990 Stratton Road	Salem	Fire	Critical Facility
Ellsworth Fire Department	6034 South Salem Warren Road	Ellsworth	Fire	Critical Facility
Green Fire Department	12210 Lisbon Road	Greenford	Fire	Critical Facility
Jackson Fire Department	352 North Salem Warren Road	North Jackson	Fire	Critical Facility
Lowellville Fire Dept, Station 31	1 McGaffney Street	Lowellville	Fire	Critical Facility
Lowellville Fire Dept, Station 32	140 East Liberty Street	Lowellville	Fire	Critical Facility
Milton Fire Department	15980 Milton Avenue	Lake Milton	Fire	Critical Facility
New Middletown Fire Department	10711 Main Street	New Middletown	Fire	Critical Facility
Sebring Fire Dept, Station 1	135 East Ohio Avenue	Sebring	Fire	Critical Facility
Sebring Fire Dept, Station 2	80 South 15th Street	Sebring	Fire	Critical Facility
Springfield Fire Dept, Station 21	3989 East Middletown Road	New Springfield	Fire	Critical Facility
Springfield Fire Dept, Station 22	13775 Woodworth Road	New Springfield	Fire	Critical Facility
Springfield Fire Dept, Station 23	13885 Youngstown-Pittsburgh Road	Petersburg	Fire	Critical Facility
Struthers Fire Dept, Station 1	96 Elm Street	Struthers	Fire	Critical Facility
Struthers Fire Dept, Station 2	22 Frank Street	Struthers	Fire	Critical Facility
WRJFD, Station 91	111 South Main Street	Poland	Fire	Critical Facility
WRJFD, Station 92	7519 Youngstown-Pittsburgh Road	Poland	Fire	Critical Facility
WRJFD, Station 93	2040 South Hubbard Road	Lowellville	Fire	Critical Facility
Youngstown Fire Dept, Station 1	420 Martin Luther King Jr. Boulevard	Youngstown	Fire	Critical Facility
Youngstown Fire Dept, Station 2	125 West Indianola Avenue	Youngstown	Fire	Critical Facility
Youngstown Fire Dept, Station 3	579 North Belle Vista Avenue	Youngstown	Fire	Critical Facility
Youngstown Fire Dept, Station 6	1817 Shehy	Youngstown	Fire	Critical Facility
Youngstown Fire Dept, Station 7	141 Madison Avenue	Youngstown	Fire	Critical Facility
Youngstown Fire Dept, Station 9	1624 East Midlothian Boulevard	Youngstown	Fire	Critical Facility
Youngstown Fire Dept, Station 12	2251 McGuffey Road	Youngstown	Fire	Critical Facility
Youngstown Fire Dept, Station 15	2739 McCollum Road	Youngstown	Fire	Critical Facility
Akron Children's Hospital Mahoning Valley	6505 Market Street	Boardman	Medical	Critical Facility
Mahoning County District Board of Health	50 westchester Drive	Austintown	Medical	Critical Facility
Vibra Hospital of Mahoning	8049 South Avenue	Boardman	Medical	Critical Facility

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Valley				
Northside Medical Center	500 Gypsy Lane	Youngstown	Medical	Critical Facility
St. Elizabeth, Boardman	8401 Market Street	Boardman	Medical	Critical Facility
Saint Elizabeth, Youngstown	1044 Belmont Avenue	Youngstown	Medical	Critical Facility
The Surgical Hospital At Southwoods	7623 Market Street	Boardman	Medical	Critical Facility
Boardman WWTP	7980 East Parkside	Boardman	Infrastructure	Infrastructure
Campbell WWTP	4200 Wilson Avenue	Campbell	Infrastructure	Infrastructure
Campbell WTP	351 Tenney Avenue	Campbell	Infrastructure	Infrastructure
Consumer's Ohio Water Company	235 State Street	Struthers	Infrastructure	Infrastructure
Craig Beach/Lake Milton WTP	Grandview Road	Lake Milton	Infrastructure	Infrastructure
New Middletown WTP	1600 Pennsylvania Avenue	Salem	Infrastructure	Infrastructure
Sebring Village WTP	135 East Ohio Avenue	Sebring	Infrastructure	Infrastructure
Youngstown WWTP	725 Poland Avenue	Youngstown	Infrastructure	Infrastructure
Youngstown WTP	160 North West Avenue	Youngstown	Infrastructure	Infrastructure
Antonine Village	2675 N Lipkey Road	North Jackson	Nursing Home	Existing Structures
Assumption Village Nursing Home	9800 Market Street	North Lima	Nursing Home	Existing Structures
Austinwoods DBA Woodlands at Austinwoods	4780 Kirk Road	Austintown	Nursing Home	Existing Structures
Beeghley Oaks Nursing Center	6505 Market Street	Boardman	Nursing Home	Existing Structures
Briarfield at Ashley Circle	5291 Ashley Circle	Youngstown	Nursing Home	Existing Structures
Brookdale Austintown	1420 South Canfield-Niles Road	Austintown	Nursing Home	Existing Structures
Camelot Arms Care Center	2958 Canfield Road	Youngstown	Nursing Home	Existing Structures
Caprice Health Care	9184 Market Street	North Lima	Nursing Home	Existing Structures
Crandall Medical Center/Copeland Oaks	800 South 15th Street	Sebring	Nursing Home	Existing Structures
Dandridge Burgandi Manor	31 Maranatha Drive	Youngstown	Nursing Home	Existing Structures
Glenellen SLC	9661 Market Street	North Lima	Nursing Home	Existing Structures
Greenbriar, Commons	8060 South Avenue	Boardman	Nursing Home	Existing Structures
Guardian Health Care Center	1735 Belmont Avenue	Youngstown	Nursing Home	Existing Structures
Hampton Woods	1525 E Western Reserve Road	Poland	Nursing Home	Existing Structures
Heritage Manor	517 Gypsy Lane	Youngstown	Nursing Home	Existing Structures
Humility House	755 Ohltown Road	Austintown	Nursing Home	Existing Structures
Inn at Christine Valley	3150 South Schenley Avenue	Youngstown	Nursing Home	Existing Structures
Inn at Ironwood	6699 Ironwood Boulevard	Canfield	Nursing Home	Existing Structures
Ivy Woods Manor	9625 Market Street	North Lima	Nursing Home	Existing Structures
Levy Gardens	584 Granada Avenue	Youngstown	Nursing Home	Existing Structures
Maplecrest Nursing Home	400 Sexton Street	Struthers	Nursing Home	Existing Structures
Masternick Memorial Health	5250 Windsor Way	New Middletown	Nursing Home	Existing Structures

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Care Center				
Meridian Arms Living Center	650 South Meridian Road	Youngstown	Nursing Home	Existing Structures
Paisley House	1408 Mahoning Avenue	Youngstown	Nursing Home	Existing Structures
Park Vista Retirement Community	1216 Fifth Avenue	Youngstown	Nursing Home	Existing Structures
Pembrooke Place	850 East Midlothian Boulevard	Youngstown	Nursing Home	Existing Structures
Pinnacle Senior Care	7206 Market Street	Boardman	Nursing Home	Existing Structures
Senior Independence Home Health	6715 Tippecanoe Place	Canfield	Nursing Home	Existing Structures
Shepard of the Valley: Poland	301 West Western Reserve Road	Poland	Nursing Home	Existing Structures
Shepard of Valley: Boardman	7148 West Boulevard	Boardman	Nursing Home	Existing Structures
St. Mary's Alzheimer's Center	1899 West Garfield Road	Columbiana	Nursing Home	Existing Structures
Sterling House of Youngstown	2300 Canfield Road	Youngstown	Nursing Home	Existing Structures
Sunrise of Poland	335 West McKinley Way	Poland	Nursing Home	Existing Structures
The Renal Group	807 Southwestern Run	Youngstown	Nursing Home	Existing Structures
Valley Home Health Care	755 Boardman-Canfield Road, N-1	Boardman	Nursing Home	Existing Structures
Vista Care Center	830 Boardman-Canfield Road	Boardman	Nursing Home	Existing Structures
Windsor House at Omni Manor HCC	3245 Vestal Road	Youngstown	Nursing Home	Existing Structures
Beloit	13666 South Main Street	Beloit	Post Office	Existing Structures
Berlin Center	15401 West Akron Canfield Road	Berlin Center	Post Office	Existing Structures
Campbell	220 12th Street	Campbell	Post Office	Existing Structures
Canfield	44 North Broad Street	Canfield	Post Office	Existing Structures
Damascus	16098 West Salem Alliance Road	Damascus	Post Office	Existing Structures
Ellsworth	6036 South Salem Warren Road	Ellsworth	Post Office	Existing Structures
Lake Milton	17839 Mahoning Avenue	Lake Milton	Post Office	Existing Structures
Lowellville	10 East Liberty Street	Lowellville	Post Office	Existing Structures
New Middletown	10399 Main Street	New Middletown	Post Office	Existing Structures
New Springfield	13813 Grant Street	New Springfield	Post Office	Existing Structures
North Benton	9131 12th Street	North Benton	Post Office	Existing Structures
North Jackson	263 South Salem Warren Road	North Jackson	Post Office	Existing Structures
North Lima	11675 South Avenue	North Lima	Post Office	Existing Structures
Petersburg	6363 East Garfield Road	Petersburg	Post Office	Existing Structures
Sebring	196 West Ohio Avenue	Sebring	Post Office	Existing Structures
Struthers	195 South Bridge Street	Struthers	Post Office	Existing Structures
Austintown	6000 Mahoning Avenue, Suite 120	Austintown	Post Office	Existing Structures
Boardman	407 Boardman Canfield Road	Boardman	Post Office	Existing Structures
Cornersburg	3375 Canfield Road	Youngstown	Post Office	Existing Structures
North Side	1716 Guadalupe Avenue	Youngstown	Post Office	Existing Structures
Poland	125 West McKinley Way	Poland	Post Office	Existing Structures

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
West Side	2030 Mahoning Avenue	Youngstown	Post Office	Existing Structures
Youngstown Main (Downtown)	99 South Walnut Street	Youngstown	Post Office	Existing Structures
Main Library	305 Wick Avenue	Youngstown	Library	Existing Structures
Austintown Library	600 South Raccoon Road	Austintown	Library	Existing Structures
Boardman Library	7680 Glenwood Avenue	Boardman	Library	Existing Structures
Brownlee Woods Library	4010 Sheridan Road	Youngstown	Library	Existing Structures
Campbell Library	280 6th Street	Campbell	Library	Existing Structures
Canfield Library	43 West Main Street	Canfield	Library	Existing Structures
East Library	430 Early Road	Youngstown	Library	Existing Structures
Greenford Library	7441 West South Range Road	Greenford	Library	Existing Structures
Michael Kusalaba Branch Library	2815 Mahoning Avenue	Youngstown	Library	Existing Structures
Newport Library	3730 Market Street	Youngstown	Library	Existing Structures
Poland Library	311 South Main Street	Poland	Library	Existing Structures
Sebring Library	195 West Ohio Avenue	Sebring	Library	Existing Structures
Springfield Library	10418 Main Street	New Middletown	Library	Existing Structures
Struthers Library	95 Poland Avenue	Struthers	Library	Existing Structures
Tri-Lakes Library	13820 Mahoning Avenue	North Jackson	Library	Existing Structures
Alliance Clay Product Company	1500 South Mahoning Ave	Smith Township	Historic Location	Cultural Resources
Arlington Avenue District	373 Arlington Street	Youngstown	Historic Location	Cultural Resources
Austintown Log House	3797 South Raccoon Rd	Austintown Township	Historic Location	Cultural Resources
Baltimore & Ohio Railroad Terminal	530 Mahoning Avenue	Youngstown	Historic Location	Cultural Resources
Butler Institute of American Art	524 Wick Avenue	Youngstown	Historic Location	Cultural Resources
Central Tower Building	1 Federal Plaza West	Youngstown	Historic Location	Cultural Resources
Crandall Park Fifth Avenue Historic District	334 Tod Lane	Youngstown	Historic Location	Cultural Resources
First National Bank Building	6 Federal Plaza West	Youngstown	Historic Location	Cultural Resources
Forest Glen Estates Historic District	4349 Oak Knoll Drive	Boardman Township	Historic Location	Cultural Resources
Hopewell Furnace Site	149 Westmore Drive	Poland Township	Historic Location	Cultural Resources
Idora Park	2700 McFarland Avenue	Youngstown	Historic Location	Cultural Resources
Jones Hall at YSU	410 Wick Avenue	Youngstown	Historic Location	Cultural Resources
Lanterman Mill	1001 Canfield Road	Youngstown	Historic Location	Cultural Resources
Lowellville Railroad Station	49 River Road	Lowellville	Historic Location	Cultural Resources
Mahoning National Bank Building	23 Federal Plaza East	Youngstown	Historic Location	Cultural Resources
Mill Creek Park Historic District	960 Bears Den Road	Youngstown	Historic Location	Cultural Resources
Old Mahoning County Courthouse	7 Court Street	Canfield	Historic Location	Cultural Resources
Poland Center School	6499 Struthers Road	Poland Township	Historic Location	Cultural Resources

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MAHONING COUNTY ASSET LIST				
Name	*Address*	*City/Town*	*Type*	*DHS/FEMA Designation*
Realty Building	47 E Federal Street	Youngstown	Historic Location	Cultural Resources
Republic Iron & Steel Office Building	415 S Market Street	Youngstown	Historic Location	Cultural Resources
Frank Sebring House	385 West Ohio Avenue	Sebring Village	Historic Location	Cultural Resources
Stambaugh Building	44 East Federal Street	Youngstown	Historic Location	Cultural Resources
State Theater	213 Federal Plaza West	Youngstown	Historic Location	Cultural Resources
Warner Theater	260 West Federal Street	Youngstown	Historic Location	Cultural Resources
Wick Avenue Historic District	638 Wick Avenue	Youngstown	Historic Location	Cultural Resources
Youngstown Sheet & Tube Company Housing	239 Jackson Street	Campbell	Historic Location	Cultural Resources

The following page shows a map of the county and jurisdictional assets identified in the table above. Where appropriate, hazard profiles contain a list that identifies each asset that would be affected by a specific hazard; refer to Section 2.4 Hazard Profiles

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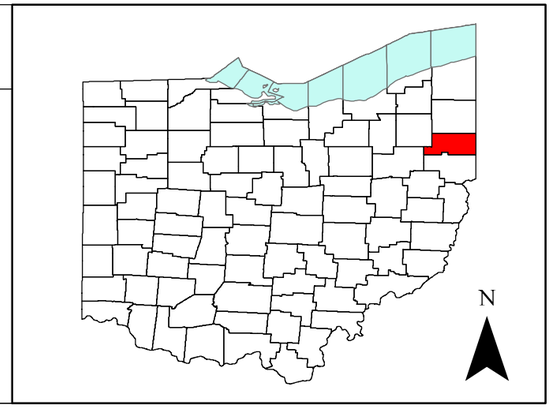
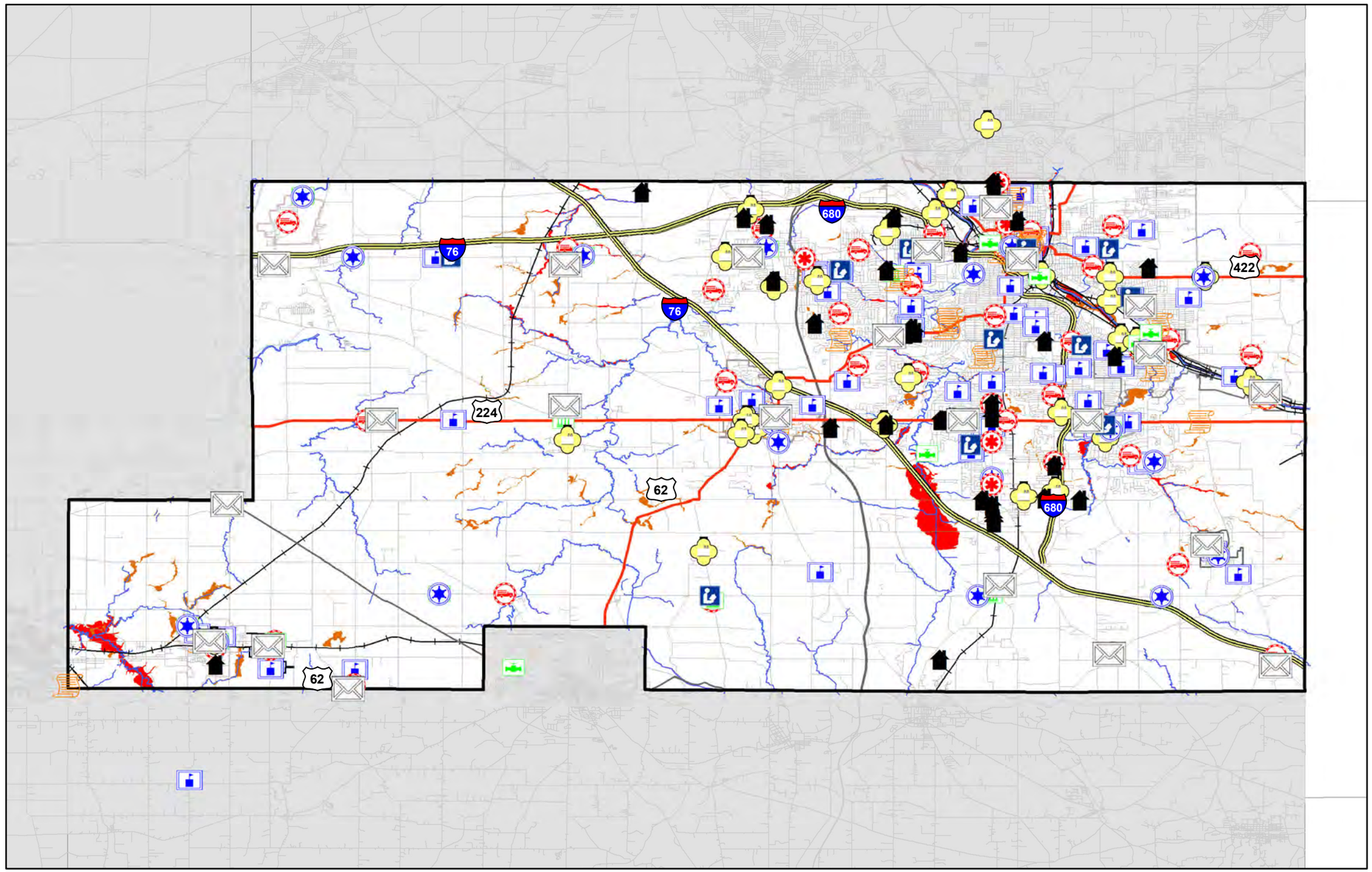
MAHONING COUNTY HAZARD MITIGATION PLAN

Asset Inventory Map

Data Source(s):
MCEMA, Planning Committee Input

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.





Mahoning Co. Assets

- Educational Facility
- Fire Station
- Government Building
- Historic Location
- Industry
- Infrastructure
- Law Enforcement
- Library
- Medical
- Nursing Home
- Post Office

1.2.11 Disaster Declarations

When a hazard incident occurs in a state, and the capabilities exceed those of the state, after the preliminary damage assessment, the Governor can request that the President declare an emergency or a disaster.

- **Emergency Declarations**: The President can declare an emergency for any occasion or instance when the President determines federal assistance is needed. Emergency declarations supplement State and local or Indian tribal government efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lessen or avert the threat of a catastrophe in any part of the United States. The total amount of assistance provided for in a single emergency may not exceed $5 million. If the emergency exceeds this amount, the President shall report to Congress.
- **Major Disaster Declarations**: The President can declare a major disaster for any natural event if the damage is of such severity that it is beyond the capabilities of state and local governments to respond. These can include any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, fire, flood, or explosion. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work. Assistance available under a major disaster declaration includes individual, public, and hazard mitigation.

The following table summarizes the disaster declarations that included Mahoning County since 1990. There have been no disaster declarations in the county since 2005 (FEMA). For detailed information on the events for each declaration, refer to the hazard profiles in Section 2.4 Hazard Profiles.

DISASTER DECLARATIONS IN MAHONING COUNTY				
Declaration Number	*Event Type Declaration*	*Dates of Event*	*Events in Mahoning County (NCEI)*	*Public (P) or Individual (I) Assistance*
DR-870	Severe storm, tornadoes, and flooding	May 28, 1990 – July 15, 1990	Thunderstorm wind	N/A
DR-951	Severe storms, tornadoes, flooding	July 12, 1992 – August 1, 1992	Thunderstorm wind	N/A
DR-1478	Severe storms and flooding	July 4, 2003 – July 11, 2003	Thunderstorm wind and hail	$1,980,992.81 approved (I)

DISASTER DECLARATIONS IN MAHONING COUNTY				
Declaration Number	*Event Type Declaration*	*Dates of Event*	*Events in Mahoning County (NCEI)*	*Public (P) or Individual (I) Assistance*
DR-1484	Severe storms, tornadoes, and flooding	July 21, 2003 – August 25, 2003	Thunderstorm wind, tornado, flood, and flash flood	$74,781,195.51 approved (I)
DR-1519	Severe storms and flooding	May 18, 2004 – June 21, 2004	Thunderstorm wind, flash flood, and hail	$19,193,921.30 approved (I) $ 10,647,960.09 approved (P)
DR-1556	Severe storms and flooding	August 27, 2004 – September 27, 2004	Hail, flood, flash flood, and strong wind	$23,662,227318 approved (I)

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1.3 CAPABILITIES

§ 201.6(b)(3)	Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

1.3.1 Existing Plans and Ordinances

Mahoning County itself and the municipalities therein have a number of capabilities that can support mitigation efforts including comprehensive plans, building codes, subdivision and land use ordinances, zoning ordinances, and floodplain regulations. The county's consultant worked through the steering committee members with jurisdictional representatives to complete a "capabilities assessment." Representatives answered questions about the following plans, codes, and ordinances from the perspectives of their home jurisdictions.

Comprehensive Plans

Comprehensive plans promote sound land use and regional cooperation among local governments to address planning issues. These plans serve as the official policy guide for influencing the location, type, and extent of future development by establishing the basic decision-making and review processes on zoning matters, subdivision and land development, land uses, public facilities, and housing needs over time.

Building Codes

Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can be adopted that require resistant or resilient building design practices to address hazard impacts common to a given community.

Subdivision and Land Use Development Ordinances

Subdivision and land development ordinances (SALDOs) are intended to regulate the development of housing, commercial, industrial or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and size of roads and the location of infrastructure can reduce exposure of development to hazard events.

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Zoning Ordinances

Zoning ordinances allow for local communities to regulate the use of land in order to protect the interests and safety of the general public. Zoning ordinances can address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development and/or require land development to consider specific hazard vulnerabilities.

National Flood Insurance Program (NFIP) Participation and Floodplain Management Ordinances

Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures located in the floodplain are flood-proofed, dry-proofed, or built above anticipated flood elevations. Floodplain ordinances may also prohibit development in certain areas altogether. The National Flood Insurance Program (NFIP) establishes minimum ordinance requirements which must be met in order for that community to participate in the program. However, a community is permitted and encouraged to adopt standards which exceed NFIP requirements.

The following table summarizes the jurisdictional capabilities of Mahoning County according to the completed online surveys.

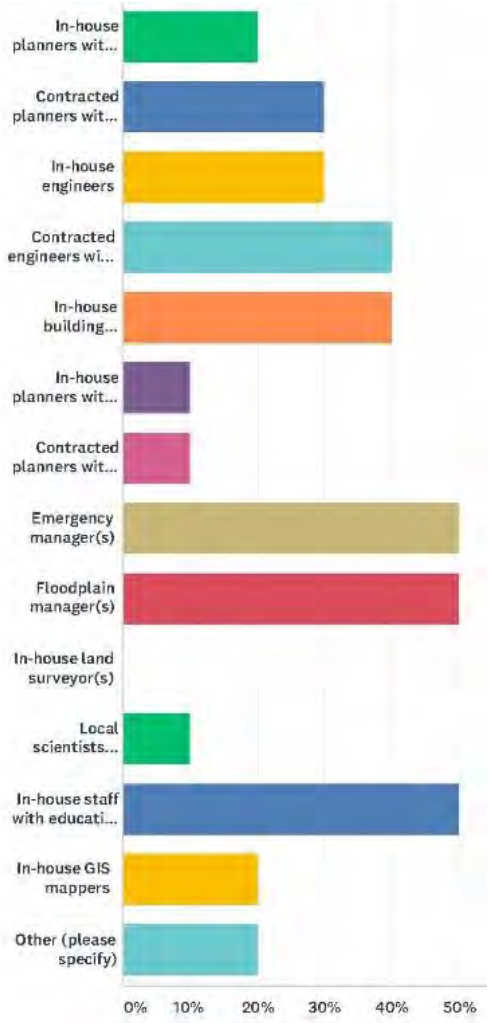
JURISDICTIONAL CAPABILITIES							
Jurisdiction	*Comprehensive Plan*	*Building Codes*	*Subdivision or Land Use Ordinance*	*Zoning Ordinance*	*Participates in the NFIP*	*Capital Budget Funds for Mitigation Projects*	*Public Works Budget for Mitigation projects*
Mahoning County	Yes	Yes	Yes	No	Yes	No†	No†
Campbell	Unknown	Yes	Yes	Yes	Yes	Unknown	Unknown
Canfield	Yes	Yes	Yes	Yes	Yes	No	No
Struthers	No	No	No	Yes	Yes	No	No
Youngstown	Unknown	Yes	Yes	Yes	Yes	No	No
Beloit	No	No	No	No	No	No	No
Craig Beach	Unknown	Yes	Yes	Yes	Yes	Unknown	Unknown
Lowellville	Unknown	Yes	Yes	Yes	Yes	Unknown	Unknown
New Middletown	Unknown	Yes	No	Yes	Yes		
Poland	Unknown	Yes	Unknown	Yes	Yes	No†	Yes∞
Sebring	No	Yes	Yes	Yes	Yes	No	No

† No, but willing to consider for future projects
∞ Limited or would be comprised of in-kind services

1.2.2 Capability Assessment

Administrative and Technical Capability

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise to effectively execute mitigation activities.



The online capabilities survey that each jurisdiction answered asked about the types of specialized staff the jurisdiction has access to. The graph to the right shows the results from all the respondents. The options included in-house planners with knowledge of land development/management practices, contracted planners with knowledge of local land development/management practices, in-house engineers, contracted engineers with intimate local knowledge, in-house building inspectors, in-house planners with an understanding of natural and/or human-caused hazards, contracted planners with an understanding of local natural and/or human-caused hazards, emergency manager(s), floodplain manager(s) in-house land surveyor(s), local scientists familiar with hazards in the community, in-house staff with education or expertise to assess vulnerability to hazards, in-house GIS mappers, or other types of personnel. Other responses included having no funds, and equipment to quickly attempt to help with emergency situations.

According to the survey, 50% of the jurisdictions have emergency managers, floodplain managers, and in-house staff with education or expertise to assess vulnerability to hazards, while no jurisdiction indicated having in-house land surveyors.

Fiscal Capability

The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of local financial resources. While some mitigation actions are

less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Federal programs which may provide financial support for mitigation activities include, but are not limited to:

- Community Development Block Grant (CDBG),
- Disaster Housing Program,
- Emergency Conservation Program,
- Emergency Management Performance Grants (EMPG),
- Emergency Watershed Protection Program,
- Hazard Mitigation Grant Program (HMGP),
- Flood Mitigation Assistance Program,
- Non-Insured Crop Disaster Assistance Program,
- Pre-Disaster Mitigation Program,
- Repetitive Flood Claims Program (RFC),
- Section 108 Loan Guarantee Programs,
- Severe Repetitive Loss (SRL) Program, and
- Weatherization Assistance Program.

State programs that may support mitigation include (but are not limited to):

- Ohio Department of Development (job ready sites and CDBG funds for economic development),
- Ohio Department of Natural Resources (land and water conservation efforts),
- Ohio Environmental Protection Agency (loans and capital improvements), and
- Ohio Emergency Management Agency (funds to support emergency preparedness, response, and overall resilience).

Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to mitigate hazard events. The adoption of hazard mitigation measures may be seen as an impediment to growth and economic development. In many cases, mitigation may not generate interest among local officials when compared with competing priorities. Therefore, the local political climate must

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be considered when designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing the adoption or implementation of specific actions.

Self-Assessment

Representative members of the jurisdictions completed a self-assessment for their jurisdiction to serve as representative capabilities within the region to effectively implement hazard mitigation activities. As part of this process, the county consultant encouraged members to consider barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as high, moderate, or limited. The following table summarizes the results of the self-assessment survey as a percentage of the eight responses received.

CAPBILITY SELF-ASSSESSMENT			
Capability	*High*	*Moderate*	*Limited*
Planning & Regulatory	0%	0%	0%
Administrative & Technical	40%	30%	30%
Fiscal	0%	50%	50%
Political	11.11%	44.44%	44.44%

The 2018 self-assessment also included four questions to gauge community receptiveness to several types of mitigation strategies. The following table details the results.

SELF-ASSSESSMENT: PROJECT CONSIDERATIONS					
Sample Mitigation Strategy	*Very Willing*	*Willing*	*Neutral*	*Unwilling*	*Very Much Unwilling*
XYZ community guides development away from known hazard areas.	11.11%	33.33%	55.55%	0%	0%
XYZ community restricts public investments or capital improvements within hazard areas.	0%	33.33%	66.66%	0%	0%
XYZ community enforces local development standards (e.g., building codes, floodplain management ordinances, etc.) that go beyond minimum state or federal requirements.	11.11%	33.33%	55.56%	0%	0%
XYZ community offers financial incentives (e.g., through property tax credits) to individuals and businesses that employ resilient construction techniques (e.g., voluntarily elevate structures, employ landscape designs that establish buffers, install green infrastructure elements, etc.).	11.11%	11.11%	77.78%	0%	0%

1.3.2 Studies, Reports, and Technical Information

The research conducted for the development of this plan included data from federal, state, and higher education studies, reports and technical information. Specific sources relative to individual hazards are listed in Appendix 5 Citations.

The consultant reviewed a number of existing plans and reports to (a) identify any obvious inconsistencies between other development and mitigation efforts, (b) as baseline information for such sections as Analyzing Development Trends, and (c) to support discussions surrounding mitigation projects. Those documents included the following.

REFERENCED DOCUMENTS		
Document Type	*Document Citation*	*How Incorporated into Plan*
Technical Information	USDHS FEMA. (June, 2016). *National Mitigation Framework.* Federal Government: Washington, DC	Used as general guidance on mitigation planning.
Technical Information	USDHS FEMA. (May, 2005). *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. Federal Government: Washington, D.C.	Used as general guidance for incorporating historic property and cultural protection.
Technical Information	USDHS FEMA. (March, 2013). *Local mitigation planning handbook.* Federal Government: Washington, D.C.	Used as general guidance on revised mitigation planning process
Technical Information	USDHS FEMA. (March, 2013). *Integrating Hazard Mitigation Into Local Planning.* Federal Government: Washington, D.C.	Used as general guidance on existing plan integration for hazard mitigation
Plan	Eastgate Regional Council of Governments (2018). *2040 Metropolitan transportation plan update*. Regional organization: Youngstown, OH.	Used for guidance on development trends and background information on Mahoning County
Plan	Mahoning County Planning Commission (2016). *Development and land use plan 2016-2026*. County Government: Youngstown, OH.	Used for guidance on development trends and background information on Mahoning County
Plan	Mahoning County Emergency Management Agency (2010). *Emergency Operations Plan*. County Government: Youngstown, OH.	Used for guidance on capabilities in Mahoning County
Plan	City of Youngstown (2010). *Youngstown 2010 Citywide Plan*. Local Government: Youngstown, OH.	Used for guidance on development trends and background information on Mahoning County
Plan	Eastgate Regional Council of Governments (May, 2015). *Yellow Creek Watershed Action Plan*. Regional organization: Youngstown, OH.	Used for guidance on development trends and background information on Mahoning County
Informational brochure	Eastgate Regional Council of Governments (n.d.). *The Mahoning River of Opportunity.* Regional organization: Youngstown, OH.	Used for guidance on development trends and background information on Mahoning County
Plan	Eastgate Regional Council of Governments (2018). Interface Comprehensive Economic Development Strategy. Regional Organization: Youngstown, OH	Used for guidance on development trends and background information on Mahoning County

1.4 TRENDS AND PROJECTIONS

§ 201.6(c)(2)(ii)(c)	Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

1.4.1 Population

Demographic information is an integral part of community and mitigation planning. Awareness of changes in population projections helps decision makers anticipate needs before they arise. Mahoning County's population has been declining since the 1970's. This decline can be attributed partially to the county's location in the nation's former industrial belt, and one of its economic foci was steel manufacturing. Industrial and extractive industries were important in the development of the county. Underneath the county surface, there are coal, limestone and clay mines. Steel and other related industries were the driving factors behind Mahoning County's economy.

The table to the right lists the Ohio Department of Development population projections for Mahoning County in 2020, 2030, and 2040; these are lower than the projections from five years ago.

MAHONING COUNTY POPULATION PROJECTIONS

Year	*Percent increase/decrease over Year 2010 Population*	*Population Projections*
2020	-5.92%	224,680
2030	-11.13%	212,240
2040	-15.15%	202,630

The highest concentration of residents lives in the cities of Struthers, Campbell, and Youngstown. Several large townships also have high population concentrations including Boardman, Coitsville, and Poland. The most heavily populated area is the urbanized northeastern portion of the county. The southern and western rural areas are less densely populated; however, unincorporated areas account for approximately 44% of the county's total population. The population density within what is termed "rural area" can vary significantly as well. For instance, subdivision or unincorporated communities may include clusters of persons and homes that result in very small, dense areas located sporadically throughout rural Mahoning County.

1.4.2 Economic and Business Development

Mahoning County contains the governmental, educational, cultural, and employment center of Youngstown. Mahoning County has a diverse economic base from its history as a steel and manufacturing hotspot and continues to benefit from its strategic logistical location.

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However, the region has experienced long-term economic distress, including pockets of high unemployment and low per-capita income compared to state and national levels (Eastgate, 2018).

The City of Youngstown and the Office of Community Planning and Economic Development (CPED) actively develop business and industrial parks in the region with competitive incentives. A Community Reinvestment Area (CRA) is a targeted area of land designated by the City of Youngstown on which property owners can receive tax incentives for constructing new or renovating existing buildings. The CRA Program permits municipalities, townships, or counties to designate areas where investment has been lagging to encourage revitalization of the existing housing stock and the development of new structures; residential, commercial, and industrial projects are all eligible (City of Youngstown, n.d.).

Throughout the years, CPED has begun and/or completed a variety of projects. Information is available on their website and includes some of the following projects. The following table outlines only projects that explicitly describe creating five or more new jobs.

DEVELOPMENT CREATING JOBS IN YOUNGSTOWN			
Project Name	*Project Description*	*Investment*	*Jobs Created*
Empyra.com, Inc. (2012)	Local software development and consulting company	$582,000	8 new full-time jobs
Green Haines Sgambati Co., LPA (2012)	Consolidate and relocate its existing Austintown and Wick Avenue office.	$115,000	Retain 17 Youngstown positions and relocate 15 employees to the City
Iron City Wood Products, Inc.	Relocate their operations and renovate the existing building to construct a manufacturing/warehousing facility.	$900,000	Relocate 43 employees to the City of Youngstown and hire 14 new full-time jobs
SKA Limited, LLC of Nevada (2012)	A new upscale pub	$264,000	4 full-time jobs and 18 part-time jobs within three years.
Dooney's Downtown, LLC dba Warehouse 50 (2013)	Expansion of their business.	$112,561	22 new jobs within three years
Hudson Fasteners, Inc. (2013)	Expansion of their business	$256,217	5 new full-time employees within three years
Potential Development Program, Inc. (2013)	Expansion of their business.	$365,750	30 full-time jobs within three years
Team Steel Fabricators, LLC (2013)	Expansion of their business	$143,283	9 full-time jobs within three years
The Learning Egg (2013)	Expansion of their business	$514,750	32 new full-time jobs within three years
VB Companies, LLC dba Hot Head Burritos (2013)	Façade Renovation	$20,353	20 new jobs over 3 years
DNV Energy, LLC (2014)	expansion of their business with the purchase of new equipment	$1,149,927	11 new jobs within three years

DEVELOPMENT CREATING JOBS IN YOUNGSTOWN			
Project Name	*Project Description*	*Investment*	*Jobs Created*
Saleskatz, Inc. (2014)	Purchase of new equipment, development of new software, and additional staff	$577,500	40 new jobs within three years
Suzie's Dogs and Drafts, LLC (2014)	Demolition and replacement of existing façade; installation of sectional doors, relocation of the front entry door, installation of exterior ceramic tile and trim, and installation of new window sills	$53,396,00	42 new jobs within three years
The Happy Campers Learning Center, LLC (2014)	Renovation of the existing structure	$86,089.00	5 new jobs within three years
M. J. Joseph Development Corporation (2015)	Build a beverage and technology complex in Youngtown that will produce the world's first and only self-chilling beverage can	$20,000,000	257 new jobs
Noble Creature Cask House, LLC (2015)	Convert the existing building into a Micro-Brewery	$123,000	6 new jobs within 3 years
Youngstown Edison Incubator Corporation (2015)	Acquire and renovate the building	$5,100,000	Retain 12 positions and create 5 new jobs
Youngstown Stambaugh Hotel, LLC (2015)	Historic renovation of the Stambaugh Building into a 134 room Doubletree Hotel	$25,750,000	25 new jobs within the first 12 months

Source: City of Youngstown CPED

The Ohio Development Services Agency (ODSA) recognizes eleven target industries important for the state's economic future. The industries are advanced manufacturing, automotive, food processing, logistics, and polymers and chemicals (Eastgate, 2018). The Community Economic Development Strategy (CEDS) (2018) plan outlines various projects that are vital to the economic development of Mahoning, Trumbull, and Ashtabula Counties. Specifically, the goal is to "move the needle" on the six defined themes of economic competitiveness in the region: workforce/training and education; innovation and entrepreneurship; access to capital; infrastructure and site development; industry and business climate; and quality of life and community vitality (Eastgate, 2018).

According to the *2040 Metropolitan Transportation Plan Update* (Eastgate, 2018), a plan which includes Mahoning and Trumbull Counties, a program called the Travel Demand Model inputs projections provided by ODSA to determine where people may reside and work over a twenty-year horizon. Locations for where people may live and/or work are divided into four zones: Central Business District (CBD), Urban, Suburban, and Rural. Given the overall decline in population, except for CBDs, each of the zones will see a further decline in residents and jobs over the projected twenty-year horizon. The number of jobs is

forecasted to incrementally grow in the areas of utilities and primary metal manufacturing. Presently, Utilities are in Niles, Weathersfield, and Youngstown. primary metal manufacturing is located along the Mahoning River Corridor and in Lordstown.

1.4.3 Transportation

The *2040 Metropolitan Transportation Plan Update* (Eastgate, 2018) provides recommended strategies and projects to maintain and develop the region's transportation system through 2040. The plan includes Mahoning and Trumbull Counties, therefore, the data presented herein includes information for both counties.

In 2000, the urban area was 146,667 acres and in 2010 it was 155,632 acres. Despite a population decline of over 34,000 people during these ten years, the urban area expanded by 8,965 acres, or 6%. An increased urban area and decreased population not only depicts sprawl but important issues such as expanding infrastructure with limited population growth. This development pattern has led to many negative externalities, including increased reliance on driving, a drastic reduction in open space and agricultural land, detrimental impacts to air and water quality, and increased need for infrastructure and services across a larger footprint (Eastgate, 2018).

It is important to understand how the population of the county moves from day to day. According to the plan, using Longitudinal Employer-Household Dynamics (LEHD) data, between 2004 and 2014 the distance that people traveled for work increased. Between 2004 and 2014, the number of people that traveled less than ten miles for work decreased by 5.1%. The number of people that commute more than fifty miles each way increased by 2.2%. More people that live in the region are traveling further for employment than in years prior, in part, due to the local economy. Another reason people are travelling further is that because of limited congestion and shorter than average commute times, it is easier to travel long distances in less time than other metropolitan regions.

All of the above data is background information for the past and current situation; it is necessary to analyze that information and provide solutions to problems in the community relating to transportation. According to the *2040 Metropolitan Transportation Plan Update* (Eastgate, 2018), currently programmed projects for the 2018-2022 period in Mahoning County include improving intersections and bikeways, building sidewalks, widening roads, repairing bridges, and installing curbs and gutter drainage systems in various locations.

1.4.4 Land Use

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The *Mahoning County Development and Land Use Plan 2016 – 2026* describes the concept for growth of the majority of the townships in Mahoning County. Mainly, the townships aim to maintain their existing land uses by limiting or encouraging the development of businesses and residential areas in certain regions. The following table briefly outlines select objectives about future land use for the townships.

LAND USE PROJECTS IN THE TOWNSHIPS	
Township	*Objectives*
Austintown Township	• Redeveloping existing commercial corridors using smart growth techniques • Preserving existing low-density residential neighborhood and promote future low-density residential development
Beaver Township	• Retaining and protecting the agricultural and rural character • Establishing residential areas at densities that are consistent with the township's ability to provide essential services and carrying capacity of the natural environment • Promote land use practices that contribute to the preservation and improvement of the environmental quality of the watersheds
Berlin Township	• N/A
Boardman Township	• Encourage well-planned light industry and development of industrial parks, so that the integrity of the surrounding land uses are not destroyed
Canfield Township	• Discourage ribbon or strip highway commercial development
Coitsville Township	• Discourage ribbon or strip highway commercial development
Ellsworth Township	• Encourage business and industry within defined areas
Goshen Township	• N/A
Green Township	• Discourage ribbon or strip highway commercial development
Jackson Township	• Encourage land management techniques that serve to protect agricultural land • Encourage well-planned light industry and the development of industrial parks, so that the integrity of surrounding land uses are not destroyed
Milton Township	• Discourage ribbon or strip highway commercial development
Poland Township	• Encourage commercial centers • Encourage well-planned light industry and the development of industrial parks, so that the integrity of surrounding land uses are not destroyed
Smith Township	• Encourage land management techniques that serve to protect agricultural land • Encourage well-planned light industry and the development of industrial parks, so that the integrity of surrounding land uses are not destroyed
Springfield Township	• N/A

Source: Mahoning County Development and Land Use Plan 2016 - 2026

1.4.5 Planned Development and Hazard Areas

When planning for new development, it is vital to consider the areas where new development will be located to avoid damages from hazardous events in the future. In Mahoning County, the cities and villages plan to expand their transportation, commerce, and residential areas; to that end, the Mahoning County Planning Commission has developed a map where development is planned in the near future. The following page shows a map of these development areas.

It is important, then, to understand where the hazards identified in this plan affect the planned development areas. To illustrate this, three maps will show the juxtaposition of the planned development locations (residential, commercial, and industrial) and the hazard areas for mine subsidence, where underground mines are located throughout the county, floodplains, and the soils in the county that are prone to subsidence.

Planners chose to show these three hazards because they are site-specific hazards with known risk areas that developers can explicitly plan for; the effects of weather events such as tornadoes, hail, and severe winter storms and human-caused events such as violent disturbances, are widespread and can be unpredictable and therefore planners should always consider the non-site specific hazards.

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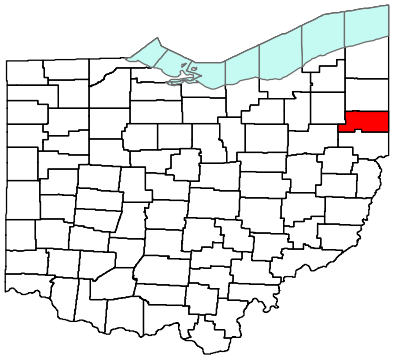
MAHONING COUNTY HAZARD MITIGATION PLAN

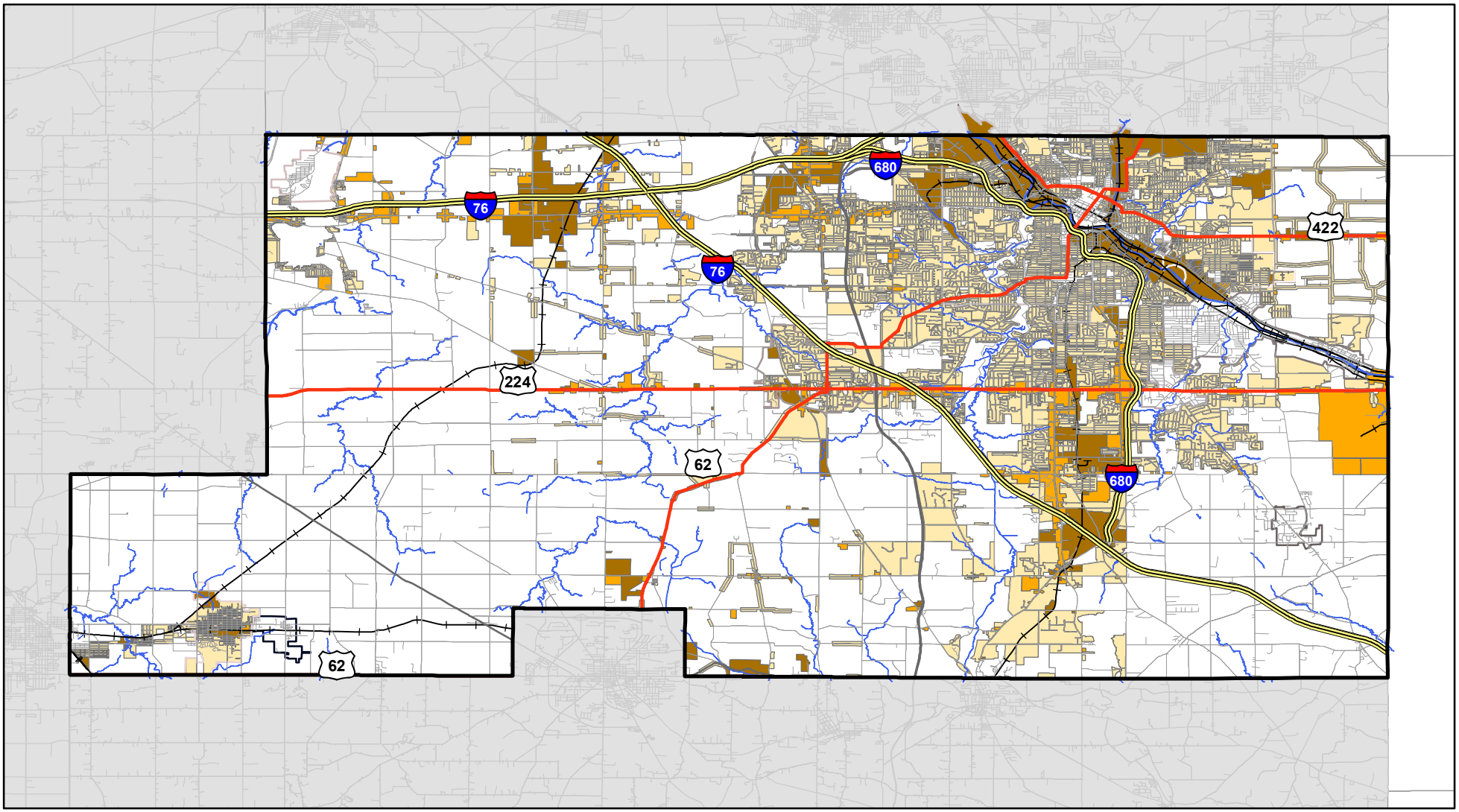
Planned Development Map

Data Source(s):
Mahoning County Planning Commission

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

- Zoned Business/Commercial
- Zoned Industrial/Manufacturing
- Zoned Residential





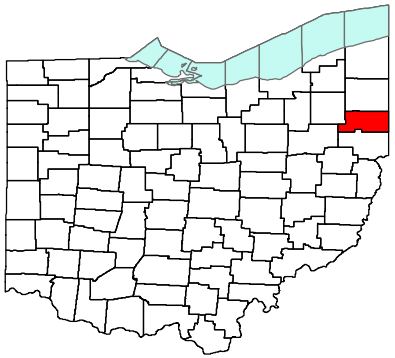
MAHONING COUNTY HAZARD MITIGATION PLAN

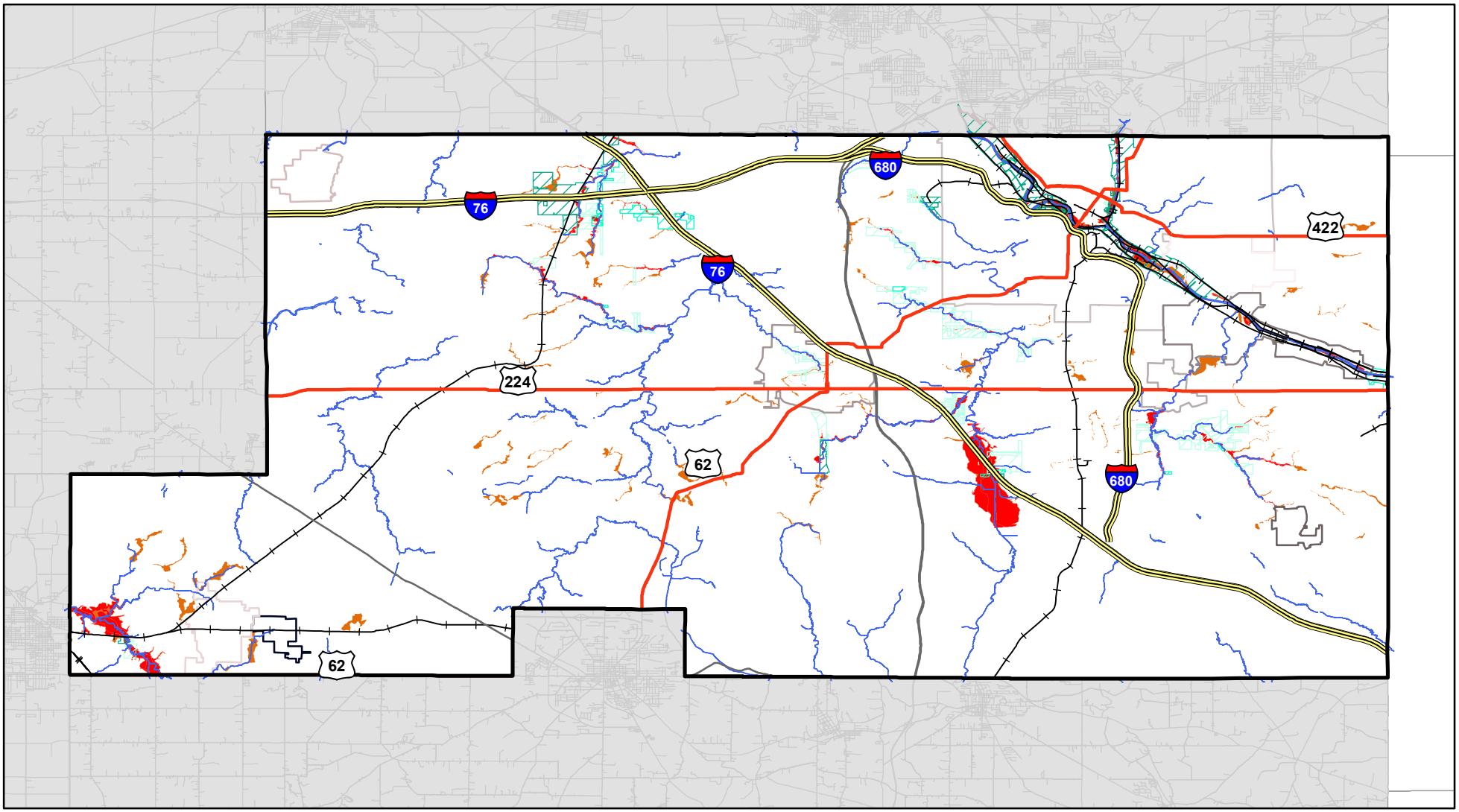
Planned Development -
Special Flood Hazard Areas Overlay

Data Source(s):
DHS/FEMA, Mahoning County Planning Commission

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

- Ind./Man. w/ Flood
- Business/Commercial w/ Flood
- Residential w/ Flood
- High Risk (100-yr)
- Medium Risk (500-yr)





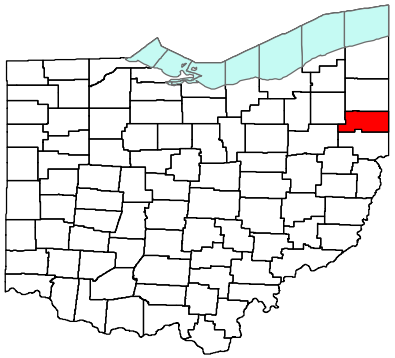
MAHONING COUNTY HAZARD MITIGATION PLAN

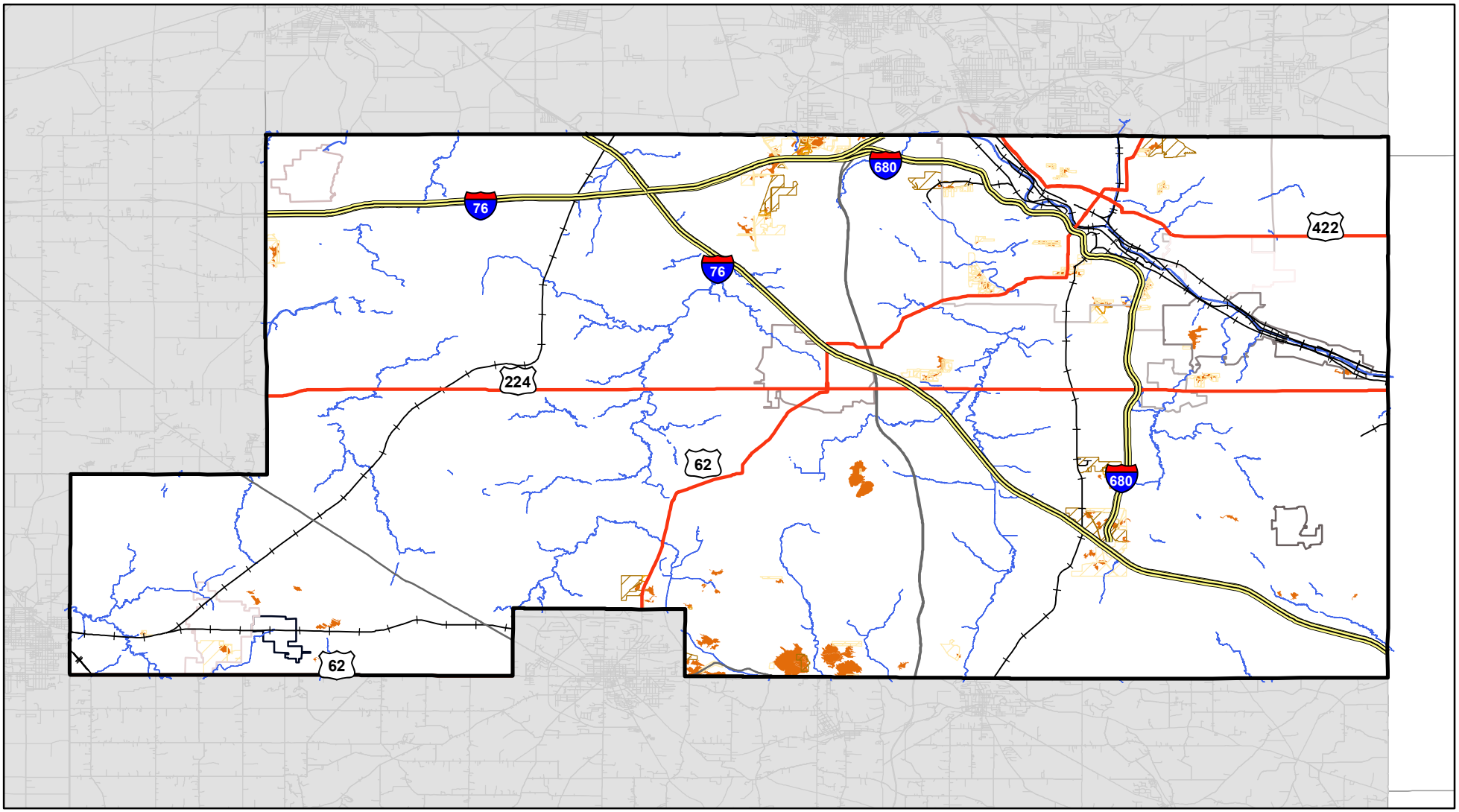
Planned Development - Abandoned Mines Overlay

Data Source(s):
Mahoning County Planning Commission, ODNR

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

- Residential w/ Abandoned Mines
- Business/Commercial w/ Abandoned Mines
- Ind./Man. w/ Abandoned Mines
- Abandoned Mine Areas





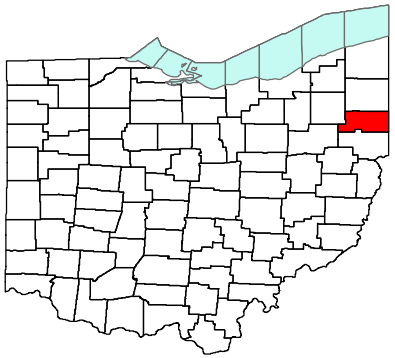
MAHONING COUNTY HAZARD MITIGATION PLAN

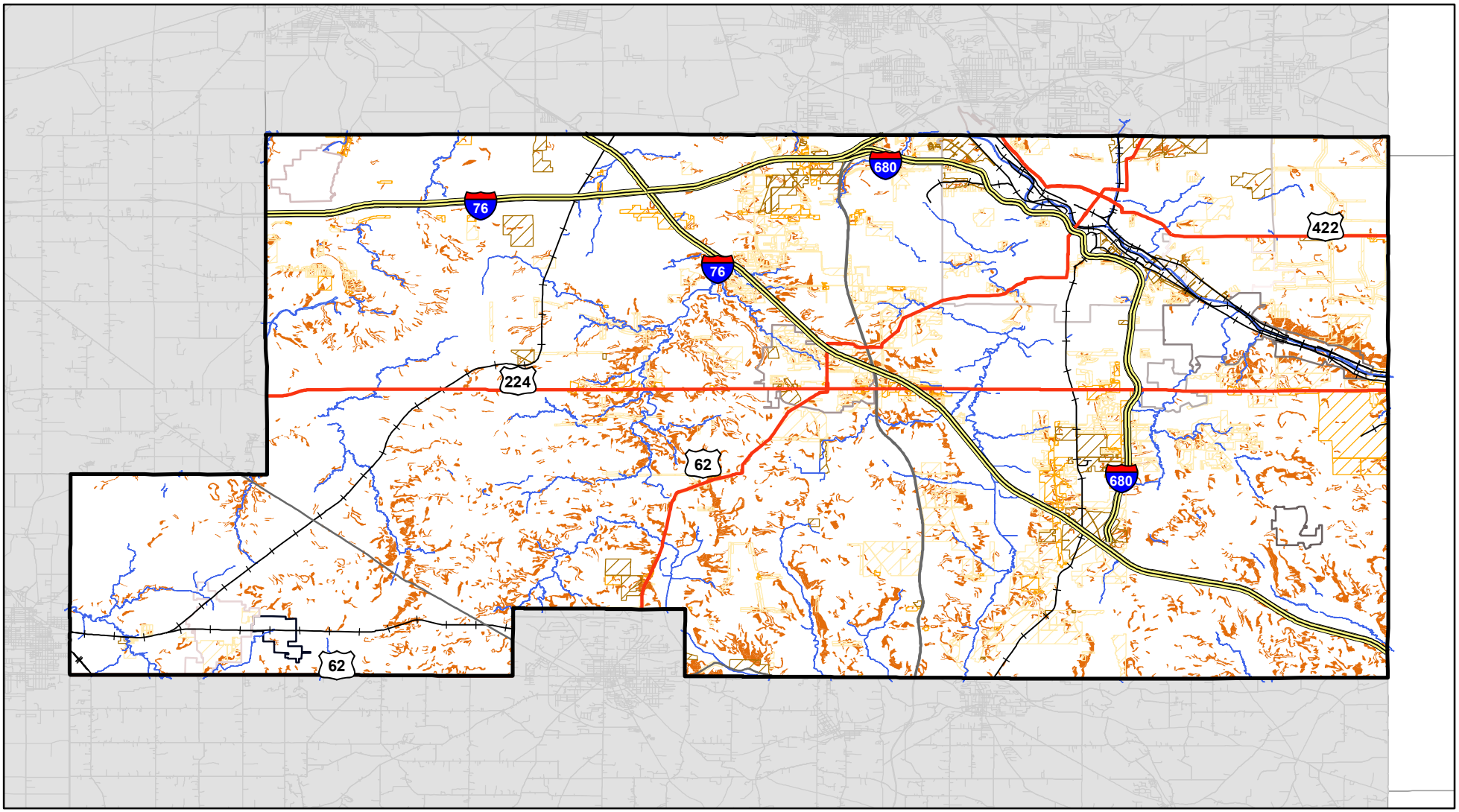
Planned Development - Subsidence Risk Areas Overlay

Data Source(s):
Mahoning County Planning Commission, ODNR

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

- Ind./Man. w/ Other Subsidence Risks
- Business/Commercial w/ Other Subsidence Risks
- Residential w/ Other Subsidence Risks
- Remote, Critical Subsidence Risk Areas





2.0 RISK ASSESSMENT

§201.6(c)(2)(i)	[The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

A risk assessment analyzes "the potential for damage, loss, or other impacts created by the interaction of hazards with community assets" (FEMA, 2013). The risk assessment section contains information on identified hazards that threaten the region in profiles and the vulnerability of the area as it relates to its assets.

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2.1 HAZARDS IDENTIFICATION

§201.6(c)(2)(i)	[The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Historically, Mahoning County has been vulnerable to a number of natural and technological or non-weather-related hazards that disrupt lives and damage or destroy property. The committee considered a variety of human-caused and natural hazards that had the potential to affect the county. This mitigation plan takes the following list of hazards into consideration for further analysis.

HAZARD INCLUSIONS AND EXCLUSIONS			
Hazard	*Type*	*Status*	*Description*
Avalanche	Natural	Not Included	Avalanches happen mainly in the western United States and Canada (Keller, Devecchio, 2015 p. 229).
Coastal Erosion	Natural	Not Included	The Atlantic East Coast, where coastal erosion is nearest, is approximately 350 miles away and the Pacific West Coast is approximately 2,200 miles away (Google Earth).
Dam/Levee Failure	Natural	Included	See Section 2.4.1
Drought	Natural	Included	See Section 2.4.2
Earthquake	Natural	Included	See Section 2.4.3
Epidemic	Natural and Human-Caused	Included	See Section 2.4.4
Extreme Temperatures	Natural	Included	See Section 2.4.5
Flood	Natural	Included	See Section 2.4.6
Hail	Natural	Included	See Section 2.4.8
Hurricanes	Natural	Not Included	The Atlantic East Coast, where hurricane paths are nearest, is approximately 350 miles away and the Pacific West Coast is approximately 2,200 miles away (Google Earth).
Land & Mine Subsidence	Natural	Included	See Section 2.4.7
Lightning	Natural	Included	See Section 2.4.8
Sea Level Rise	Natural	Not Included	Sea level rise occurs in the ocean; the Atlantic East Coast is approximately 350 miles away and the Pacific West Coast is approximately 2,200 miles away (Google Earth).
Storm Surge	Natural	Not Included	Storm surges occur in the ocean; the Atlantic East Coast is approximately 350 miles away and the Pacific West Coast is approximately 2,200 miles away (Google Earth).
Tornado	Natural	Included	See Section 2.4.9
Tsunamis	Natural	Not Included	The Atlantic East Coast, where tsunamis would be closest, is approximately 350 miles away and the Pacific West Coast is approximately 2,200 miles away (Google Earth).
Wind	Natural	Included	See Section 2.4.9
Winter Weather	Natural	Included	See Section 2.4.10

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HAZARD INCLUSIONS AND EXCLUSIONS			
Hazard	*Type*	*Status*	*Description*
Wildfire	Natural	Not included	The county EMA assured that Mahoning County does not experience wildfires and therefore will not include this hazard in the plan.
Violent Disturbance	Human-Caused	Included	See Section 2.4.11
Volcanoes	Natural	Not Included	The closest monitored volcano is in Yellowstone National Park in Wyoming (USGS) and is approximately 1,550 miles away (Google Earth).

The committee determined that the list that they currently have from the last plan (dam failure, drought, earthquake, flooding, land and mine subsidence, severe thunderstorm and hail, severe wind and tornado, severe winter weather, temperature extreme and terrorism) accurately portrayed the hazards the communities face on a regular basis. However, they did add one more human-caused hazard to the list, epidemic, and changed the name of one hazard from terrorism to violent disturbance so as to include more accurate occurrences of the hazard such as active shooter, riots, and bomb threats.

Committee members, jurisdictions, and the public considered the hazardous materials (hazmat) hazard to the county but the committee determined that they would not include this hazard in this plan because of the following reasons.

- The county has a well-equipped, very capable level II hazmat team that has been in operation for several years.
- The committee feels that there is little to do mitigation-wise regarding hazmat incidents, making them more of a response operation than a mitigation one.
- The Mahoning County Emergency Operations Plan contains an annex specifically for hazmat.

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2.2 RISK

§201.6(c)(2)(i)	[The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

§201.6(c)(2)(i)	[The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

One of the components of the risk assessment is to determine the risk of a hazard, determined by the probability of occurrence and the potential severity of the event. This process helps identify which hazards pose the most significant risk to Mahoning County and its municipalities. The probability of an event happening is determined based on the number of events that have occurred within a certain timeframe. The timeframe is based on information available from different sources and varies depending on the data. Different sources provide data on the number of events throughout a period of years. This data is used to calculate probability.

The probability of occurrence is broken down into five categories as seen in the table to the right. The chance of occurrence of a hazard within the next year can be quantified based on historical data. This can be expressed in a numerical measure or as a percentage of 0-100 percent. It is calculated by adding the total occurrences of a specific hazard and dividing it by the years of data.

PROBABILITY		
Value	*Description*	*Definition*
.81 – 1.0 (81 – 100%)	Frequent	Will occur during a year
.61 – .80 (61 – 80%)	Probable	Likely to occur in a year
.41 - .60 (41 – 60%)	Occasional	May or may not occur in a year
.21 - .40 (21 – 40%)	Remote	Unlikely to occur in a year
0 - .20 (0 – 20%)	Improbable	So unlikely that it can be assumed it will not occur in a year

Although some hazards have zero recorded occurrences, the risk still exists. Since non-natural hazards generally do not depend on weather patterns to occur, they are not informed by this type of historical data. Non-natural and technological hazards are nearly impossible to assign a measurement of probability. When a hazard in this plan does not have historical occurrences, the profile will detail how the probability was calculated.

The severity of an event is based on three main factors: 1) the historical deaths, injuries, and property/crop damage; 2) the extent of potential secondary and/or cascading impacts of the hazard and; 3) the potentially impacted geographic area as determined

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through risk mapping. Generally, the severity estimations will be less exact than probability estimations. The four classifications of severity are shown on the right.

SEVERITY	
Description	*Definition*
Catastrophic	Death or major structural loss
Critical	Severe injury, severe illness, or marginal structural damage
Marginal	Minor injury, minor illness, or structural damage
Negligible	Less than minor injury, illness or structural damage

The combination of hazard probability and hazard severity results are shown in a table known as the Risk Assessment Matrix. There are many definitions for the level of risk (i.e. low or very low, high or very high); for the purposes of this plan, the determinations are made to follow the *Ohio Hazard Mitigation Plan* of 2014 document so as to align this county plan with the state's plan.

RISK ASSESSMENT MATRIX						
		PROBABILITY				
		Frequent	*Probable*	*Occasional*	*Remote*	*Improbable*
SEVERITY	*Catastrophic*	Highest	Highest	High	Medium	Low
	Critical	High	High	Medium	Low	Lowest
	Marginal	High	Medium	Low	Lowest	Lowest
	Negligible	Medium	Low	Low	Lowest	Lowest

During a meeting, the committee analyzed all the hazards for probability and severity and filled out risk assessment matrices. The consultant averaged the results; they are shown in the following table.

COMMITTEE HAZARD RISK ASSESSMENT			
Hazard	*Average Probability*	*Average Severity*	*Average Risk*
Dam Failure	Improbable	Catastrophic	LOW
Drought	Remote	Marginal	LOWEST
Earthquake	Occasional	Negligible	LOW
Epidemic	Occasional	Critical	MEDIUM
Extreme Temperatures	Remote	Marginal	LOWEST
Flood	Probable	Marginal	MEDIUM
Land & Mine Subsidence	Improbable	Marginal	LOWEST
Severe Thunderstorm and Hail	Frequent	Marginal	HIGH
Severe Wind and Tornado	Probable	Critical	HIGH
Severe Winter Storm	Probable	Critical	HIGH
Terrorism (a.k.a. Violent Disturbance)	Improbable	Critical	LOWEST

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2.3 VULNERABILITY

Vulnerability is the "measure of propensity of an object, area, individual, group, community, country, or other entity to incur the consequences of a hazard" (Coppola, 2015, p. 33). There are many aspects that contribute to the vulnerability of a people; these can include income disparity, class, race or ethnicity, gender, age, disability, health, and literacy (Thomas & Phillips, 2013, p. 2, 3). The following is a brief description of how each of the aspects can contribute to vulnerability to disasters.

- **Income Disparity**: Income disparities produce different outcomes from disasters that can cause more human suffering, and requiring more external support.
- **Class**: Lower-income families tend to live in housing that suffers disproportionately during disasters.
- **Race or Ethnicity**: Warning messages tend to be issued in the dominant language with an expectation that people will take the recommended action immediately.
- **Gender**: Domestic and stranger violence increases after a disaster. Although women tend to be the ones most likely to secure relief aid for the family, they are underrepresented and underused in recovery efforts.
- **Age**: Elderly populations are frequently reluctant to seek assistance before and secure aid after a disaster out of concern that they may lose their independence.
- **Disability**: People with disabilities experience challenges in acquiring transportation to evacuate areas as well as to access appropriate shelters and post-disaster housing.
- **Health**: Disasters can disrupt access to care. Individuals on health services are faced with life threatening circumstances if these services cannot be accessed. Disasters tend to exasperate chronic and mental health conditions.
- **Literacy**: Many emergency preparedness materials are available in written form. Few options exist for people with low reading levels, other languages, or cognitive abilities.

2.3.1 Complicating Variables

Direct consequences of disasters can include fatalities, injuries, and damages to humans, animals or property. However, disasters do not end there; there are a number of indirect effects, both tangible and intangible, associated with disasters. Some examples of these include loss of livelihood and income, loss of community and population, mental and

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psychosocial impacts, costs of rebuilding, repair or replacement, loss of inventory, wages and tax revenue, etc. (Coppola, 2015). All of these also have a cost associated with them but it is much more difficult to assign a specific dollar value and quantify accurately. For this analysis, the primary focus of loss estimates will be direct consequences of the given hazard.

A number of situations could occur that would result in a disruption to a number of critical systems throughout Mahoning County. Some hazards are complicated by a series of loosely-related variables; these are often considered *cascading hazards*. For example, high winds may cause sporadic damage throughout the county, but often do not become a significant countywide concern until a large number of residents are without power. In addition to weather-related power outages, cascading hazards in Mahoning County could include (but not be limited to) the following.

- Damage to infrastructure (i.e. roads, bridges, tunnels, pipes, utility poles etc.) and to residences following flooding
- Flooding of downstream areas in the event of a dam failure
- Drinking water supply shortages and contamination following severe and prolonged drought conditions or floods
- Power outages, ruptured gas lines, etc. following earthquakes or severe weather
- Public health concerns following flooding conditions
- Road closures and damage to residences resulting from land subsidence

The complicating variables related to each hazard are described within the profiles. The information presented is based on worst-case scenario events; a single event may not always reach all impacts described. However, it is important to understand that the impacts of hazards go beyond what is seen immediately after the event. The effects of one event can last months or even years, especially where public health, social, economic, environmental and infrastructure impacts are concerned.

2.3.2 Hazards and Climate Change

Many natural hazards are related to climate such as droughts, severe weather, and floods. There is an important distinction between weather and climate. Weather refers to the atmospheric conditions of a geographical region over a short period of time, such as days or weeks. Climate, in contrast, refers to the atmospheric conditions of a geographical area over

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long periods of time, such as years, or even decades (Keller, Devecchio, 2015, pp. 406-407).

According to the U.S. Global Change Research Program (2016), there are several weather and climate changes that have already been observed in the United States.

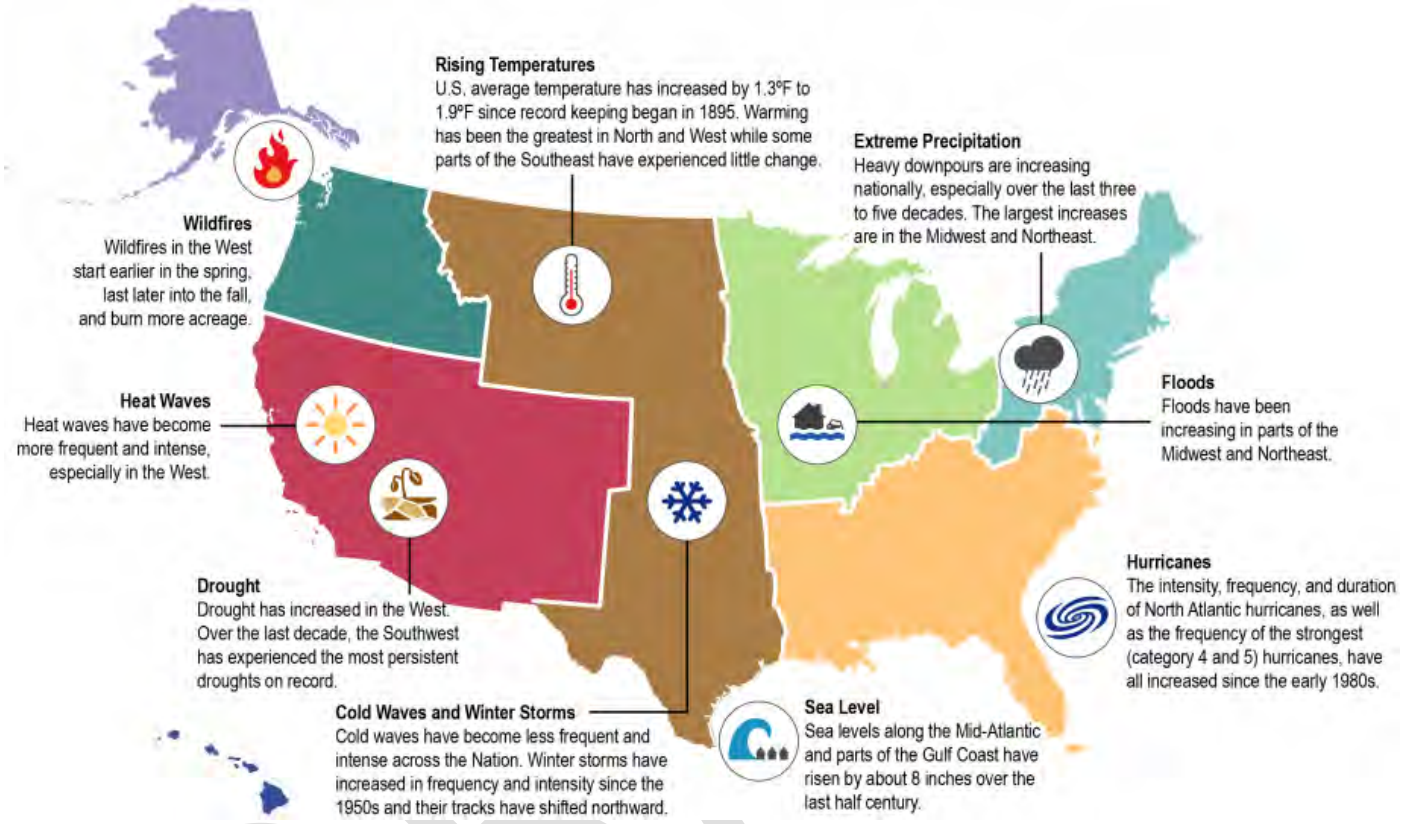
- Since recordkeeping began in 1895, the average U.S. temperature has increased by 1.3°F to 1.9°F with most of the increase happening since 1970. In addition, the first decade of the 2000s has been the warmest on record.
- The average precipitation across the U.S. has increased since 1900 with some areas experiencing higher than the national average and some lower. Heavy downpours are increasing, especially over the last 30-50 years.
- Drought events have increased in the west. Changes in precipitation and runoff, combined with changes in consumption and withdrawal, have reduced surface and groundwater supplies in many areas.
- Some types of severe weather events have experienced changes; heat waves are more frequent and intense, and cold waves have become less frequent and intense overall.
- The intensity, frequency, and duration of North Atlantic hurricanes have increased since the early 1980s.

Climate change can have a significant impact on human health and the environment. The changes mentioned above can affect the environment by leading to changes in land-use, ecosystems, infrastructure conditions, geography and agricultural production. Extreme heat, poor air quality, reduced food and water supply and quality, changes in infectious agents and population displacement can lead to public health concerns such as heat-related illnesses, cardiopulmonary illnesses, food, water and vector-borne diseases and have consequences on mental health and stress (USGCRP, 2016).

The National Climate Assessment (NCA) defined climate trends for national U.S. regions in 2014. The major trends are seen to be

- wildfires and heat waves on the west coast,
- rising temperatures and increased severity and frequency of winter storms in the middle of the country,
- more rain and flooding in the Midwest and northeastern parts of the country, and
- an increase in sea levels in the mid-Atlantic with an increase of hurricane activity in the southeastern states.

In Ohio, the trend will be an increase in flooding which will lead to more events of hazards such as land subsidence, and possible dam failures or epidemics.



2.3.3 Public Health and Social Vulnerability

Understanding the overall health status of the community is important in determining the vulnerability of the population to any given hazard; emergencies and disaster situations can exacerbate existing medical conditions. Vulnerable populations, populations of concern, or populations at risk are defined as those individuals or groups of people who are more exposed to the risks of the impacts of a hazard because of their age, gender, income, occupation, disability, physical or mental health, literacy, income, religion, education, or ethnicity.

Some groups face a number of stressors related to both climate and non-climate factors. For example, people living in impoverished urban or isolated rural areas, floodplains, coastlines, and other at-risk locations are more vulnerable not only to extreme weather and persistent climate change but also to social and economic stressors. Many of

these stressors can occur simultaneously or consecutively. Over time, this “accumulation” of multiple, complex stressors is expected to become more evident as climate impacts interact with stressors associated with existing mental and physical health conditions and with other socioeconomic and demographic factors.

Each hazard profile goes further into detail explaining how the hazard could affect public health and social vulnerability.

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2.4 HAZARD PROFILES

The following table contains a summary of all the hazards this plan analyzes. The table includes the hazard's period of occurrence, warning time, number of years with history of events, number of events in those years, the probability and severity of the occurrence, the risk, and an estimate for the historical or potential losses.

Planners determined the hazard rankings after identifying the risk or each hazard. There are five rankings based on the risk assessment matrix; those with the highest risk will be the number one hazard that affects the county.

Dam/Levee Failure #5

Period of Occurrence:	At any time	*Number of Years:*	N/A
Warning Time:	Hours to months depending on drought or precipitation conditions and dam maintenance practices.	*Number of Events:*	0
Risk:	Lowest	*Probability:*	Remote
Loss Estimate:	There have been $0 in damages to date, but the cost of failure would be the replacement of the dam or levee and damages to property caused by the failure.	*Severity:*	Marginal

Drought #5

Period of Occurrence:	At any time, typically after a period of prolonged lack of precipitation	*Number of Years:*	18
Warning Time:	Weeks to months	*Number of Events:*	5
Risk:	Lowest	*Probability:*	Remote
Loss Estimate:	$0	*Severity:*	Marginal

Earthquake #4

Period of Occurrence:	At any time	*Number of Years:*	18
Warning Time:	None	*Number of Events:*	14
Risk:	Low	*Probability:*	Probable
Loss Estimate:	Minimal for typical earthquakes; HAZUS-MH estimates complete loss of buildings to be $2.3M due to a 5.0 magnitude earthquake.	*Severity:*	Negligible

Epidemic #4

Period of Occurrence:	At any time	*Number of Years:*	N/A
Warning Time:	None to weeks	*Number of Events:*	N/A
Risk:	Low	*Probability:*	Remote
Loss Estimate:	$838 per year per person, or $114M per year in the county	*Severity:*	Critical

Extreme Temperatures #5

Period of Occurrence:	At any time, typically during summer and winter months	*Number of Years:*	35
Warning Time:	Days	*Number of Events:*	13
Risk:	Lowest	*Probability:*	Remote
Loss Estimate:	Reports estimate $105K in damages to pipes and water mains due to freezing temperatures	*Severity:*	Negligible

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Flood #2

Period of Occurrence:	At any time, typically after a period of prolonged precipitation	*Number of Years:*	22
Warning Time:	Hours to days	*Number of Events:*	31
Risk:	High	*Probability:*	Frequent
Loss Estimate:	HAZUS-MH estimates $247M in damages from a 100-year flood event. Repetitive loss properties amount to $1M.	*Severity:*	Marginal

Land & Mine Subsidence #4

Period of Occurrence:	At any time	*Number of Years:*	N/A
Warning Time:	None to weeks	*Number of Events:*	N/A
Risk:	Low	*Probability:*	Remote
Loss Estimate:	Up to $42.9M for repairs to foundations in known hazard areas.	*Severity:*	Critical

Severe Thunderstorm and Hail #2

Period of Occurrence:	At any time, typically during summer months	*Number of Years:*	39
Warning Time:	Hours to days	*Number of Events:*	109
Risk:	High	*Probability:*	Frequent
Loss Estimate:	On average, $139K annually	*Severity:*	Critical

Severe Wind and Tornado #3

Period of Occurrence:	At any time, typically tornadoes are associated with thunderstorms, therefore during the summer months	*Number of Years:*	63
Warning Time:	Hours to minutes	*Number of Events:*	27
Risk:	Medium	*Probability:*	Occasional
Loss Estimate:	$10M since 1955	*Severity:*	Critical

Severe Winter Storm #3

Period of Occurrence:	At any time, typically during winter months	*Number of Years:*	22
Warning Time:	Days	*Number of Events:*	31
Risk:	Medium	*Probability:*	Frequent
Loss Estimate:	On average, $447K annually	*Severity:*	Negligible

Violent Disturbance #4

Period of Occurrence:	At any time	*Number of Years:*	N/A
Warning Time:	None	*Number of Events:*	N/A
Risk:	Low	*Probability:*	Improbable
Loss Estimate:	Unknown	*Severity:*	Catastrophic

SUMMARY OF HAZARD RANKINGS				
#1 Hazard (Highest Risk)	*#2 Hazard (High Risk)*	*#3 Hazard (Medium Risk)*	*#4 Hazard (Low Risk)*	*#5 Hazard (Lowest Risk)*
• No hazards	• Flood • Severe Thunderstorm and Hail	• Severe Wind and Tornado • Severe Winter Storm	• Earthquake • Epidemic • Land & Mine Subsidence • Violent Disturbance	• Dam/Levee Failure • Drought • Extreme Temperatures

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The following sections contain a profile of each hazard considered by this plan, which provides details on how the hazard impacts the area. Within each profile, research and historical data informs the following elements.

- **Hazard Overview**: Defines the hazard and presents a brief summary table of the hazard.
- **Possible Causes**: Describes a variety of causes that can contribute to the occurrence of a hazard.
- **Impact and Vulnerability**: Describes impacts on different topics such as health, the environment, or infrastructure that may result from the hazard as well as specific populations that may be vulnerable.

§ 201.6(c)(2)(ii)	A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

- **Historical Occurrences**: Summarizes significant past events related to the hazard.

§ 201.6(c)(2)(i)	A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

- **Location and Extent**: Identifies the physical places in the region that are vulnerable to the hazard and the severity of a hazard in a given location.

§ 201.6(c)(2)(i)	A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

- **Loss and Damages**: Outlines the methods used for loss amounts (of deaths, injury and/or property damage depending on information available) and estimates based on historical information and vulnerable populations, structures, and infrastructure.

§ 201.6(c)(2)(ii)(A)	The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
§ 201.6(c)(2)(ii)(B)	An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;

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- **Previous and Ongoing Mitigation Efforts:** Describes any efforts to reduce the impact of the particular hazard through legislation, planning, or structural projects.
- **Risk Assessment**: Details methods of calculating probability and severity of each hazard.
- **Map and Assets**: Graphically shows the geographic locations or populations in the county that are vulnerable to each hazard. This section also identifies the assets that fall under the hazard risk area.

§ 201.6(c)(2)(iii)	For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

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2.4.1 Dam/Levee Failure

HAZARD OVERVIEW

Dams and levees are man-made structures designed to obstruct or restrain water that may cause flooding downstream. Dam or levee failure is when the structure gives way in whole or in part due to a variety of possible causes.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time, typically after a prolonged period of rain causing damages or a prolonged period of drought causing erosion.	Overall Hazard Ranking:	**5**
	Warning Time:	The warning time of dam failure could be from hours to days, when forecasts predict large amounts of precipitation, to months if there are known maintenance issues.	State Risk Ranking:	Frequency: Possible Impact: Critical Ranking: 3 - Medium
	Probability:	Remote	Severity:	Marginal
	Type of Hazard:	Technological	Disaster Declarations:	None

There are approximately 90,580 dams in the United States, the majority of which are privately owned; state and local authorities, public utilities, and federal agencies own others. Currently, the average age of the dams in the country is 56 years. The American Society of Civil Engineers calculates the status of these dams and generates a grade; the grade of the U.S. dams is 'D', and 17% of all dams are classified as high-hazard (ASCE, 2017).

The benefits of dams and levees are numerous: they provide water for drinking, navigation, and agricultural irrigation, and save lives by preventing or reducing floods. Dams and levees are man-made structures designed to obstruct or restrain waters that may cause flooding downstream. These structures are generally made with concrete or earthen materials.

In terms of emergency management, dam failures are categorized as either *sunny day failures* or *rainy day failures*. *Sunny day failures* occur during a non-flooding situation with the reservoir near normal pool level. *Rainy day failures* usually involve periods of rainfall and flooding, and can exacerbate inadequate spillway capacity. Improper design of a spillway or operation of gates during high flows can lead to excessive water pressure and subsequent failure as well. Even though both types of failures can be disastrous, it can be assumed that a *sunny day failure* would be more catastrophic due to its unanticipated occurrence and the lack of time to warn residents downstream (State of Ohio, 2014 p3 184).

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According to Ohio Administrative Code Rule 1501:21-13-01, dams fall under one of four classes (ODNR, n.d.). For impacts from each dam class, see the impacts and vulnerability section below.

- **Class I:** Dams having a total storage volume greater than 5,000 acre-feet or a height of greater than 60 feet.
- **Class II:** Dams having a total storage volume greater than 500 acre-feet or a height of greater than 40 feet.
- **Class III:** Dams having a total storage volume greater than 50 acre-feet or a height of greater than 25 feet.
- **Class IV:** Dams having a total storage volume of 50 acre-feet or less or a height of 25 feet or less. Class IV dams are exempt from permit requirements.

POSSIBLE CAUSES

There are three types of failures of earthen dams: overtopping, seepage or piping, and structural failure (ODNR, n.d.).

- **Overtopping** failures result from the erosive action of water on the embankment. Erosion is due to uncontrolled flow of water over, around, and adjacent to the dam. Earthen embankments are not designed to be overtopped and therefore are particularly susceptible to erosion. Once erosion has begun during overtopping, it is almost impossible to stop. Overtopping causes 34% of dam failures.
- **Structural** failures can occur in either the embankment or the appurtenances. Structural failure of a spillway, lake drain, or other appurtenance may lead to failure of the embankment. Cracking, settlement, and slides are the more common signs of structural failure of embankments. Large cracks in an appurtenance or the embankment, major settlement, and major slides will require emergency measures to ensure safety, especially if the problems occur suddenly. Foundation defects and slope instability are the cause of 30% of dam failures.
- All earthen dams have s**eepage** resulting from water percolating slowly through the dam and its foundation. Seepage must, however, be controlled in both velocity and quantity. If uncontrolled, it can progressively erode soil from the embankment or its foundation, resulting in the rapid failure of the dam. Erosion of the soil begins at the downstream side of the embankment, either in the dam proper or the foundation, progressively works toward the reservoir, and eventually develops a “pipe” or direct conduit into the reservoir. Seepage can cause slope failure by creating high

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pressures in the soil pores or by saturating the slope. Seepage or piping causes 20% of dam failures.

The three types of failures are often interrelated in a complex manner. For example, uncontrolled seepage may weaken the soil and lead to a structural failure. A structural failure may shorten the seepage path and lead to a piping failure. Surface erosion may result in structural failure, and so on.

Minor defects such as cracks in the embankment may be the first visual sign of a major problem, which could lead to failure of the structure. Someone experienced in dam design and construction should evaluate the seriousness of all deficiencies as soon as they are detected.

IMPACTS & VULNERABILITY

The potential downstream hazards are defined as the resultant downstream damage should the dam fail, including probable future development. The potential downstream hazards are broken into four classes, which coincide with the class of dam defined by height and storage as discussed above.

POTENTIAL DOWNSTREAM HAZARDS	
Class	*Description*
Class I	• Probable loss of life • Structural damage to high value property (i.e., homes, industries, major public utilities).
Class II	• Disruption of a public water supply or wastewater treatment facility, release of health hazardous industrial or commercial waste, or other health hazards • Flooding of residential, commercial, industrial, or publicly owned structures • Flooding of high-value property • Damage or disruption to major roads including but not limited to interstate and state highways, and the only access to residential or other critical areas such as hospitals, nursing homes, or correctional facilities as determined by the chief • Damage or disruption to railroads or public utilities • Damage to downstream class I, II or III dams or levees, or other dams or levees of high value. Damage to dams or levees can include, but is not limited to, overtopping of the structure
Class III	• Property losses including but not limited to rural buildings not otherwise described, and class IV dams and levees not otherwise listed as high-value property. At the request of the dam owner, the chief may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property • Damage or disruption to local roads including but not limited to roads not otherwise listed as major roads.
Class IV	• Losses restricted mainly to the dam.

Uncontrolled floodwaters are one of the most powerful and destructive forces in nature. Dams that are not designed to withstand major storms or are in a state of disrepair may be destroyed, increasing flood damage downstream. The potential for damage due to dam failure is increasing along with the increased amount of residential and commercial

development within the hydraulic shadow of dams. In many cases, existing dams will need to be modified to keep downstream areas safe from catastrophic flooding.

HISTORICAL OCCURRENCES

Several research methods were utilized in an attempt to identify any past occurrences of dam failures in Mahoning County. Those research efforts yielded no evidence of any historic or recent dam failures in Mahoning County. In addition, the Ohio State Hazard Mitigation Plan does not report any dam incidents or failures between 1852 and 2014 for Mahoning County.

LOCATION & EXTENT

There are 24 dams in Mahoning County, according to the Ohio Department of Natural Resources (ODNR), Division of Soil & Water Resources – Dam Safety and the National Inventory of Dams. Of these, seven are Class I, six are Class II, and 11 are Class III. Per the United States Army Corps of Engineers National Levee Database, there are no levees in Mahoning County.

Mahoning County contains dams that could present the possibility of significant flood damage to the residents and businesses located near or downstream from the dams. In many cases, the dams are less than five miles away from the nearest community. Berlin Lake Dam and the Lake Milton Dam are located in the western portion of the county and would have a significant impact on the Village of Craig Beach if either of them were to fail. Several segments of key transportation infrastructure could also be affected by a failure of any one of the seven class I dams.

DAMS IN MAHONING COUNTY				
Dam Name	*Dam Class*	*Owner Type*	*Dam Type*	*River*
Arrowhead Lake Dam No. 1	Class II	Private	Earth	Tributary to Mill Creek
Berlin Dam*	Class I	Federal	Gravity, Earth	Mahoning River
Burgess Lake Dam	Class II	Public Utility	Earth	Burgess Run
Evans Lake Dam	Class I	Public Utility	Earth	Yellow Creek
King's Lake Dam	Class III	Private	Earth	Coffee Run
Lake Cohasset Dam	Class II	Local Government	Masonry	Mill Creek
Lake Glacier Dam	Class III	Local Government	Masonry	Mill Creek
Lake Hamilton Dam	Class I	Public Utility	Concrete	Yellow Creek
Lake Milton Dam	Class I	State	Earth	Mahoning River
Lake Park Dam	Class III	State	Concrete, Earth	Tributary to Mahoning River
Lower Diehl Lake Dam.	Class III	Private	Earth	West Branch Meander Creek

DAMS IN MAHONING COUNTY				
Dam Name	*Dam Class*	*Owner Type*	*Dam Type*	*River*
Mahoning County JVS Lake Dam	Class III	Local Government	Earth	Tributary to Meander Creek
Mayfield Lake Dam	Class III	Private	Earth	Tributary to Mahoning River
McKelvey Lake Dam	Class I	Public Utility	Concrete	Dry Run
Mike Lake Dam	Class II	Private	Earth	Burgess Run
Newport Lake Dam	Class II	Local Government	Masonry	Mill Creek
Pine Lake Dam	Class I	Public Utility	Earth	Yellow Creek
Rock Island Lake Dam	Class III	Private	Earth	Tributary to Meander Creek
Thomson Lake Dam	Class III	Private	Earth	Andersons Run
USX Corporation Low Head Dam	Class III	Local Government	Earth	Mahoning River
Western Reserve Lake Dam	Class III	Private	Earth	Tributary to Meander Creek
Woodside Lake Dam	Class II	State	Earth	Factory Run Tributary to Mill Creek
Youngstown Upground Reservoir	Class I	Public Utility	Concrete, Earth	N/A
Zoldan Pond Dam	Class III	Private	Earth, Earth	Unnamed Tributary to Mill Creek

Sources: Ohio Division of Natural Resources & National Inventory of Dams
** Berlin Dam is located outside of Mahoning County in Portage County but failure could affect Mahoning.*

LOSS & DAMAGES

There have been zero historical dam failures in Mahoning County; consequently, the average loss to be expected based on past occurrences would be $0. However, if a dam or levee failed, the damages would amount to the sum of the cost to replace the dam or levee and losses of property from the failure.

PREVIOUS AND ONGOING MITIGATION EFFORTS

Eastgate Regional Council of Governments is currently supporting the U.S. Army Corps of Engineers project to remove nine dams along the Mahoning River; dam and sediment removal will allow the river to flow naturally. To date, only two of the nine dam removals are funded. After the dams are removed, communities will enjoy the restoration of the connection to the river. The entire project will cost an estimated $100 million.

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RISK ASSESSMENT

DAM/LEVEE FAILURE RISK CALCULATION				
Probability		*Severity*		*Risk*
REMOTE		MARGINAL		LOWEST
Because there have been no occurrences of dam failure in Mahoning County in the past, the probability based on historical occurrences would be improbable. However, due to the fact that the risk is present and the overall condition of dams in the US is poor and the amount of high and significant hazard dams is high, this hazard is considered to be remote.	+	The amount of Class I, high hazard dams in Mahoning county is low and most are located in rural areas.	=	The risk assessment calculates the risk of dam or levee failure to be the lowest.

MAP AND ASSETS

According to the GIS map with an overlay of dams and assets, there would be no risk to assets from the predetermined list.

The dam failure map shows the locations of the dams in Mahoning County. The majority of the county is at the lowest risk of dam failure. However, some locations may be at a slightly higher risk due to the dam location, the topography, and the population downstream that may be at risk.

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MAHONING COUNTY HAZARD MITIGATION PLAN

Dam Failure Risk Map

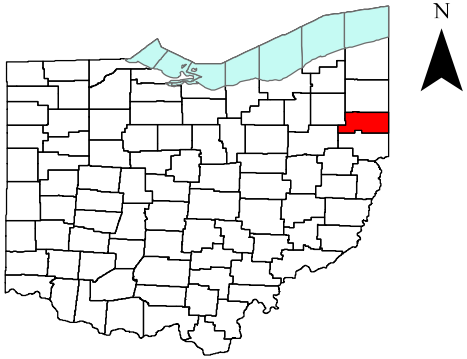
Data Source(s):
ODNR

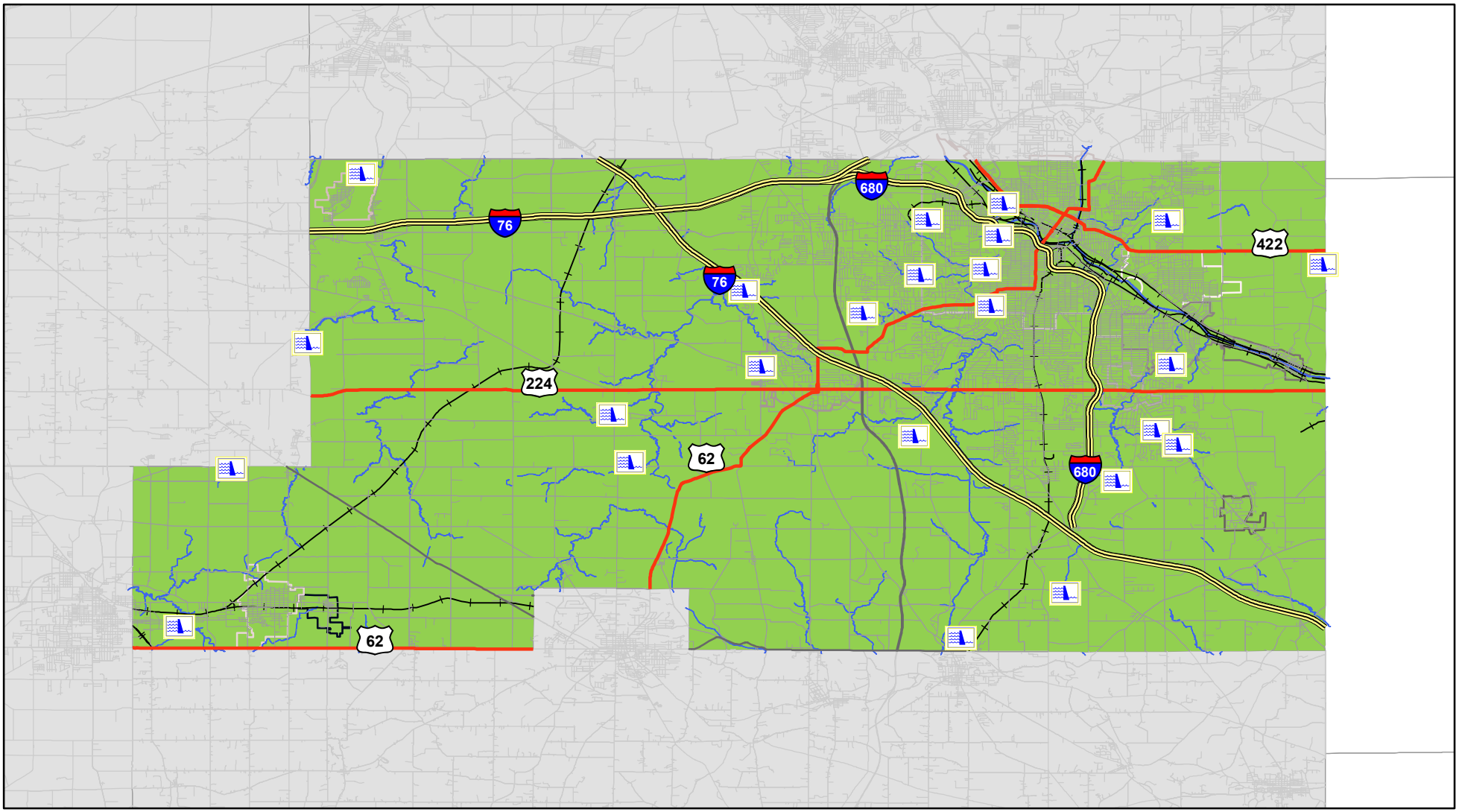
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Dams

Remote, Marginal Risk

Lowest Risk





2.4.2 Drought

HAZARD OVERVIEW

A period of abnormally dry weather, which persists long enough to produce a serious hydrological imbalance.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	During periods of lower-than-normal precipitation. Typically during warmer months, but can last several months and across seasons.	Overall Hazard Ranking:	**5**
	Warning Time:	Weeks	State Risk Ranking:	Frequency: Likely Impact: Negligible Ranking: 2 - Low
	Probability:	Remote	Severity:	Marginal
	Type of Hazard:	Natural	Disaster Declarations:	None

Drought is defined as a period of abnormally dry weather, which persists long enough to produce a serious hydrological imbalance. Drought is a term used in relation to who or what is being affected by the lack of moisture. Drought can be a result of multiple causes including global weather patterns that produce persistent, upper-level high-pressure systems with warm dry air resulting in less precipitation. Droughts develop slowly and are not identified until they are already under way. There are several types of droughts (Sears, 2017, p. 138).

- **Meteorological Drought:** Differences from the normal precipitation amounts. Because not every area receives the same amount of rainfall, a drought in one place might not be considered a drought in another.
- **Agricultural Drought:** Moisture deficiency seriously injurious to crops, livestock, or other agricultural commodities. Parched crops may wither and die. Pastures may become insufficient to support livestock. Effects of agricultural droughts are difficult to measure because there are many other variables that may impact production during the same growing season.
- **Hydrological Drought**: Reduction in stream flow, lake and reservoir levels, depletion of soil moisture, and a lowering of the ground water table. Consequently, there is a decrease in groundwater discharge to streams and lakes. A prolonged hydrological drought will affect the water supply.
- **Socioeconomic Drought:** A lack of water that begins to affect people's daily lives.

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The Palmer Drought Severity Index (PDSI) is a widely used measure of drought to track moisture conditions. The PDSI is defined as "an interval of time, generally in months or years in duration, during which the actual moisture supply at a given place rather consistently falls short of the climatically expected or climatically appropriate moisture supply". The range of PDSI is from –4.0 (extremely dry) to +4.0 (excessively wet), with the central half (-0.5 to +0.5) representing the normal or near normal conditions. In the United States, the USDA, National Drought Mitigation Center at University of Nebraska-Lincoln, U.S. Department of Commerce, and NOAA developed another measurement of droughts named the U.S. Drought Monitor (USDM). The table to the right shows the two scales and how they compare.

USDM AND PDSI COMPARISON			
U.S. Drought Monitor		*Palmer Drought Severity Index*	
N/A		> 4.0	Extreme moist spell
		3.0 to 3.99	Very moist spell
		2.0 to 2.99	Unusual moist spell
		1.0 to 1.99	Moist spell
		0.50 to 0.99	Incipient moist spell
		-0.49 to 0.49	Near normal
		-0.5 to -0.99	Incipient dry spell
D0	Abnormally dry	-1.0 to -1.99	Mild drought
D1	Moderate drought	-2.0 to -2.99	Moderate drought
D2	Severe drought	-3.0 to -3.99	Severe drought
D3	Extreme drought	< -4.0	Extreme drought
D4	Exceptional drought	N/A	

POSSIBLE CAUSES

Precipitation falls in uneven patterns across the country; the amount of precipitation at a particular location varies from year to year, but over a period of years, the average amount is fairly constant. The amount of rain and snow also varies with the seasons. Even if the total amount of rainfall for a year is about average, rainfall shortages can occur during a period when moisture is critically needed for plant growth, such as in the early summer. When little or no rain falls, soils can dry out and plants can die. When rainfall is less than normal for several weeks, months, or years the flow of streams and rivers declines, water levels in lakes and reservoirs fall, and the depth to water in wells increases. If dry weather persists and water-supply problems develop, the dry period can become a drought (USGS, 2016).

IMPACTS AND VULNERABILITY

Droughts can impact drinking water both in terms of availability and demand. According to the U.S. Environmental Protection Agency (EPA), as temperatures rise, people and animals need more water to maintain health. Additionally, a large number of economic activities require abundant water sources such as energy production (hydroelectric and

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nuclear power generation, for example) and growing food crops. As droughts reduce available water sources, local officials will need to closely monitor water usage to maintain enough for critical uses.

According to the U.S. Drought Monitor, there are possible impacts from each level of drought; these are described below.

D0 Abnormally Dry	*Going into drought:* • short-term dryness slowing planting, growth of crops or pastures *Coming out of drought:* • some lingering water deficits • pastures or crops not fully recovered
D1 Moderate Drought	• Some damage to crops, pastures streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested
D2 Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed
D3 Extreme Drought	• Major crop/pasture losses Widespread water shortages or restrictions
D4 Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies

Water is a resource often taken for granted. In recent years, water availability and quality have become important public concerns in Mahoning County. Information available for the last plan update indicated that 92% of the overall population of Mahoning County depends on surface water for their water supply; recent data from USGS for 2015 suggests that this figure is now closer to 96%. The rest of the population obtains their water from groundwater.

The USGS keeps track of groundwater data; in Mahoning County there is a well site where they measure water levels. The well, located in Canfield Township, measures the Allegheny Formation local aquifer, a part of the larger Pennsylvanian Aquifer System, the aquifer that supplies water to Mahoning County. The following graphic shows the water level below the surface from USGS well data juxtaposed with indicators of drought occurrences from the USDM; every time there was a drought, the water level dropped at the well. However, this graphic also indicates that typically, there is an increase in water during the spring and a decrease in the fall; droughts typically occur during the summer and fall months.

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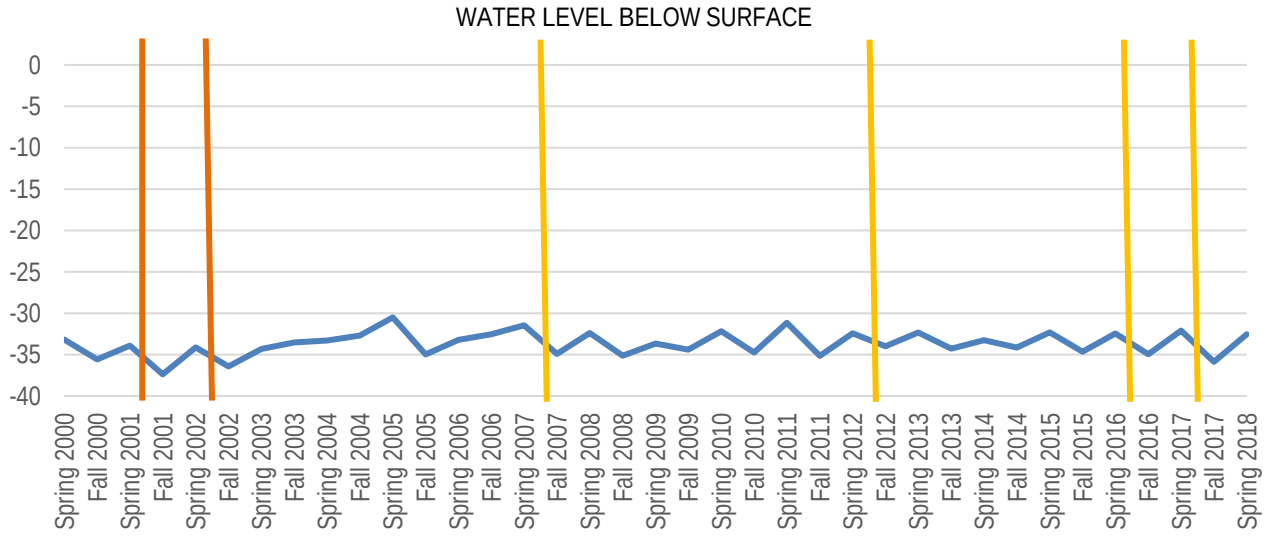
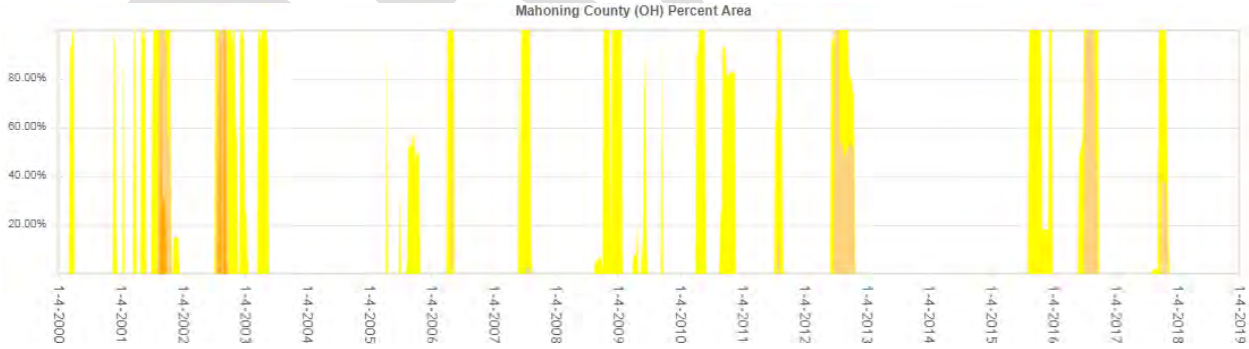


HISTORICAL OCCURRENCES

As seen in the U.S. Drought Monitor graph below, Mahoning County has experienced several instances of abnormally dry conditions (in yellow). The county has experienced few moderate droughts (light orange) and even fewer severe droughts (orange). The county has not experienced extreme or exceptional drought conditions since 2000. The moderate or severe droughts occurred in select months of 2001, 2002, 2007, 2016, and 2017. The longest-lasting severe drought conditions occurred between August and September of 2001, lasting six consecutive weeks.



LOCATION AND EXTENT

Droughts are a region-wide hazard that can affect all areas and jurisdictions within the region. Droughts are widespread events that may extend to several states in varying degrees of severity. Within Mahoning County, the extent of a drought would be equal or very similar given the region's geography and environmental qualities. A drought can vary in

severity throughout the year; what starts out as a mild drought can reach severe or extreme drought status and then return to a mild drought. This process could take weeks or even months and the effects could be felt even months after the drought conditions are over.

LOSS AND DAMAGES

In Mahoning County, there have been no disaster declarations due to drought conditions, therefore, it is necessary to seek alternative sources of information for potential losses. The USDA keeps data about agriculture through the 5-year censuses; the following table outlines the number of farms in Mahoning County at every past census year since 1997 as well as the harvested cropland. As described above, there have been moderate or severe droughts in 2001, 2002, 2007, 2016, and 2016. The data suggests that even though there were two droughts between the census years of 1997 and 2002, there was still a 4% increase in the number of harvested acres in the county. Between 2002 and 2007 there was a decrease in the percentage of harvested cropland in the county, but since there were no drought conditions, this decline cannot be attributed to drought.

USDA CENSUS OF AGRICULTURE HARVESTED CROPLAND AND FARMS					
Census Year	*Harvested Cropland*	*Farms*	*Average Harvested Cropland Per Farm*	*% Change in Harvested Cropland from Previous Census*	*% Change in Farms from Previous Census*
1997	46,712	542	86 acres	N/A	N/A
2002	48,642	652	74 acres	+ 4%	+ 20%
2007	41,656	578	72 acres	- 14%	- 12%
2012	51,384	578	88 acres	+ 23%	0%

Based on the information above, losses in the agriculture sector (the hardest hit during drought conditions) due to drought in Mahoning County are $0.

PREVIOUS AND ONGOING MITIGATION EFFORTS

Efforts to mitigate the effects of drought conditions in Mahoning County include consistent vigilance of forecasted conditions like the prevalence of rainfall, the development and distribution of public awareness materials concerning natural hazard risks, displaying drought information at public events.

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RISK ASSESSMENT

DROUGHT RISK CALCULATION					
Probability			*Severity*		*Risk*
REMOTE			MARGINAL		LOWEST
Events 5	= 0.27	+	The damage from droughts in Mahoning County has been confined mainly to the agricultural sector.	=	The risk assessment matrix categorizes drought as one of the lowest risk hazards in Mahoning County.
Years 18					
Between 2000 and 2018 there have been 5 instances of moderate or severe drought in the county.					

MAP AND ASSETS

The following map shows the risk areas for drought. The areas in yellow represent the agricultural land cover for Mahoning County, where crops and other vegetation would be more susceptible to the effects of a drought. Although there are many assets that fall within this area, as listed in the table below, the built environment is rarely susceptible to droughts.

ASSETS WITHIN DROUGHT-SUSCEPTIBLE AREAS			
Name	*Address*	*Jurisdiction*	*Type*
Boardman, Stadium Drive Elementary	111 Stadium Drive	Boardman	Educational Facility
South Range, Elementary/Middle/High	11300 Columbiana-Canfield Road	Canfield	Educational Facility
Springfield, Middle/High School	11335 Youngstown-Pittsburgh Road	New Middletown	Educational Facility
Western Reserve, Elem/Middle/High	13850 Akron-Canfield Road	Berlin Center	Educational Facility
Jackson-Milton, Middle/High School	13910 Mahoning Avenue	North Jackson	Educational Facility
West Branch, High School	14277 Main Street	Beloit	Educational Facility
West Branch, Middle School	14409 Beloit-Snodes Road	Beloit	Educational Facility
Youngstown, Paul C. Bunn Elem.	1825 Sequoya Drive	Youngstown	Educational Facility
Austintown, Elementary School	245 Idaho Road	Austintown	Educational Facility
Youngstown, MLK Elementary	2725 Mariner Avenue	Youngstown	Educational Facility
Youngstown, Kirkmere Elementary	2851 Kirk Road	Youngstown	Educational Facility
Canfield, C.H. Campbell Elementary	300 Moreland Drive	Canfield	Educational Facility
Poland, Dobbins Elementary	3030 Dobbins Road	Poland	Educational Facility
Poland, North Elementary	361 Johnston Place	Poland	Educational Facility
Canfield, Hilltop Elementary	400 Hilltop Boulevard	Canfield	Educational Facility
Austintown, Fitch High School	4560 Falcon Drive	Austintown	Educational Facility
Struthers, Elementary School	520 Ninth Street	Struthers	Educational Facility
Diocese of Ygn, ECLC-St. Luke	5225 South Avenue	Boardman	Educational Facility
Boardman, Market Street Elementary	5555 Market Street	Boardman	Educational Facility

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ASSETS WITHIN DROUGHT-SUSCEPTIBLE AREAS			
Name	*Address*	*Jurisdiction*	*Type*
Youngstown, Taft Elementary	730 East Avondale Avenue	Youngstown	Educational Facility
MCCTC	7300 North Palmyra Road	Canfield	Educational Facility
Boardman, Hight School	7777 Glenwood Avenue	Boardman	Educational Facility
Damascus Fire Dept, Station 2	11990 Stratton Road	Salem	Fire Station
Milton Fire Department	15980 Milton Avenue	Lake Milton	Fire Station
Youngstown Fire Dept, Station 12	2251 McGuffey Road	Youngstown	Fire Station
Springfield Fire Dept, Station 21	3989 East Middletown Road	New Springfield	Fire Station
Youngstown Fire Dept, Station 3	579 North Belle Vista Avenue	Youngstown	Fire Station
Ellsworth Fire Department	6034 South Salem Warren Road	Ellsworth	Fire Station
Cardinal Joint Fire District, Station 2	7075 Herbert Road	Canfield	Fire Station
Milton Twp. Hall	15992 Milton Avenue	Lake Milton	Government Building
Idora Park	2700 McFarland Avenue	Youngstown	Historic Location
Austintown Log House	3797 South Raccoon Rd	Austintown Township	Historic Location
Wal-Mart	1300 Doral Drive	Youngstown	Industry
Calex Corporation	2415 Wilson Avenue	Campbell	Industry
Corcon Inc.	3763 McCartney Road	Lowellville	Industry
InfoCision Management	5740 Interstate Boulevard	Youngstown	Industry
Campbell WWTP	4200 Wilson Avenue	Campbell	Infrastructure
Craig Beach/Lake Milton WTP	2563 Grandview Road	Lake Milton	Infrastructure
Milton Police Department	15992 Milton Avenue	Lake Milton	Law Enforcement
Poland Twp. Police Department	3339 Dobbins Road	Poland	Law Enforcement
The Surgical Hospital At Southwoods	7623 Market Street	Boardman	Medical
Vibra Hospital of Mahoning Valley	8049 South Avenue	Boardman	Medical
Hampton Woods	1525 E Western Reserve Road	Poland	Nursing Home
St. Mary's Alzheimer's Center	1899 West Garfield Road	Columbiana	Nursing Home
Antonine Village	2675 N Lipkey Road	North Jackson	Nursing Home
Dandridge Burgandi Manor	31 Maranatha Drive	Youngstown	Nursing Home
Greenbriar, Commons	8060 South Avenue	Boardman	Nursing Home
The Renal Group	807 Southwestern Run	Youngstown	Nursing Home
Caprice Health Care	9184 Market Street	North Lima	Nursing Home
Beloit	13666 South Main Street	Beloit	Post Office
Berlin Center	15401 West Akron Canfield Road	Berlin Center	Post Office
Ellsworth	6036 South Salem Warren Road	Ellsworth	Post Office

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MAHONING COUNTY HAZARD MITIGATION PLAN

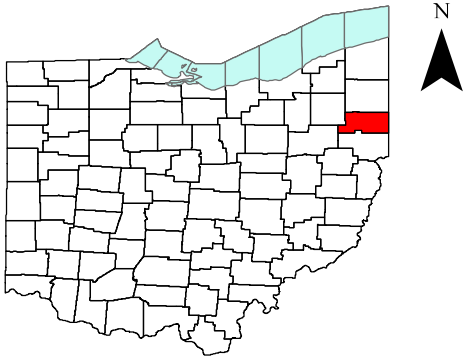
Drought Risk Map

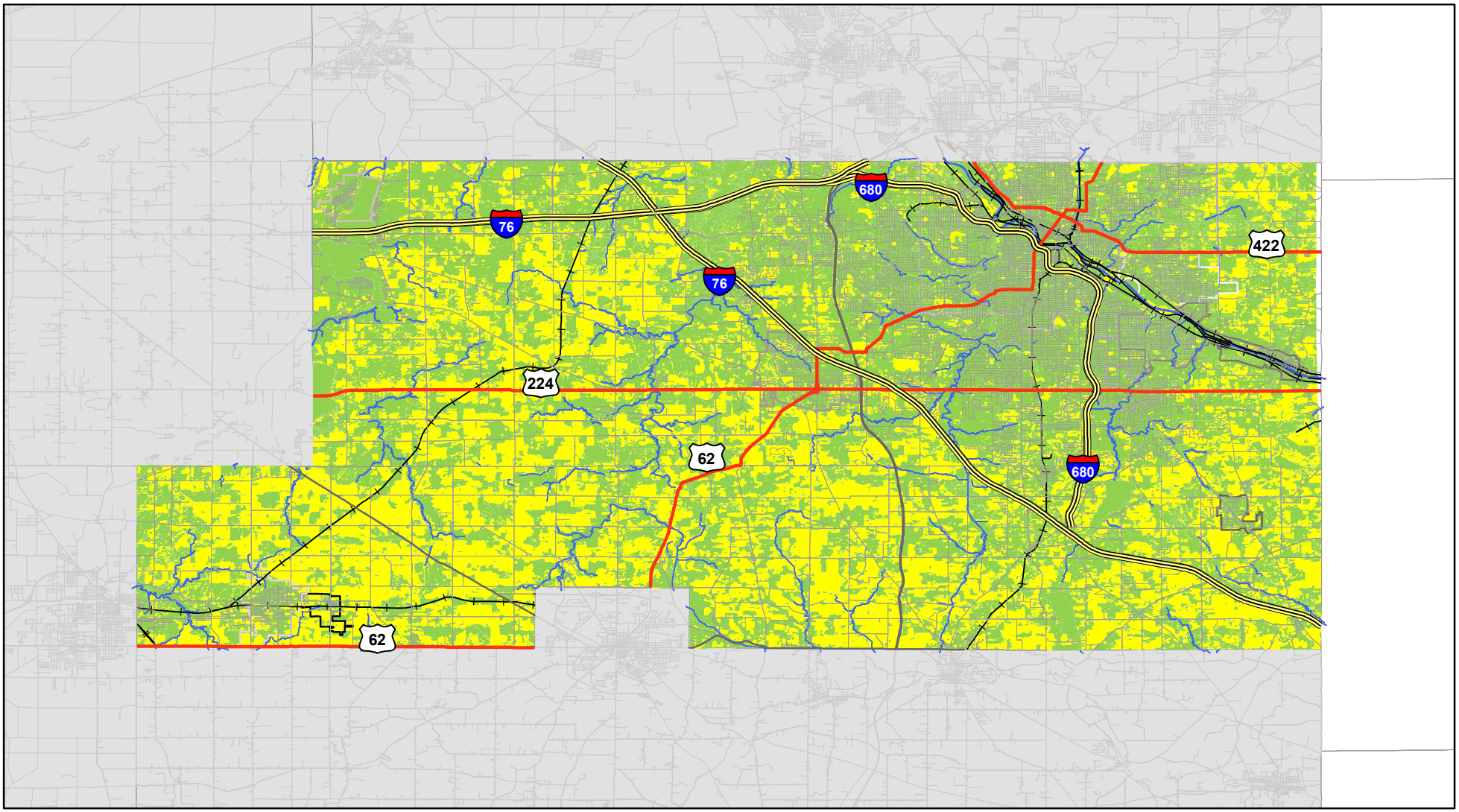
Data Source(s):
ODNR, U.S. Drought Monitor

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Remote, Marginal Risk

Lowest Risk





2.4.3 Earthquake

HAZARD OVERVIEW

An earthquake is the moving or shaking of the Earth's tectonic plates due to built-up pressure				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time	Overall Hazard Ranking:	**4**
	Warning Time:	None	State Risk Ranking:	Frequency: Possible Impact: Limited Ranking: 2 – Low
	Probability:	Probable	Severity:	Negligible
	Type of Hazard:	Natural and human-caused	Disaster Declarations:	None

Earthquakes are one of nature's most damaging hazards and are more widespread than is often realized. The area of greatest seismic activity in the United States is along the Pacific Coast, in the states of California and Alaska; however, as many as 40 states can be characterized as having moderate earthquake risk. Although most people do not think of Ohio as an earthquake-prone state, at least 170 earthquakes with epicenters in Ohio have been felt since 1776, most were felt in the local region surrounding the epicenter, and 14 of these have caused "minor to moderate" damage in Ohio.

Earthquakes move or shake the earth in three different directions depending on the plate movements: convergent, divergent, and transform generating primary and secondary waves. There are three common ways to measure an earthquake:

- **Richter Scale**: Developed in 1935, the Richter scale measures the scale and severity of an earthquake, The magnitude of an earthquake can range between 0 and 10. The effects of an earthquake can extend far beyond the site of its occurrence.
- **Modified Mercalli Scale**: The modified Mercalli scale measures earthquakes based on their intensity on the surface. This scale uses roman numerals I through XII to denote detection and damage levels associated with an earthquake.
- **Peak Ground Acceleration (PGA):** PGA is "the maximum ground acceleration that occurred during earthquake shaking at a location. PGA is equal to the amplitude of

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the largest absolute acceleration recorded on an accelerogram at a site during a particular earthquake" (Douglas, 2003).

The table to the right shows the relation between the Richter scale (magnitude) and Modified Mercalli Scale.

MODIFIED MERCALLI AND MAGNITUDE SCALE COMPARISON

Modified Mercalli Scale		*Magnitude Scale*
I	Felt by few people under especially favorable conditions.	1.5
II	Felt by few persons at rest, especially on upper floors of buildings.	2.0 2.5
III	Felt quite noticeably indoors, especially on upper floors of buildings. Many do not recognize it as an earthquake. Standing vehicles may rock slightly. Vibration feels like passing truck.	3.0
IV	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation of a heavy truck striking building; standing vehicles rock noticeably.	3.5
V	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned.	4.0 4.5
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.	5.0
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by vehicle drivers.	5.5
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse; damage great in poorly built structures; fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned. Disturbs	6.0
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Underground pipes broken.	6.5 7.0
X	Some well-built wooden structures are destroyed; most masonry and frame structures with foundations destroyed; train rails bent.	7.5
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Underground pipelines taken out of service. Train rails bent greatly.	8.0
XII	Damage total. Waves seen on ground surfaces. Lines of sight and level are distorted. Objects thrown into the air.	8.5

POSSIBLE CAUSES

The Earth is made up of tectonic plates; the boundary lines where these tectonic plates meet are called faults. Friction along the boundaries or faults causes the rocks to stress and strain. "When the stress of the rocks exceed their strength, that is, their ability to withstand the force, the rock rupture and are permanently displaced along the fault plane" (Keller & Devecchio, 2015) causing earthquakes that reach and affect the infrastructure on the surface.

A common misconception is that hydraulic fracturing, or "fracking" is causing all of the induced earthquakes. In reality, fracking "is directly causing a small percentage of the felt-induced earthquakes observed in the United States…Most induced earthquakes in the United States are a result of the deep disposal of fluids (wastewater) related to oil and gas production" (Rubinstein and Mahani, 2015).

IMPACTS AND VULNERABILITY

The severity of an earthquake is dependent on the amount of energy released from the fault or epicenter. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning, and after just a few seconds can cause

massive damage and extensive causalities. Common effects of earthquakes are ground motion and shaking, surface ruptures, and ground failure. The risk of fire immediately following an earthquake is often high because of broken electrical lines and gas mains. In recent years, officials in most of the world's major cities have installed devices that shut these services down automatically if an earthquake strikes. Other hazards that may result from an earthquake are utility and communications failures.

The impacts to a community from earthquake events include injuries to citizens and public safety officials, damage to property, lost revenue and economic damages, increased demand on public safety and infrastructure related services. Ground shaking from earthquakes can collapse buildings and bridges, disrupt gas, electric, and phone service, and sometimes trigger landslides, flash floods, fires, and tsunamis.

HISTORICAL OCCURRENCES

The USGS provides historic information on earthquakes and allows for search parameters; for this profile, the search included data for the following parameters: between January 1, 1950 and June 20, 2018, a minimum magnitude of 2.5, and a search area square that encompassed the area shown in the graphic to the right (Erie, PA to the north; Wheeling, WV to the south; Ford City, PA to the east; Elyria, OH to the west). The USGS does not register earthquakes under a 2.5 magnitude; therefore, data from OhioSeis, a subdivision of Ohio Department of Natural Resources (DNR) completes the information. OhioSeis registers lower magnitude earthquakes than USGS. The following table outlines the earthquakes in and near Mahoning County since 2010. USGS registered 33 earthquakes in the set area between 1983 and 2009; these are not included in the table.

EARTHQUAKES IN AND AROUND MAHONING COUNTY 2010-2018					
Date	*Source*	*Depth (km)*	*Magnitude*	*Place*	*Description*
3/11/2014	OhioSeis	5	2.1	Lowellville, Mahoning County	A small earthquake in the Lowellville area of Mahoning County was felt at 3:01 EDT.
3/10/2014	OhioSeis	5	2.2 to 3.0	Lowellville, Mahoning County	Four small earthquakes above 2.0 magnitude were recorded about 2.8 kilometers (1.75 miles) south of Lowellville, Poland Township, Mahoning County, at 2:26 a.m EDT (3.0 magnitude), 2:42 a.m. EDT (2.4 magnitude), 11:03 a.m. EDT(2.2 magnitude), and 11:44 a.m. EDT (2.6 magnitude). Felt reports were received for the 2:26, 11:03, and 11:44 events. There were no damages from these minor

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EARTHQUAKES IN AND AROUND MAHONING COUNTY 2010-2018					
Date	*Source*	*Depth (km)*	*Magnitude*	*Place*	*Description*
					earthquakes.
3/5/2014	OhioSeis	5	2.3	Lowellville, Mahoning County	A small earthquake occurred at 10:05 p.m. EST (March 4) south of Lowellville, Poland Township, Mahoning County. No felt reports were received.
11/12/2013	OhioSeis	3	2.1	Youngstown, Mahoning County	A minor earthquake occurred in the Youngstown area on November 12, 2013, 3:12 p.m. EST. There were no felt reports.
7/1/2013	USGS	5	3.2	6km NW of Fairport Harbor, Ohio	N/A
3/8/2013	USGS	5	2.7	Lake Erie, Ohio	N/A
1/13/2012	OhioSeis	5	2.1	Youngstown, Mahoning County	A very small earthquake was instrumentally recorded on January 13, 2012 at 5:22 p.m. Eastern Standard Time in the Youngstown area. No felt reports were received, which is not unusual considering the small magnitude of this event.
12/31/2011	USGS & OhioSeis	5	4.0	Youngstown-Akron urban area, Ohio	A 4.0 magnitude earthquake centered at Youngstown rocked northeastern Ohio just before 3:05 p.m. EST on New Year's Eve. This was the 11th earthquake in a sequence that began on March 17, 2011 at Youngstown. The December 31 earthquake was felt throughout northeastern Ohio, adjacent areas in western Pennsylvania, and in Ontario, Canada. Media reports indicate that damage was minor from this event with a few reports of cracked plaster and glassware falling from shelves. Earthquakes in the low 4 magnitude range would not be expected to cause major damage. More than 4,700 felt reports have been submitted by individuals to the U.S. Geological Survey's Did You Feel It Web site.
12/24/2011	OhioSeis	3.55	2.7	Youngstown, Mahoning County	A small earthquake rattled portions of Youngstown early (1:24 a.m. EST) on the morning of December 24. No damage was reported. More than 90 people submitted reports to the USGS Did You Feel It Web site.
11/25/2011	OhioSeis	5	2.2	Youngstown, Mahoning County	A small earthquake occurred at Youngstown at 1:47 a.m. EST. This event is in the same area as previous small earthquakes in the Youngstown area. No felt reports were received.
10/20/2011	OhioSeis	5	2.3	Youngstown, Mahoning County	A small earthquake was felt in Youngstown at 6:41 p.m. EDT. There were no reports of damage. This earthquake is in the vicinity of several other small earthquakes in 2011.
9/30/2011	OhioSeis	5	2.7	Youngstown, Mahoning County	A small earthquake on September 29, 2011, at 8:52 p.m. EDT, was widely felt in Youngstown and surrounding communities including Campbell, Canfield, Girard, Hubbard, McDonald, and Mineral Ridge, throughout an area of about 1,000 square kilometers. More than 300 felt reports were submitted. Many residents reported a loud boom followed by brief shaking and some thought a vehicle had hit the house or a tree had fallen. No damage was reported. Several small earthquakes have occurred in this area in 2011.
9/26/2011	OhioSeis	5	2.6	Youngstown, Mahoning County	A small earthquake was felt by a few people on the west side of Youngstown at 9:06 p.m. Eastern Daylight Time. This event is in the general area of several small earthquakes in recent months.
9/2/2011	OhioSeis	5	2.2	Youngstown, Mahoning County	A small earthquake occurred at 5:03 p.m. EDT on September 2 on the west side of Youngstown. This is in the general vicinity of earthquakes on March 17, August 22, and August 25. A few people in Youngstown reported feeling the event.

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EARTHQUAKES IN AND AROUND MAHONING COUNTY 2010-2018					
Date	*Source*	*Depth (km)*	*Magnitude*	*Place*	*Description*
8/22/2011	OhioSeis	5	2.2	Youngstown, Mahoning County	A very small earthquake occurred at 4:00 a.m. EDT on the west side of Youngstown. No felt reports were received.
8/25/2011	OhioSeis	5	2.4	Youngstown, Mahoning County	A small earthquake occurred at 3:44 p.m. on August 25 on the west side of Youngstown. No felt reports were received
6/5/2011	USGS	5	3	Ohio	N/A
3/17/2011	OhioSeis	5	2.6	Youngstown, Mahoning County	A small earthquake at 6:42 a.m EDT was a foreshock to the larger (2.6 mbLg) mainshock at 6:53 a.m. A few people felt the foreshock although some may have confused both events as they were closely spaced in time and general location.
3/17/2011	USGS & OhioSeis	5	2.1	Youngstown-Akron urban area, Ohio	A small earthquake rattled residents of Youngstown and Austintown at 6:53am. Residents reported a loud boom followed by a sharp jolt. No damage was reported.
6/23/2010*	USGS	N/A	5	Ontario-Quebec Border Region, Canada	This event was widely felt across Ohio, New York, Pennsylvania, and neighboring areas
6/10/2010	USGS	5	2.6	Lake Erie, Ohio	A small earthquake occurred beneath Lake Erie, northwest of Mentor. A number of people in the Mentor area reported feeling it as a brief jolt preceded by a booming sound. There was no damage reported. A few residents reported a second, and much smaller, shock about 10 minutes after the first one.
6/7/2010*	USGS	N/A	2.3	Madison, Lake County, Ohio	Several felt reports, all from the west side of Madison, were received by the Ohio Seismic Network. Residents described a booming sound and a sharp jolt. There was no damage from the 2.3-magnitude event.
5/17/2010	USGS	5	2.7	Ohio	The epicenter was in a relatively rural area near the Cuyahoga Valley National Park.
4/25/2010	USGS	5	3	Ohio	N/A

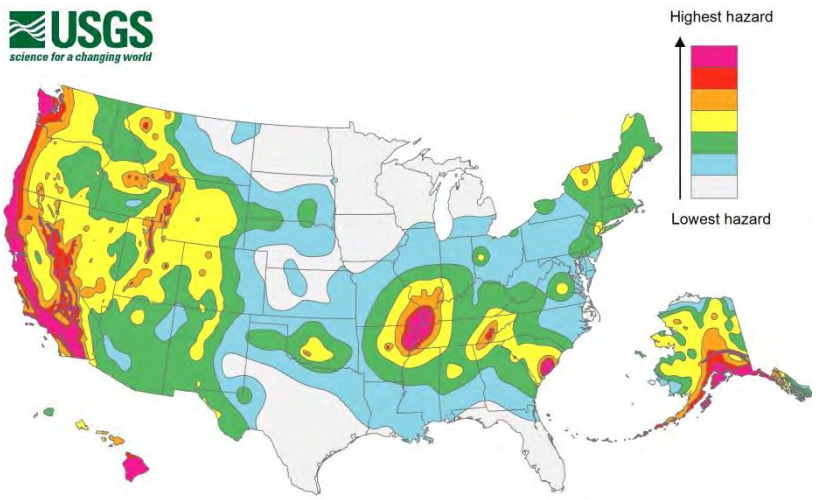
Sources: USGS Earthquake & Ohio DNR

Since 2000, there have been 27 felt earthquakes in Mahoning County. In 2011 there were a series of small earthquakes attributed to the operations of the Northstar 1 injection well in the Youngstown area. OhioSeis had not recorded seismic activity with epicenters in the Youngstown or Mahoning County area before this (Ohio EMA, 2014). Similarly, in 2014, another series of small earthquakes associated with injection wells were felt in Poland Township, south of Lowellville.

LOCATION AND EXTENT

The U.S. has areas that are prone to earthquakes; the coasts of California, Oregon and Washington are more vulnerable to seismic activity due to the presence of the Ballenas, Brothers, and the San Andreas Faults on the west coast. Also of note is the New Madrid

Seismic Zone located in Arkansas, Missouri, and Tennessee. On the east coast, there is the Eastern Tennessee Seismic Zone that stretches from Alabama to Virginia.



The USGS (2014) has a map of the US that identifies the highest and lowest hazard zones for earthquakes. In it, it shows the majority of the State of Ohio mostly as low risk; this includes Mahoning County. The southernmost, west, and northeastern most parts of the state have only a slightly higher risk of earthquake hazards. Mahoning County is considered a low risk area for natural earthquakes.

Ohio is located on the periphery of the New Madrid Seismic Zone, an area in Missouri and adjacent states that was the site of the largest earthquake sequence to occur in historical times in the continental United States. Earthquake activity in Mahoning County would probably stem from an event along the Smith Township Fault, which crosses Smith Township in western Mahoning County. Three other faults lie nearby in adjacent counties. The Suffield Fault System lies to the west in Portage County. The Highlandtown Fault and the Pittsburgh-Washington Cross Strike Structural Discontinuity lies to the south in Columbiana County. There is also a major fault located under Lake Erie to the north of Mahoning County.

LOSS AND DAMAGES

All USGS and OhioSeis descriptions of earthquakes indicate that there have been no major losses or damages to structures or people, only minor damage such as cracked plaster or glass.

The effects of a potential earthquake striking Mahoning County were analyzed using the HAZUS-MH program from the Federal Emergency Management Agency. The scenario depicts a 5.0 earthquake (the lowest possible magnitude to use in the program) located at the county seat of each county. The following tables describe the expected building damages by occupancy type and the building-related economic loss estimates.

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MAHONING COUNTY EXPECTED BUILDING DAMAGE BY OCCUPANCY (HAZUS)										
	None		*Slight*		*Moderate*		*Extensive*		*Complete*	
	Count	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*	*Count*	*%*
Agriculture	187	0.34	61	0.21	70	0.38	37	0.66	9	0.60
Commercial	2,101	3.77	1,094	3.87	1,307	7.11	654	11.81	192	12.39
Education	74	0.13	35	0.12	42	0.23	19	0.34	6	0.37
Government	82	0.15	23	0.08	27	0.14	11	0.19	3	0.20
Industrial	676	1212	308	1.09	400	2.17	222	4.01	64	4.11
Other Residential	7,000	12.57	3,321	11.76	2,204	11.99	648	11.70	171	11.03
Religion	232	0.42	11	0.39	110	0.60	55	1.00	17	1.09
Single Family	45,81.42	81.42	23,295	82.46	14,230	77.38	3,897	70.30	1,085	70.19
TOTAL	55,712	-	28,249	-	18,390	-	5,543	-	1,546	-

MAHONING COUNTY HAZUS BUILDING-RELATED ECONOMIC LOSS ESTIMATES (MILLIONS OF DOLLARS)							
Category	*Area*	*Single Family*	*Other Residential*	*Commercial*	*Industrial*	*Others*	*Total*
Income Losses	Wage	0.00	5.30	103.65	5.82	4.26	119.04
	Capital Related	0.00	2.23	83.43	4.27	1.20	91.12
	Rental	26.77	21.64	43.57	2.52	2.01	91.12
	Relocation	99.03	13.98	68.85	11.61	17.85	211.32
	Subtotal	125.79	43.16	299.50	24.21	25.32	517.99
Capital Stock Losses	Structural	141.64	31.65	89.01	35.01	18.96	316.27
	Non Structural	490.54	197.56	235.70	105.89	50.03	1,049.72
	Content	181.38	50.46	128.18	74.77	27.80	462.60
	Inventory	0.00	0.00	4.18	14.72	0.39	19.30
	Subtotal	813.56	249.67	457.08	230.39	97.18	1,847.89
TOTAL		939.35	292.83	756.58	254.61	122.51	2,365.87

PREVIOUS AND ONGOING MITIGATION EFFORTS

The United States has been a world front-runner in mitigation efforts related to natural disasters. The advent of United States building codes, zoning codes, research on liquefaction areas and ground shaking, building retrofitting, non-structural mitigation/tie-downs, public education, drop-cover-and-hold exercises, and public television specials have dramatically reduced the impact to property, injuries and economic damage. When the United States is compared to countries that do not have these codes and standards (e.g., Turkey, Iran, and Pakistan the earthquake disaster results are dramatically different).

Currently, Mahoning County Emergency Management Agency utilizes its website and social media to distribute information on earthquake preparedness. They also utilize FEMA's ready.gov website.

RISK ASSESSMENT

As noted previously, USGS and OhioSeis have different thresholds of recording earthquake magnitude (2.5+ and below 2.5, respectively). Because earthquakes below 2.5 to 2.7 cause little damage according to the Modified Mercalli Scale, earthquakes below a

magnitude of 2.5 are not considered for this risk analysis, only earthquakes with the potential to cause even minor structural damage.

EARTHQUAKE RISK CALCULATION					
Probability			*Severity*		*Risk*
PROBABLE			NEGLIGIBLE		LOW
Events 14	= 0.77	+	The amount of damages that earthquakes have caused in Mahoning County is negligible.	=	The risk assessment matrix categorizes the risk of earthquakes to be low.
Years 18					
Considering 2.5+ magnitude earthquakes since 2000, there is a 'probable' probability of occurrence during a year in Mahoning County.					

MAP AND ASSETS

The following map shows low and lowest risk areas for earthquakes in Mahoning County. The "low" risk areas on the map are those with soils that are prone to liquefaction (i.e. sandy, silty, or gravely); no assets are located in these areas.

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MAHONING COUNTY HAZARD MITIGATION PLAN

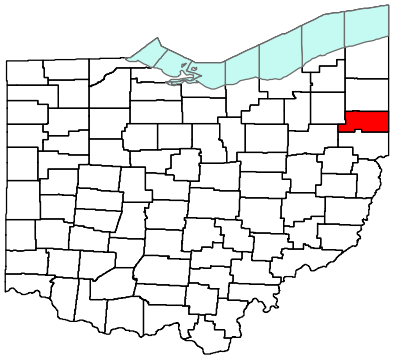
Earthquake Risk Map

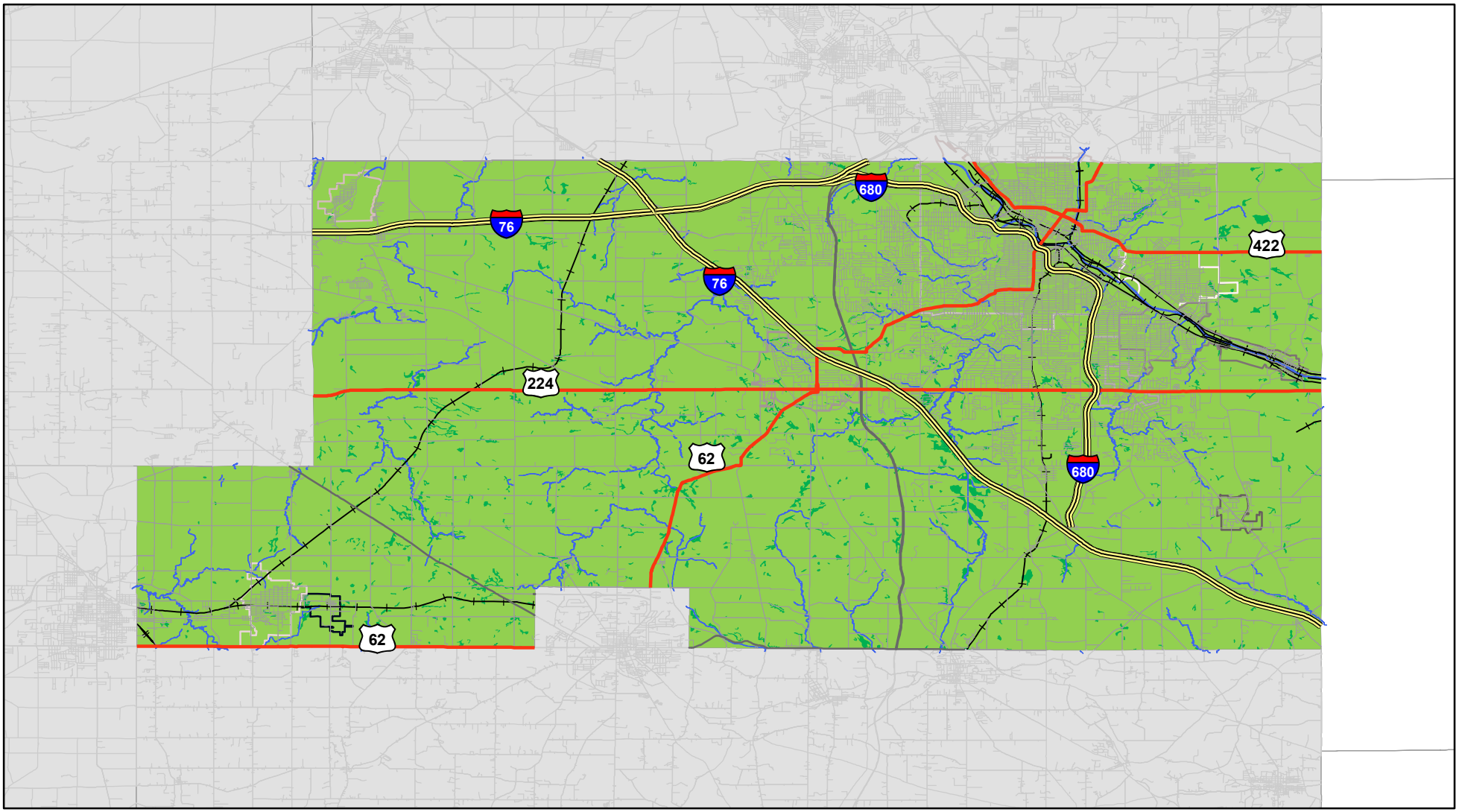
Data Source(s):
NRCS, ODNR, USGS

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Low Risk

Lowest Risk





2.4.4 Epidemic

HAZARD OVERVIEW

A sudden increase in the number of cases of a disease above what is normally expected in a certain area.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time	Overall Hazard Ranking:	**4**
	Warning Time:	Months to days	State Risk Ranking:	Not ranked
	Probability:	Remote	Severity:	Critical
	Type of Hazard:	Natural and human-caused	Disaster Declarations:	None

According to the Centers for Disease Control and Prevention (CDC), there are various levels that refer to the amount or extent of a disease occurrence (CDC, 2012).

- **Endemic** refers to the constant presence and/or usual prevalence of a disease or infectious agent in a population within a geographic area; it is the amount of a particular disease that is usually present in a community or baseline.
- **Sporadic** refers to a disease that occurs infrequently and irregularly.
- **Hyper endemic** refers to persistent, high levels of disease occurrence.
- **Cluster** refers to an aggregation of cases grouped in place and time that are suspected to be greater than the number expected, even though the expected number may not be known.
- **Epidemic** refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in that population in that area. Epidemics occur when an agent and susceptible hosts are present in adequate numbers, and the agent can be effectively conveyed from a source to the susceptible hosts. More specifically, an epidemic may result from:
  - a recent increase in amount or virulence of the agent,
  - the recent introduction of the agent into a setting where it has not been before,
  - an enhanced mode of transmission so that more susceptible persons are exposed,
  - a change in the susceptibility of the host response to the agent, and/or

  - factors that increase host exposure or involve introduction through new portals of entry.
- **Outbreak** carries the same definition of epidemic but is often used for a more limited geographic area.
- **Pandemic** refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.

Some diseases are so rare in a given population that a single case warrants an epidemiologic investigation (e.g., rabies, plague, polio), other diseases occur more commonly so that only deviations from the norm warrant investigation. For this plan, diseases considered are limited to Class A and Class B Reportable Infectious Diseases, according to the Ohio Administrative Code Chapter 3701-3.

POSSIBLE CAUSES

Epidemics can develop with little or no warning and quickly erode the capacity of local medical care providers. A fast developing epidemic can last several days and extend into several weeks. In some extreme cases, they can last for several months. An epidemic can occur at any time of the year, but the warm summer months, when bacteria and microorganism growth are at their highest, present the greatest risk.

IMPACTS AND VULNERABILITY

Major concerns during an epidemic or outbreak include the ability of local health care providers to provide medical attention to everyone who becomes ill, and the ability to identify the source or what is causing the population to become ill.

Cascading effects of epidemics can include the following.

- Illness or death
- Civil disturbance
- Distrust of government
- Poor water quality
- Temporary loss of income

HISTORICAL OCCURRENCES

The table below summarizes data from the Mahoning County Health Department annual reports. Since 2006 they have been tracking reportable diseases in the county and

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reporting them. Yellow boxes indicate that there were more cases than the average amount over the years in that year (outbreak or epidemic). For example, over the 12 years from 2006 to 2017, there has been an average of 0.17 cases of infant Botulism, so even one case in a year would be considered over the average and indicate an epidemic, according to the CDC definition previously outlined. Therefore, in 2009 and 2015, when there was one case reported, it can be considered that there was an epidemic or outbreak. Boxes in orange indicate an increasing trend in the number of cases over the average for at least three years. In contrast, green boxes indicate a steady decreasing trend in the number of cases under the average for the last three years.

MAHONING COUNTY REPORTABLE DISEASE SUMMARY 2006-2017

Reportable Disease	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*Average Cases Per Year*
Botulism, infant	0	0	0	1	0	0	0	0	0	1	0	0	0.17
Campylobacteriosis	6	11	5	11	13	12	17	7	10	10	12	14	10.67
Chlamydia	110	0	0	178	351	369	339	340	323	416	489	495	284.17
Creutzfeldt-Jakob Disease	0	0	0	2	0	1	0	0	0	0	0	0	0.25
Coccidioidomycosis	0	0	1	0	0	1	0	0	1	0	0	0	0.25
Cryptosporidiosis	3	3	5	2	9	5	10	3	3	1	6	2	4.33
Cytomegalovirus - congenital	0	0	0	0	0	0	0	1	0	0	0	0	0.08
Dengue	0	1	0	0	0	0	0	0	0	0	0	0	0.08
E.coli	4	3	2	1	1	0	2	1	0	4	3	4	2.08
Ehrlichiosis	0	0	0	0	0	0	0	0	0	1	0	0	0.08
Giardiasis	5	1	3	3	7	5	3	2	3	7	4	5	4.00
Gonococcal	0	0	0	21	53	79	74	99	92	108	148	122	66.33
Haemophilus influenzae (invasive disease)	2	0	2	0	3	2	0	1	3	3	3	4	1.92
Hepatitis A	0	1	0	0	2	0	0	4	2	0	0	9	1.50
Hepatitis B (acute and chronic)	3	8	10	11	18	19	21	22	29	27	32	28	19.00
Hepatitis C (acute and chronic)	53	63	56	66	95	124	112	89	186	210	196	191	120.08
Influenza (H1N1)	0	0	0	6	0	0	0	0	0	0	0	0	0.50
Influenza hospitalization	0	0	0	52	0	21	45	70	106	96	152	295	69.75
Kawasaki disease	2	1	0	0	0	0	0	0	0	0	0	0	0.25
LaCrosse Encephalitis	0	0	0	0	0	0	0	0	2	0	1	0	0.25
Legionnaires' disease	5	1	5	7	3	2	10	11	6	11	8	11	6.67
Listeriosis	2	0	0	0	0	0	0	1	2	0	0	1	0.50
Lyme disease	3	1	1	3	4	4	11	1	13	17	18	6	6.83
Meningitis, aseptic	9	2	5	14	5	13	5	11	7	9	6	5	7.58
Meningitis, bacterial	2	1	0	1	4	2	2	1	0	1	1	0	1.25
Meningococcal Disease	0	0	0	0	0	0	0	0	0	0	1	0	0.08
Mumps	1	0	0	0	0	0	0	1	3	2	0	0	0.58

MAHONING COUNTY REPORTABLE DISEASE SUMMARY 2006-2017													
Reportable Disease	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*Average Cases Per Year*
Mycobacterial disease	0	3	2	1	0	9	11	7	7	14	9	0	5.25
Pertussis	6	1	1	7	22	18	13	14	26	51	20	29	17.33
Q Fever	0	0	0	0	0	0	0	0	0	3	0	0	0.25
Rocky Mountain Spotted Fever	0	0	2	0	1	1	0	1	0	0	3	1	0.75
Salmonellosis	13	13	16	23	18	16	13	11	10	17	20	25	16.25
Shingellosis	0	0	2	7	1	0	0	2	2	5	2	8	2.42
Streptococcal disease, Group A invasive	4	1	5	7	3	2	4	6	10	4	1	0	3.92
Streptococcal disease, Group B in newborn	0	0	1	1	2	1	1	0	1	0	0	0	0.58
Streptococcus pneumoniae	6	16	26	26	24	19	18	21	9	11	20	12	17.33
Tetanus	0	0	0	0	0	1	0	0	0	0	0	0	0.08
Tuberculosis	1	5	3	3	2	1	1	0	0	2	1	0	1.58
Varicella	189	37	36	7	20	17	5	4	6	7	14	10	29.33
Vibrio Parahaemolyticus infection	0	0	1	0	0	0	0	0	0	0	0	0	0.08
West Nile Virus	0	0	0	0	0	0	0	0	1	1	0	0	0.17
Yersiniosis	0	0	1	0	0	0	0	0	1	1	1	0	0.33
Zika Virus	0	0	0	0	0	0	0	0	0	0	1	0	0.08
Source: Mahoning County Health Department Annual Reports 2006 to 2017				Number of cases reported are above annual average			Steady increase above average for at least 3 consecutive years			Steady decrease from average for at least 3 consecutive years			

Three of the seven reportable diseases in the previous table are sexually transmitted diseases or infections (STD/STI). In addition, all the steady increases above the average (identified in orange) have occurred in the past five to seven years.

In April of 2009, the secretary of the U.S. Department of Health and Human Services declared that as a consequence of confirmed cases of Swine Influenza A (swH1N1) in California, Texas, Kansas, and New York, that a public health emergency existed nationwide involving Swine Influenza A that affects or has significant potential to affect national security. The secretary of Health and Human services renewed this determination four times (DHHS, 2018). Mahoning County experienced an outbreak and was part of this epidemic in 2009 with 6 reported cases.

In October of 2017, the secretary of the U.S. Department of Health and Human Services declared that as a result of the consequences of the opioid crisis, a public health emergency exists nationwide (DHHS, 2018). Because the opioid crisis does not meet the definition of reportable disease, this 'epidemic' is not included in this hazard profile or plan.

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In June of 2018, the Ohio Department of Health released a statement declaring a statewide community outbreak of Hepatitis A. As seen in the table above, cases of Hepatitis A increased from zero in 2016 to nine in 2017, a number of cases not seen before. The only other year with a spike in Hepatitis A cases was 2013 with four cases.

LOCATION AND EXTENT

An epidemic can affect all parts of Mahoning County but is more probable to occur in densely populated areas, such as the Cities of Campbell, Canfield, Struthers, and Youngstown. Additionally, outbreaks could occur in particularly large, multi-unit residential developments and facilities at which a large workforce is employed.

LOSS AND DAMAGES

Losses based on historical epidemic occurrences are difficult to estimate. According to a study by Molinari (2007), seasonal influenza results in a substantial economic impact, estimated, in part, at $16.3 billion in lost earnings. By population, Mahoning County represents 0.7% of the United States. Since seasonal influenza primarily impacts the human population, using Mahoning County's composition of the U.S. as a multiplier (i.e., 0.007) and applying it to the potential economic impact, lost earnings in Mahoning County could reach a staggering $114,100,000 each year. Though that number appears high, it equates to approximately $838 per year for each person listed by the U.S. Census Bureau as "in civilian labor force" for the county. Epidemics rarely affect structures. Epidemics may affect people and, at times, the operations of critical facilities, businesses, and other community assets.

PREVIOUS AND ONGOING MITIGATION EFFORTS

The Mahoning County Health Department has an Emergency Response Plan, updated in 2015, that is part of the county emergency operations plan. In it, they describe their preparedness level as 'good' for all the identified hazards except for radiological, which is rated 'poor,' and chemical, which is rated 'fair.' The plan rates biological infectious disease as a medium probability and a high disruption risk.

RISK ASSESSMENT

This profile considers all of the reportable diseases in Mahoning County; however, for this plan, the definition of epidemic is a sudden increase in cases. As seen in the

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historical occurrences, the cases have increased for certain reportable diseases, but there has not been a true sudden increase. However, there is a need to recognize the increasing number of cases or reportable diseases.

EPIDEMIC RISK CALCULATION				
Probability		*Severity*		*Risk*
REMOTE		CRITICAL		LOW
Although there have been no cases of a true epidemic in Mahoning County, the probability of occurrence is still present.	+	An epidemic in Mahoning County would have critical severity due to potential illness and economic impacts.	=	The risk assessment calculates the risk of epidemic to be the low.

MAP AND ASSETS

The map on the following page shows he low, medium, and high risk of epidemic areas in Mahoning County; these are based on population. The average percentage of vulnerable population (aged 5 and under and 65 and over) in each census tract is 23.07%.

"Low" risk areas are census tracts where the vulnerable population is at or less than the average. "Medium" risk areas are census tracts where the vulnerable population is one standard deviation (4.33%) above the average. "High" risk areas are census tracts where the vulnerable population two standard deviation above the average.

There would be no anticipated structural impacts to assets in Mahoning County, therefore, no assets are listed herein.

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MAHONING COUNTY HAZARD MITIGATION PLAN

Epidemic Risk Map

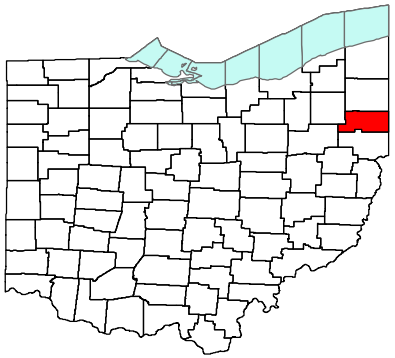
Data Source(s):
CDC, MCHD, U.S. Census Bureau

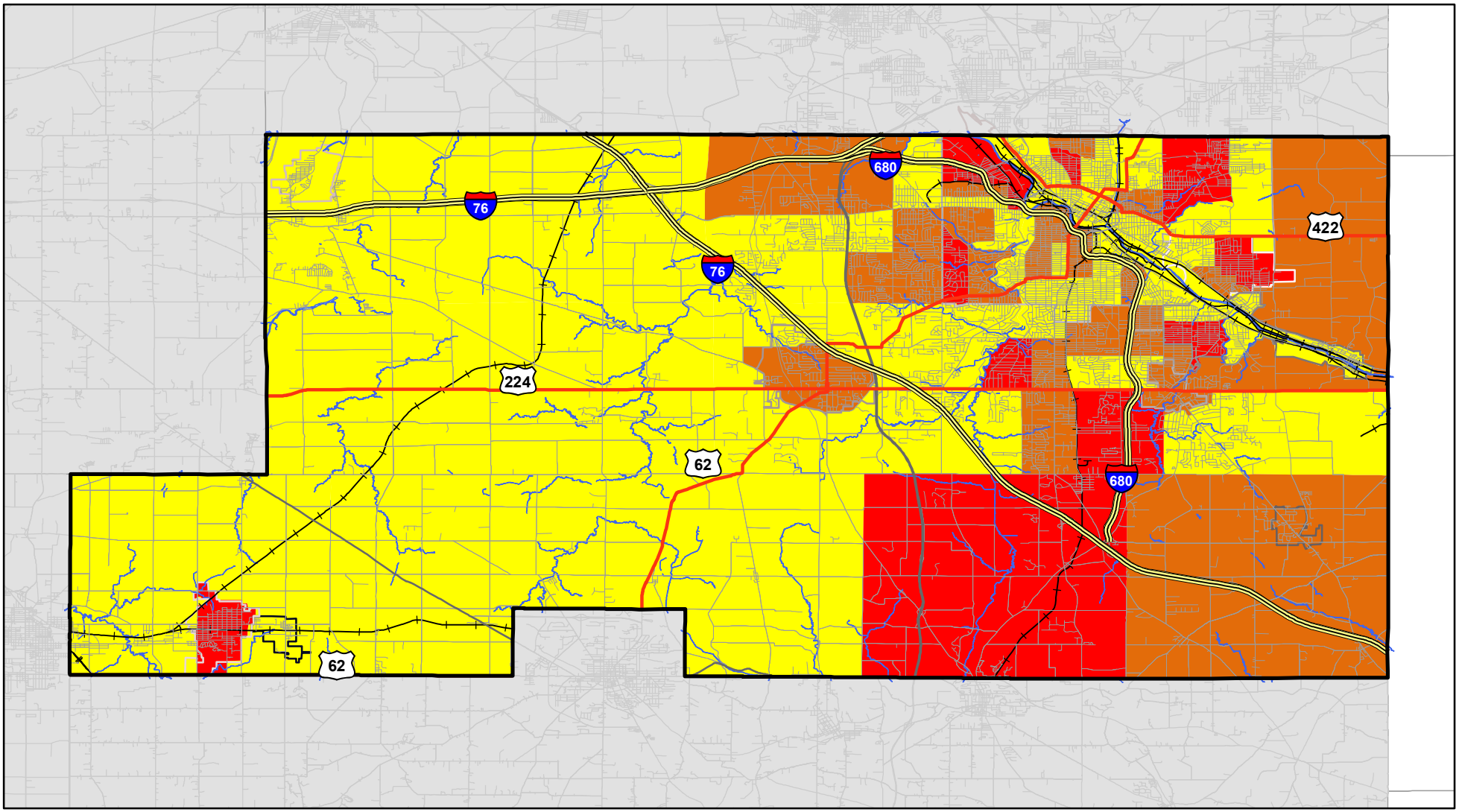
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk

Medium Risk

Low Risk



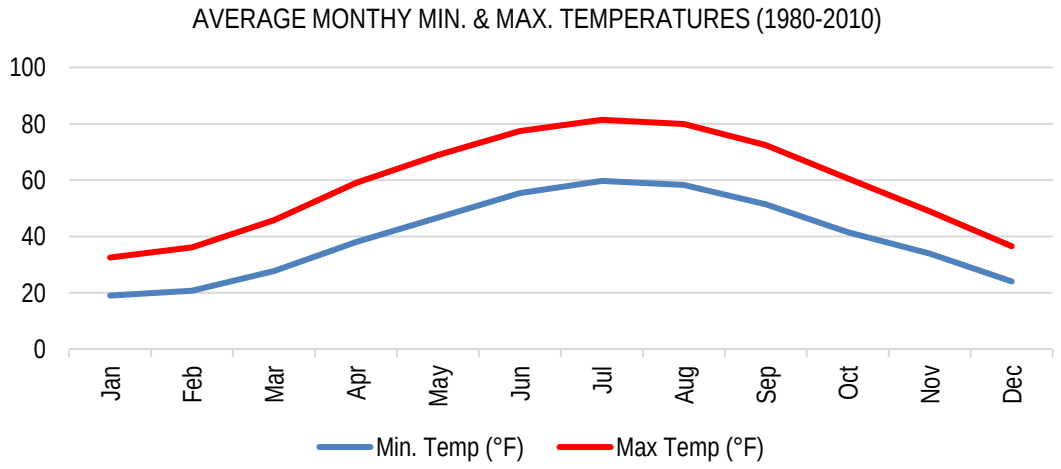


2.4.5 Extreme Temperatures

HAZARD OVERVIEW

Temperature extremes, for the purpose of this profile, includes hot and cold temperatures.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time, typically during winter or summer months.	Overall Hazard Ranking:	**5**
	Warning Time:	Days	State Risk Ranking:	Not ranked
	Probability:	Remote	Severity:	Negligible
	Type of Hazard:	Natural	Disaster Declarations:	None

Extreme temperatures (hot and cold) are a new hazard the committee included in this update cycle. Extreme temperatures, for this profile, will include both hot and cold temperature extremes. To know what range of temperature is considered extreme for the region, it is necessary to know what the average temperatures are throughout any given year. The National Oceanic and Atmospheric Administration (NOAA) can generate reports of monthly "normals" at its different stations. The data chosen for the region is from the Youngstown Warren Regional Airport. The following graphic shows average ranges of temperature from 1981 to 2010. Every month has a high and low average temperature in degrees Fahrenheit. Extreme temperatures would be those either 10 degrees above or below the average high or low temperatures.



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Heat

Temperatures vary widely over the course of a year, but each season has average temperature ranges associated with them. Summer and winter have, generally, the highest and lowest range of temperatures, respectively. When the temperature is consistently greater than the normal in summer, meteorologists refer to it as a heat wave, which means, "temperatures of ten or more degrees above the average high temperature persist across the geographic region for several days or weeks" (Haddow, Bullock, & Coppola, 2014, p.51). These conditions can be a contributor to drought conditions when combined with a lack of rainfall. Excessive heat has a history of being deadly. In the United States, "more than 1,500 die from exposure to excessive heat" (Haddow, Bullock, & Coppola, 2014, p.52). These conditions can also have serious impacts on crops, causing below average harvests. Repeated years of extreme temperatures can easily cause significant economic impacts on agricultural industries. The National Centers for Environmental Information (NCEI) tracks two types of extreme heat temperatures.

- **Heat:** A period of heat resulting from the combination of high temperatures (above normal) and relative humidity. A heat event occurs whenever heat index values meet or exceed locally/regionally established advisory thresholds, or a directly-related fatality occurs due to the heat event.
- **Excessive Heat:** Excessive heat results from a combination of high temperatures (well above normal) and high humidity. An excessive heat event occurs when heat index values meet or exceed locally/regionally established excessive heat warning thresholds, on a widespread or localized basis (National Weather Service Instruction 10-1605, 2007).

Cold

While there is no widely accepted definition of extremely cold temperatures, periods of colder than average conditions can cause an array of negative consequences depending on their duration (Haddow, Bullock, & Coppola, 2014, p.51). Extremely cold temperatures are immediately dangerous to both humans and livestock by causing frostbite and hypothermia, which can lead to permanent injury and death. The chart on the next page shows how quickly frostbite can occur at different temperatures and wind speeds. In unprotected structures cold temperatures can freeze water pipes causing them to burst upon thawing, leading to significant damage. Cold snaps during typically warmer weather

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during the growing season can damage and destroy some crops, depending on their sensitivity to temperature. NCEI tracks two types of extreme cold temperatures.

- **Cold/Wind Chill:** Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typical value is -18° F or colder) conditions, on a widespread or localized basis. There can be situations where advisory criteria are not met, but the combination of seasonably cold temperatures and low wind chill values (roughly 15° F below normal) may result in a fatality.
- **Extreme Cold/Wind Chill:** A period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria (typical value around -35° F or colder), on a widespread or localized basis. Normally these conditions should cause significant human and/or economic impact. The polar vortex is a large area of low pressure and cold air surrounding both of the Earth's poles. It always exists near the poles, but weakens in summer and strengthens in winter. The term "vortex" refers to the counter-clockwise flow of air that helps keep the colder air near the Poles. Many times, during winter in the northern hemisphere, the polar vortex will expand, sending cold air southward with the jet stream. This occurs fairly regularly during wintertime and is often associated with large outbreaks of Arctic air in the United States.

POSSIBLE CAUSES

Weather patterns throughout the year naturally cause temperatures to rise and fall in the summer and winter months due to the inclination of the Earth towards the sun. However, the extreme temperatures that have been experienced in the last decade are attributable to climate change.

IMPACTS AND VULNERABILITY

The majority of the impacts of extreme temperatures affect the population's health rather than damage buildings. Some of the effects extreme temperatures could have on structures are minor compared to other hazards. Effects on buildings and infrastructure could include broken pipes, cracks in roads or bridges due to expansion and contraction, and power outages. In addition to impacts on health, extreme temperatures can also cause damages to transportation infrastructure, agriculture, energy, and water resources.

Extreme heat can cause a wide range of health problems or even make existing health problems worse. Some of the milder symptoms include discomfort, skin eruptions and

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heat fatigue which can lead to heat cramps, heat exhaustion, and heat stroke. Occasionally some people may require medical attention. Prolonged exposure to extreme heat can even cause death (CDC).

Sweating cools the body through evaporation. However, high relative humidity retards evaporation, robbing the body of its ability to cool itself. When heat gain exceeds the level the body can remove, body temperature begins to rise, and heat-related illnesses and disorders may develop.

Approximately 400 people die each year from exposure to heat, according to the Centers for Disease Control and Prevention (CDC). Our bodies dissipate heat by varying the rate and depth of blood circulation, by losing water through the skin and sweat glands, and as a last resort, by panting, when blood is heated above 98.6°F.

HEAT RISKS	
Heat Index	*Possible heat disorders for people in higher risk groups*
130°F or higher	Heatstroke/sunstroke is highly likely with continued exposure.
105-130°F	Sunstroke, heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.
90-105°F	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity.
80-90°F	Fatigue possible with prolonged exposure and/or physical activity.

Problems arising from prolonged exposure to the cold can include hypothermia, frostbite and non-freezing cold injuries such as chilblains and trench/immersion foot. Sunburn is also possible during extremely cold weather events (Army Public Health Center).

COLD RISKS		
Stage	*Core Temperature*	*Signs and Symptoms*
Mild Hypothermia	99-97°F	Normal, shivering may begin.
	97-95°F	Cold sensation, goose bumps, unable to perform complex tasks with hands, shivering can be mild to severe, hands numb.
Moderate Hypothermia	95-93°F	Shivering, intense, muscles incoordination becomes apparent, movements slow and labored, stumbling pace, mild confusion, may appear alert. Use sobriety test, if unable to walk a 9 meter (30 foot) straight line, the person is hypothermic.
	93-90°F	Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, frequently stumbles, difficulty speaking, signs of depression, withdrawn.
Severe Hypothermia	90-86°F	Shivering stops, exposed skin blue of puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness
	86-82°F	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.
	82-78°F	Unconscious, a heartbeat, and respiration erratic, a pulse may not be obvious.
	78-75°F	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.

Source: Canadian Centre for Occupational Health and Safety

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Although extreme temperatures affect everyone in the region, some people may be more vulnerable to their effects. For example, the homeless population could be more at risk simply for being exposed to the elements; children and the elderly population may be more susceptible to changes in temperature as well as the poor if they cannot afford to keep cool during an extreme heat event or to stay warm during an extreme cold event.

HISTORICAL OCCURRENCES

Between 1950 and 2018, NCEI reports merely nine events of extreme temperatures; however, data is only available from 1996, according to the database. According to the Spatial Hazard Events and Losses Database for the United States (SHELDUS), there were only four reports of heat events between 1983 and 1995. The following table contains event data from both sources. In total, there have been 13 recorded events, 6 involving heat, 2 cold, and 5 extreme cold events.

The following are brief descriptions of the events with which damages are associated as well as the most recent events.

EXTREME TEMPERATURE EVENTS 1983-2010		
Event Date	*Event Type*	*Damage to Property*
9/1983	Heat	N/A
6/1994	Heat	N/A
7/1995	Heat	N/A
8/1995	Heat	N/A
2/2/1996	Cold/Wind Chill	$100,000
1/10/1997	Cold/Wind Chill	$5,000
6/6/1999	Heat	$0
7/1/1999	Heat	$0
1/15/2009	Extreme Cold/Wind Chill	$0
3/27/2012	Extreme Cold/Wind Chill	$0
1/6/2014	Extreme Cold/Wind Chill	$0
1/28/2014	Extreme Cold/Wind Chill	$0
2/20/2015	Extreme Cold/Wind Chill	$0
13 Events	Total	$105,000

Source: NCEI & SHELDUS

- **February 2, 1996**: Bitter cold arctic air was over the area with overnight low temperatures averaging between zero and 10 below and daytime high temperatures in the single digits. Wind gusts of 25 mph on the 2nd dropped wind chills as low as 40 below zero. Actual air temperatures dropped as cold as -20 at Amherst (Lorain County) and -18 at Hambden (Geauga). Record lows were set at most stations across northern Ohio. A number of pipes and water mains froze and/or broke. One fatality due to hypothermia was reported in Cleveland.
- **January 10, 1997**: Low temperatures were in the single digits or below zero across all of Northern Ohio, causing frozen and ruptured water pipes. With wind chills of 40 to 50 below zero, many schools were forced to close. There were four hypothermia deaths reported in Cuyahoga County during this time period.

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- **January 28, 2014:** Low pressure tracked across the northern Great Lakes pulling an arctic cold front east across the area. Temperatures ahead of the front were in the upper 30s and lower 40s, falling through the day with dangerously cold wind chill values developing. West to southwest winds of 5 to 15 mph combined with temperatures as low as -15 degrees to produce the wind chill conditions. Findlay recorded the coldest wind chill value reported in northern Ohio of -33 degrees. Nearly all schools were closed on the 28th with most school also closed on the 29th.
- **February 20, 2015**: For the second time in a week, bitterly cold weather and dangerous wind chills were reported across the area. The coldest temperatures since the January 1994 arctic outbreak were reported across Northeast Ohio. The morning low at the Northeast Ohio Regional Airport in Ashtabula County was minus 29 degrees. The rest of the area saw low temperatures from minus 10 to 20 degrees. Winds just before and after daybreak where strong enough to generate wind chills of minus 25 or colder for a few hours. Schools were once again closed throughout Northeast Ohio.

LOCATION AND EXTENT

Extreme temperatures, hot and cold, affect each jurisdiction within Mahoning County equally. Though the temperatures may vary slightly from day to day, the overall average of all the county's temperatures and susceptibility to extremes is very similar.

Urban areas can experience the heat island effect; this effect occurs on the surface and in the atmosphere. Dry surfaces exposed to the sun such as pavement and roofs can reach temperatures of 50-90° hotter than the air, while more rural areas maintain surface temperatures similar to those of the air (EPA, n.d.).

LOSS AND DAMAGES

Although deaths have been documented as a result of cold temperatures in Ohio, the NCEI database does not report any injuries or deaths caused by either type of extreme temperatures in Mahoning County. Losses reported amount to $105,000 for damages to pipes and water mains due to freezing temperatures.

Other types of losses besides structure or infrastructure damage and injury and death are those that are more difficult to calculate, such as school closures across a region and loss of several hours or days of work.

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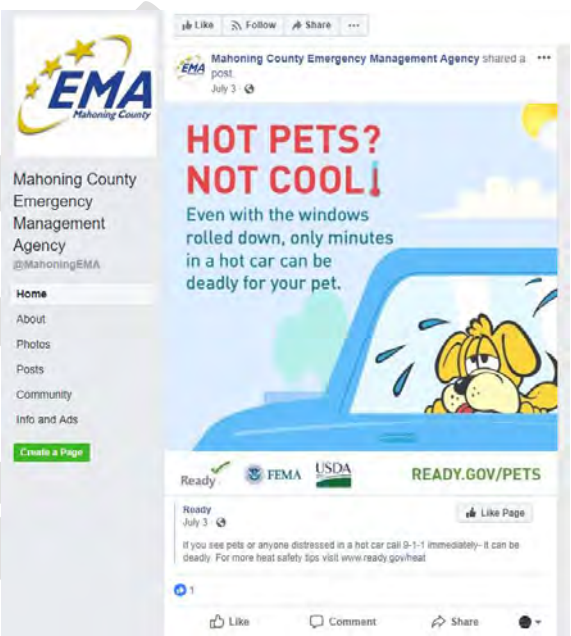
PREVIOUS AND ONGOING MITIGATION EFFORTS

Because this hazard is new to the plan, there are no documented ongoing or completed mitigation projects for extreme temperatures. However, agencies and organizations around the county recognized the risk and have implemented various projects. One example is Mahoning County EMA's social media site where they share educational information for extreme temperature events.



Additionally, the American Red Cross maintains and operates shelters in Mahoning County during extreme temperature events.

RISK ASSESSMENT

EXTREME TEMPERATURES WEATHER RISK CALCULATION					
Probability			*Severity*		*Risk*
REMOTE			NEGLIGIBLE		LOWEST
Events 13	= 0.37	+	Although the possibility of death exists, none have been recorded in Mahoning County. Damages are limited to property.	=	The risk assessment matrix calculates the risk of extreme temperatures to be the lowest in Mahoning County.
Years 35					
Between 1983 and 2018 there were 13 extreme temperature events.					

MAP AND ASSETS

The map for extreme temperature relating to heat shows three risk types: lowest, low, and medium. This data is based on the urban heat island effect where heat is more likely to be higher in densely populated, heavily paved areas. To calculate this, planners ran a density-based cluster analysis of address points in GIS; the denser the cluster, the higher the risk. Structures are not considered to be as vulnerable to heat temperature extremes, therefore, no assets are affected in the area.

The map for extreme temperature relating to cold shows three risk types as well: lowest, low, and medium. This data is based on the U.S. Census tracts for population that would be most vulnerable to the cold (aged 5 and under and 65 and over). Planners calculated the average percentage of the vulnerable population in each census tract to be 23.07%. “Low” risk areas are census tracts where the vulnerable population is at or less than the average. “Medium” risk areas are census tracts where the vulnerable population is one standard deviation (4.33%) above the average. “High” risk areas are census tracts where the vulnerable population two standard deviation above the average.

Structures could potentially experience damage from extreme cold temperatures. However, there are no areas in the county that would be more prone to risk; therefore, all assets in Mahoning County are considered equally at risk, albeit low. For a full list of assets in the county, refer to Section 1.2.10 Asset Inventory.

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MAHONING COUNTY HAZARD MITIGATION PLAN

Temperature Extreme (Heat) Risk Map

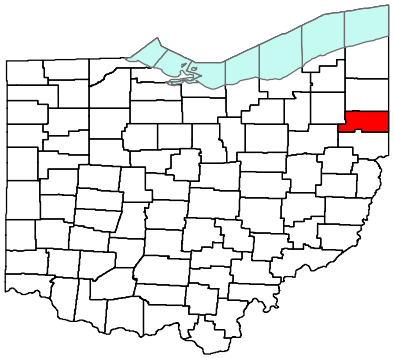
Data Source(s):
NOAA NCEI, U.S. Census Bureau

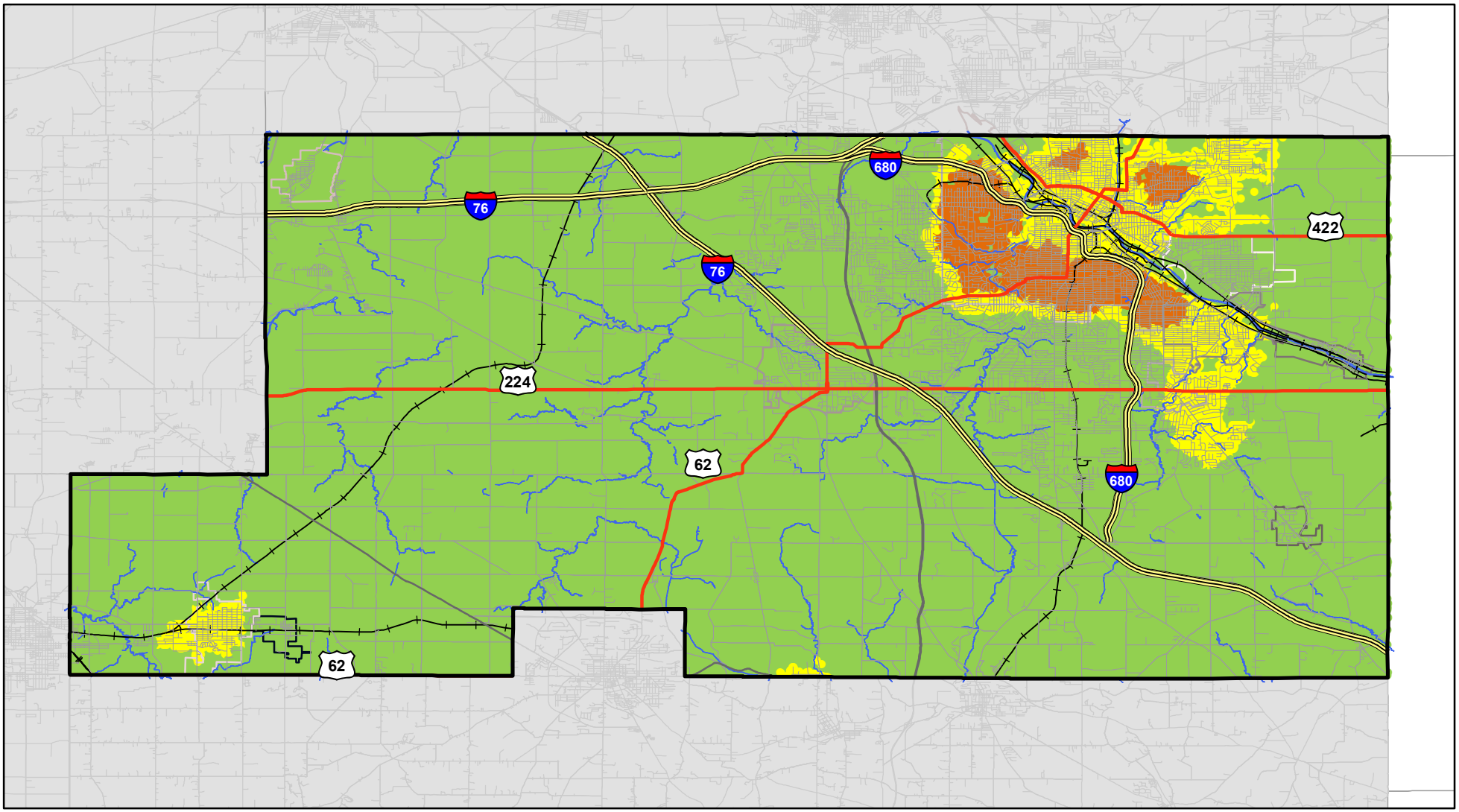
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Medium Risk

Low Risk

Lowest Risk





MAHONING COUNTY HAZARD MITIGATION PLAN

Temperature Extreme (Cold) Risk Map

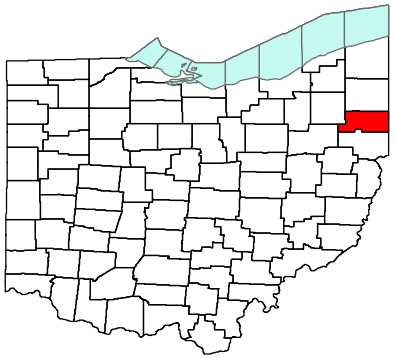
Data Source(s):
NOAA NCEI, U.S. Census Bureau

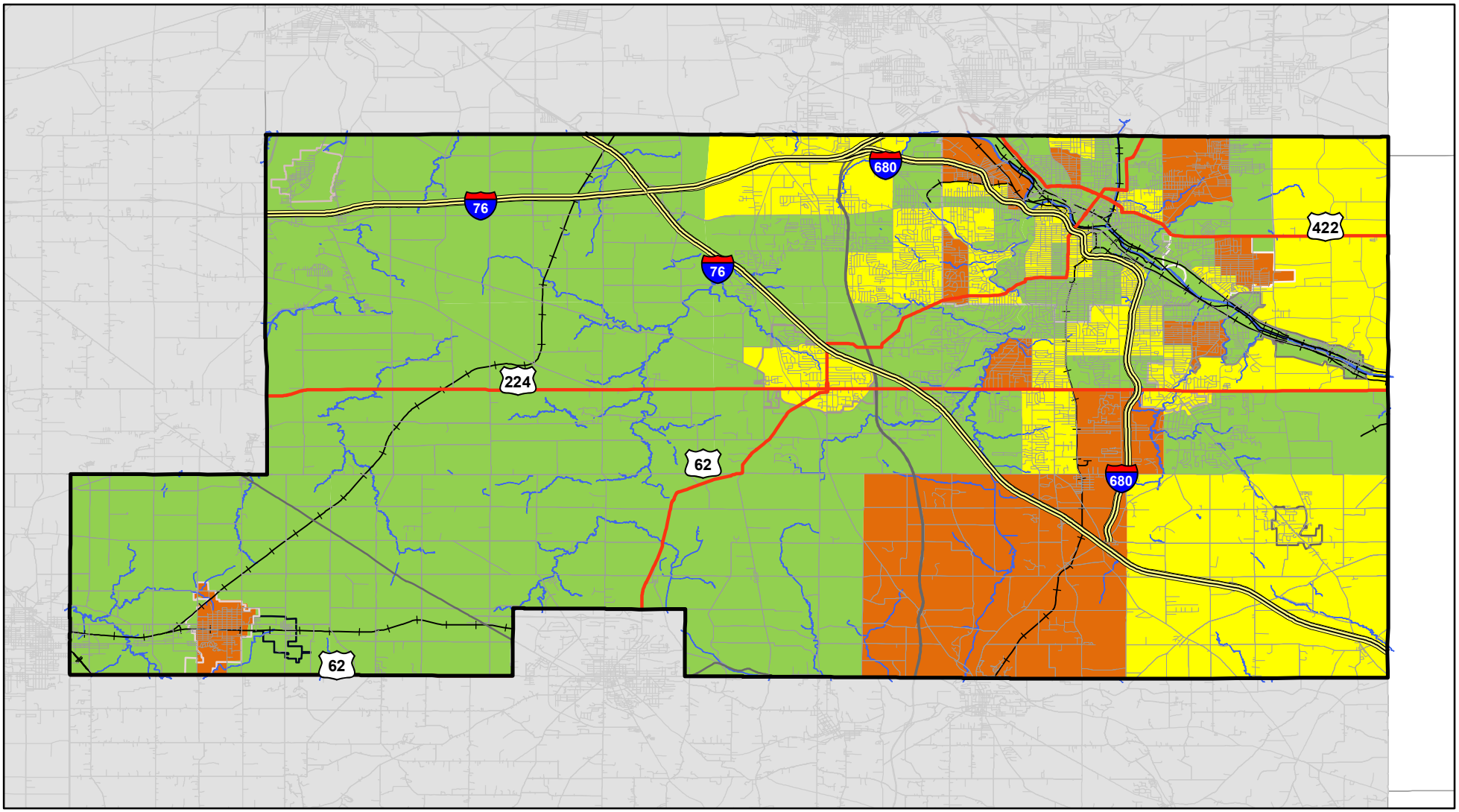
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Medium Risk

Low Risk

Lowest Risk





2.4.6 Flood

HAZARD OVERVIEW

A general or temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters or the rapid accumulation of runoff surface waters from any source.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time, typically after prolonged periods of precipitation.	Overall Hazard Ranking:	**2**
	Warning Time:	Hours to minutes	State Risk Ranking:	Frequency: Highly likely Impact: Critical Ranking: 4 - High
	Probability:	Frequent	Severity:	Marginal
	Type of Hazard:	Natural	Disaster Declarations:	DR-1484 DR-1519 DR-1556

Floods are the most prevalent hazard in the United States. Each year, floods cause more property damage in the United States than any other type of natural disaster, killing an average of 150 people a year. Floods are described by their horizontal extents, the depth of the floodwaters and the probability of occurrence. Unfortunately, the probability of occurrence has historically been expressed in terms such as a “100 year flood”, which the general public logically assumes means a flood that happens once in 100 years. In fact, the probability of occurrence is best interpreted as a percent chance of occurring. So, a 100 year flood is that flood level that has a 1% chance of occurring in any given year. The 100 year, or 1% flood, is often used for planning purposes. Smaller floods are more likely to occur, thus a 10 year flood has a 10% chance of occurring in any given year.

The NFIP is a governmental program administered through FEMA that, “aims to reduce the impact on private and public structures… by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations” (FEMA). Each jurisdiction participating in the NFIP has a designated NFIP coordinator, sometimes referred to as the floodplain manager. This individual maintains the jurisdiction’s floodplain ordinance and ensures that development is compliant with that ordinance. Each local floodplain manager serves as the point of contact with FEMA regarding floodplain mapping. For more information on how each jurisdiction participates in the NFIP, refer to Appendix 1 Planning Documentation.

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JURISDICTIONS PARTICIPATING IN NFIP*				
Jurisdiction	*Initial FHBM Identified*	*Initial FIRM Identified*	*Current Effective Map Date*	*Reg-Emer Date*
Mahoning County	12/27/1974	02/15/1979	11/18/2009	02/15/1979
Campbell	03/01/1974	11/18/2009	11/18/2009	09/03/1979
Canfield	04/17/1974	11/01/1978	11/18/2009	11/01/1978
Struthers	03/15/1974	11/19/1980	11/18/2009	11/19/1980
Youngstown	04/051974	07/18/1977	11/18/2009	07/18/1977
Craig Beach	04/18/1975	01/17/1978	11/18/2009	04/17/1978
Lowellville	04/15/1974	09/03/1979	11/18/2009	09/03/1979
New Middleton	N/A	11/18/2009	11/18/2009	03/18/2010
Poland	04/09/1976	11/18/2009	11/18/2009	11/18/2009
Sebring	08/08/1975	08/11/1978	11/18/2009	08/11/1978

Source: FEMA NFIP
** The Village of Beloit does not currently participate in the NFIP*

POSSIBLE CAUSES

According to NOAA, some of the possible causes for flooding include the following.

- **Excessive Rainfall:** This is the most common cause of flooding. Water accumulates quicker than the soil can absorb resulting in flooding.
- **Snowmelt**: It occurs when the major source of water involved is caused by melting snow. Unlike rainfall that can reach the soil almost immediately, the snowpack can store the water for an extended amount of time until temperatures rise above freezing and the snow melts.
- **Ice or Debris Jams**: Common during the winter and spring along rivers, streams and creeks. As ice or debris moves downstream, it may get caught on any sort of obstruction to the water flow. When this occurs, water can be held back, causing upstream flooding. When the jam finally breaks, flash flooding can occur downstream.
- **Dam Breaks or Levee Failure**: Dams can overtop, have excessive seepage or have structural failure. For more information on this topic see section 2.4.1 Dam and Levee Failure.

IMPACTS AND VULNERABILITY

Hazards associated with flooding can be divided into: primary hazards that occur due to contact with water, cascading or secondary effects that occur because of the flooding, such as disruption of services and health impacts, and long-term or tertiary effects, such as changes in the position of river channels.

The following table describes the types of effects of flooding.

EFFECTS OF FLOODING	
Type	*Description*
Primary Effects	• With higher velocities, streams are able to transport larger particles as suspended load. Such large particles include not only rocks and sediment, but, during a flood, such large objects as automobiles, houses, and bridges. • Massive amounts of erosion can be accomplished by floodwaters. Such erosion can undermine bridge structures, levees, and buildings, causing their collapse. • Water entering human-built structures causes damage. Even with minor flooding of homes, furniture is ruined, floors and walls are damaged, and anything that comes in contact with the water is likely to be damaged or lost. Flooding of automobiles usually results in damage that cannot easily be repaired. • The higher velocity of floodwaters allows the water to carry more sediment as suspended load. When the floodwaters retreat, velocity is generally much lower and sediment is deposited. After retreat of the floodwaters, everything is usually covered with a thick layer of stream-deposited mud, including the interior of buildings. • Flooding of farmland usually results in crop loss. Livestock, pets, and other animals are often carried away and drowned. • Humans that get caught in high velocity floodwaters are often drowned. • Floodwaters can concentrate garbage, debris, and toxic pollutants into small areas that can cause the secondary effects of health hazards.
Cascading or Secondary Effects	• Disruption of Services o Drinking water supplies may become polluted, especially if sewerage treatment plants are flooded. o Gas and electrical service may be disrupted. o Transportation systems may be disrupted, resulting in shortages of food and cleanup supplies.
Long-Term or Tertiary Effects	• Location of river channels may change as the result of flooding; new channels develop, leaving the old channels dry. • Sediment deposited by flooding may destroy farmland (although silt deposited by floodwaters could also help to increase agricultural productivity). • Jobs may be lost due to the disruption of services, destruction of business, etc. (although jobs may be gained in the construction industry to help rebuild or repair flood damage). • Destruction of wildlife habitat.

HISTORICAL OCCURRENCES

The history of flooding within Mahoning County indicates that flooding can occur at any time of the year. However, most floods in the Mahoning watershed occur from April through August, and these are associated with heavy rains falling over already saturated ground. Winter and spring rains, although of lesser intensity than summer and fall rains, are usually of longer duration and result in greater peak flows in streams.

The worst hazard events experienced in Mahoning County have been incidences of flooding. The following are brief descriptions of the significant floods that have occurred over the past 22 years.

FLOOD AND FLASH FLOOD EVENTS IN MAHONING COUNTY 1996-2018		
Event Date	*Event Type*	*Damage*
3/20/1996	Flood	$0
5/11/1996	Flash Flood	$0
5/11/1996	Flood	$30,000
6/13/1996	Flash Flood	$50,000
6/24/1996	Flash Flood	$250,000
12/11/1996	Flash Flood	$0
6/2/1997	Flood	$0
1/7/1998	Flash Flood	$0
1/9/1998	Flood	$0
4/16/1998	Flood	$0
4/16/1998	Flash Flood	$0
4/8/2000	Flood	$0
6/13/2003	Flood	$100,000
7/21/2003	Flash Flood	$750,000
7/21/2003	Flood	$10,000,000
7/22/2003	Flash Flood	$2,000,000
7/27/2003	Flood	$0
7/27/2003	Flash Flood	$8,000,000
8/9/2003	Flash Flood	$450,000
5/22/2004	Flash Flood	$1,700,000
9/8/2004	Flood	$250,000
9/8/2004	Flash Flood	$1,800,000
9/9/2004	Flood	$500,000
9/17/2004	Flood	$500,000
1/1/2005	Flood	$800,000
8/5/2005	Flood	$50,000
8/20/2007	Flash Flood	$75,000
2/28/2011	Flood	$200,000
5/12/2011	Flood	$0
5/14/2011	Flood	$0
6/23/2015	Flash Flood	$2,200,000
Total	31 Events: 14 Flash Floods & 17 Floods	$29,705,000

Source: NCEI

- **June 24, 1996** – Heavy rain caused flooding of streets, basements and low lying areas. The Village of Sebring's sewer treatment plant was rendered inoperable; with thirty feet of water and sewage filling the lower two levels.
- **July 22, 2003 (DR-1484)** – Two to four inches of rain fell in Mahoning County during the day. Rainfall rates approached two inches per hour during the evening hours. With the soil already saturated, this rain led to widespread flooding across the county. Boardman and the southern portion of Youngstown were the hardest hit areas. In Boardman, 15 homes had water up to the top of the first floor. Three other homes were destroyed when their basement walls collapsed. Over 60 roads had to close due to flooding. There were numerous people rescued from their homes and vehicles. This flash flooding resulted in approximately $2 million in property damage.
- **July 27, 2003 (DR-1484)** – Thunderstorms dumped up to three inches of rain on Mahoning County, with rainfall rates of nearly two inches per hour. With the ground still saturated from flooding the previous week, small streams and creeks in the county quickly rose. The north and east side of Youngstown were among the hardest hit areas in the county. Extensive urban and lowland flooding occurred in these areas. 17 buildings on the Youngstown State University (YSU) campus were damaged by flooding as well as several industrial

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areas along the river in Youngstown. Severe flooding also occurred in Campbell, Struthers and Boardman. Many homes and businesses in these communities were damaged. Total property damage from this flood was estimated at $8 million.

- **May 22, 2004 (DR-1519)** – Thunderstorms dumped heavy rains on Mahoning County during the early morning hours of May 22nd causing widespread flooding. This was the third round of thunderstorms to affect the county in less than 24 hours. One to three inches of rain fell during the early morning storms. This rain combined with ground already saturated from the earlier storms caused many small streams and creeks to leave their banks. In Poland, Yellow Creek went into flood damaging many homes and a library. The Mahoning River went into flood in Mill Creek Park flooding several roads and stranding several vehicles. Extensive flooding also occurred on the north side of Youngstown. Several roads and bridges were damage by flooding and over a dozen more roads had to be closed because of flooding. Dozens of homes were damaged by flood waters with ten damaged enough to be declared uninhabitable.
- **September 8, 2004 (DR-1556)** – Heavy rains associated with the remnants of Tropical Storm Frances caused flooding over portions of Mahoning County. Most of the flooding occurred in the eastern half of the county where rainfall totals were the greatest. A branch of Yellow Creek left its banks and flooded much of the Cobbler's Run Subdivision along Dobbins Road. Several families had to be evacuated and at least two homes were destroyed when their basement walls collapsed. A library in Poland was also damaged. Hundreds of homes in Mahoning County were damaged. This flooding event resulted in approximately $1.8 million in property damage.
- **September 17, 2004 (DR-1556)** – For the second time in a week, extensive urban and lowland flooding was reported across Mahoning County as remnants of Hurricane Ivan moved across the Ohio Valley. In Mahoning County rainfall totals Included: 2.8 inches at Canfield, 3.7 inches at East Lewistown and 3.9 inches at Craig Beach. Runoff from this rain caused many rivers and streams to leave their banks flooding many low lying areas. At Youngstown, the Mahoning River went above the 10-foot flood stage cresting at 14.26 feet. Hundreds of homes in both Mahoning and Trumbull Counties sustained damages from either lowland or basement flooding.
- **January 1, 2005** – Heavy rain and runoff from snowmelt caused widespread flooding throughout Northeast Ohio. January 2005 was among the wettest January's ever. In

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addition to heavy rain, extensive snowpack existed over Northeast Ohio at the beginning of the month. Temperatures in the upper 40s and 50s the first three days of the month caused a rapid snowmelt and brought area streams and creeks to bank full just in time for a significant winter storm on the 5th and 6th. Then, just as things began to return to normal, heavy rains fell on the area on the 11th, 12th and 13th causing conditions to once again worsen. Many rivers, including the Mahoning, Cuyahoga and Black exceeded flood stage.

- **August 20, 2007** – Heavy rain fell across the Village of Sebring resulting in flash flooding with basements flooding, and roads becoming flooded causing cars to become stranded. A commercial building was flooded because the water was so high in the street that passing vehicles created waves. A vehicle rescue was performed during the afternoon hours. This flash flood resulted in approximately $75,000 in property damage in the Village of Sebring.
- **February 28, 2011** – Heavy rain and rapid snow melt led to widespread flooding across portions of Mahoning County. Several residents had to be rescued or evacuated primarily in the Poland area. Dozens of roads had to be closed because of flooding and washouts were reported in several areas. Over a thousand homes were damaged by flooding; damage estimates from northern Ohio topped $30 million for this event.
- **May 12, 2011** – During the evening and nighttime hours of May 11th, an area of low pressure located over southern Wisconsin slowly progressed northeast over the upper Great Lakes. A frontal boundary extended southeast of the low, across portions of Indiana into southern Ohio. That frontal boundary lifted north during the day on May 12 and stalled directly over northern Ohio. Thunderstorms developed along this boundary and produced large hail and significant rainfall throughout the day on May 12th. The severe thunderstorms and flash flooding continued through May 13th. Thunderstorms with torrential rainfall moved over Mahoning County during the early evening hours of the 12th. Rainfall rates exceeded 1 per hour, with Doppler radar estimates of 1 to 2.5 falling over northern Mahoning County. The heaviest rain fell near Youngstown, with basement flooding and some road closures along RT 422 near the Metropark.
- **May 14, 2011** - An area of low pressure moved up from the Mississippi River Valley into Ohio. The storm system had adequate moisture from the Gulf of Mexico, which increased rainfall rates to over an inch and a half per hour. This intense rainfall

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triggered several small rivers and streams to overflow their banks, and for low lying and poor drainage areas to flood. The highest rainfall amounts were observed over northwest OH with 2 to 3 inches reported near Toledo. Amounts this high were observed elsewhere, though they were more spotty and not over the same basins. Widespread 1 to 2 inches was the average rainfall totals across the region. Overwhelmed drainage systems and saturated ground cover from recent floods and heavy rain set the stage for additional flooding on the 14th. A storm brought an inch or less of rainfall to the Youngstown area; however the high rate of rainfall was sufficient to produce flooding. Several roads in Youngstown flooded with up to a foot of water as drains backed up.

- **June 23, 2015** - Heavy rainfall of 1.5 to 2.5 inches of rain fell across mainly central Mahoning County during the morning of June 23rd. Lowellville received significant damage to McGill Street between Walnut and Wood Streets with the road considered
- to be a total loss. The drainage system could not handle the flow of water and caused the road to buckle in several locations. Several streets were flooded in Lowellville, Struthers, and Boardman. Numerous retention ponds, back yards, and basements were also flooded. The Yellow Creek in Struthers overflowed its banks. In
- Poland Township the Canterbury Creek also flooded some 13 homes on their first floor. An unofficial rain gauge in the area recorded near 5 inches of rainfall from the event. Another housing development prone to flooding saw 100 homes inundated with water up to the electric boxes.

LOCATION AND EXTENT

Mahoning County's largest watershed, the Mahoning River, drains the majority of the county via a number of creeks including; Mill Creek, Meander Creek, Mosquito Creek, Crab Creek, and Yellow Creek. The basin drains from southwest to northeast in the western part of the county, and from northwest to southeast in the eastern part. After crossing the Pennsylvania border, the Mahoning River flows southeast and joins the Beaver River, which flows into the Ohio River. Some of the southern townships of Mahoning County are drained by the Little Beaver Creek basin via Beaver Creek (Middle Fork), East Branch, Cherry Valley, Honey Creek, North Fork, and Bull Creek. The county contains approximately 446 linear miles of major streams and rivers.

Riverine flooding, which is usually caused by a significant amount of rainfall over a period of days and can be worsened by snowmelt conditions, is very likely to continue

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striking areas located along the banks of the Mahoning River, and Yellow Creek. Some areas near the paths of the river are particularly low-lying areas. Local officials should consider strengthening, and/or developing building and/or development regulations in these areas.

Because the majority of Mahoning County is of relatively flat or gently rolling topography, flooding is usually a widespread event, as small creek and streams over fill their banks and flood large areas of agricultural fields and several rural roads. Flooding that occurs in or near the urban areas is often attributed to failing storm sewers and poor drainage systems. Excessive amounts of impermeable surfaces such as pavement can increase the amount and rate of water runoff. Development affects the runoff of storm water and snowmelt. When rain falls in an undeveloped area, as much as 90 percent (90%) of it will infiltrate the ground; in a highly developed area, as much as 90% of it will run off.

LOSS AND DAMAGES

FEMA can estimate losses from flood to buildings in Mahoning County through the HAZUS-MH program (provided by Ohio EMA). The program calculates the expected losses to buildings from a 100-year flood event. The following tables outline the expected building damages by occupancy and type and the building-related economic losses.

According to HAZUS-MH, the majority of buildings damaged would be residential; most of these can expect to receive between 1 and 50% of damage, while the program calculates that only six buildings would be substantially damaged from a 100-year flood event. The following table outlines the expected damages by occupancy.

EXPECTED BUILDING DAMAGE BY OCCUPANCY												
Occupancy	*1-10*		*11-20*		*21-30*		*31-40*		*41-50*		*Substantially*	
	Ct.	*%*	*Ct.*	*%*	*Ct.*	*%*	*Ct.*	*%*	*Ct.*	*%*	*Ct.*	*%*
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	2	50	1	25	1	25	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	1	20	4	80	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	15	18	40	48	14	17	4	5	5	6	6	7
Total	16		46		15		5		5		6	

Very few buildings would receive any substantial damage from a 100-year flood; according to the program estimates, the only type of building type that would be affected

would be those of wood construction. The majority of the building types would receive between 1 and 50% damage. The following table outlines the expected damage by building type in Mahoning County.

EXPECTED BUILDING DAMAGE BY BUILDING TYPE												
Building Type	*1-10*		*11-20*		*21-30*		*31-40*		*41-50*		*Substantially*	
	Ct.	*%*	*Ct.*	*%*	*Ct.*	*%*	*Ct.*	*%*	*Ct.*	*%*	*Ct.*	*%*
Concrete	0	0	2	100	0	0	0	0	0	0	0	0
Manufactured Housing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	2	22	6	67	1	11	0	0	0	0	0	0
Steel	1	25	3	75	0	0	0	0	0	0	0	0
Wood	13	17	36	47	13	17	4	5	5	6	6	8

Building-related losses include the building itself, its contents, the inventory, income, relocation costs, rental income losses, and lost wages. According to HAZUS-MH the highest overall loss would be to industrial buildings.

BUILDING-RELATED ECONOMIC LOSS ESTIMATES (MILLIONS OF DOLLARS)						
Category	*Area*	*Residential*	*Commercial*	*Industrial*	*Others*	*Total*
Building Loss	Building	19.17	10.22	23.65	0.69	53.73
	Content	8.75	26.97	64.57	3.13	103.42
	Inventory	0.00	0.60	9.41	0.03	10.04
	Subtotal	27.92	37.79	97.62	3.86	167.19
Business Interruption	Income	0.15	20.06	4.25	1.41	25.87
	Relocation	4.87	4.60	2.83	0.57	12.86
	Rental Income	1.92	3.39	0.77	0.06	6.13
	Wage	0.36	21.38	3.25	10.76	35.75
	Subtotal	7.29	49.43	11.10	12.79	80.62
All	Total	35.21	87.22	108.72	16.65	247.81

When buildings experience more than one loss due to flooding they can become repetitive or severe repetitive loss properties. There are two accepted definitions of repetitive loss and severe repetitive loss; one from the Flood Mitigation Assistance (FMA) grant and the other from the National Flood Insurance Program (NFIP). The following table outlines the definitions.

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REPETITIVE LOSS AND SEVERE REPETITIVE LOSS DEFINITIONS		
Program	*Repetitive Loss*	*Severe Repetitive Loss*
Flood Mitigation Assistance (FMA) Grant	*A Repetitive Loss (RL) property is a structure covered by a contract for flood insurance made available under the NFIP that:* Has incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25% of the market value of the time of each such flood event; At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.	(a) Is covered under a contract for flood insurance made available under the NFIP; and (b) Has incurred flood-related damage i. For which 4 or more separate claims payments (includes building and contents) have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000, or ii. For which at least 2 separate claims payments (includes only building) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.
National Flood Insurance Program (NFIP)	A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978.	A single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

In Mahoning County, there have been 27 repetitive loss properties and one severe repetitive loss property. The following tables list the city, occupancy type, and payments for the properties.

REPETITIVE LOSS PROPERTIES IN MAHONING COUNTY									
City	*Occupancy Type*	*Mitigated?*	*Insured?*	*Zone*	*Total Building Payment*	*Total Contents Payment*	*Losses*	*Total Paid*	*Average Pay*
Youngstown	Other Non-Residential	No	Yes	A	$28,223.75	$495,667.27	5	$523,891.02	$104,778.20
Canfield	Single Family	No	Yes	C	$14,023.09	$5,797.65	2	$19,820.74	$9,910.37
Youngstown	Other Residential	No	No	C	$9,637.33	$0.00	2	$9,637.33	$4,818.67
Youngstown	Single Family	No	No	A	$9,028.19	$6,715.90	3	$15,744.09	$5,248.03
Boardman	Other Residential	No	No	C	$22,894.72	$0.00	2	$22,894.72	$11,447.36
Poland	Single Family	No	No	C	$3,794.00	$1,820.25	2	$5,614.25	$2,807.13
Youngstown	Single Family	No	No	C	$5,197.86	$1,879.73	2	$7,077.59	$3,538.80
Youngstown	Other Non-Residential	No	No	A02	$1,103.03	$37,111.58	2	$38,214.61	$19,107.31
Youngstown	Other Non-Residential	No	No	B	$5,307.13	$42,633.66	3	$47,940.79	$15,980.26
Youngstown	Other Residential	No	No	C	$3,232.25	$0.00	2	$3,232.25	$1,616.13
Youngstown	Other Residential	No	No	C	$5,982.40	$0.00	2	$5,982.40	$2,991.20

REPETITIVE LOSS PROPERTIES IN MAHONING COUNTY									
City	*Occupancy Type*	*Mitigated?*	*Insured?*	*Zone*	*Total Building Payment*	*Total Contents Payment*	*Losses*	*Total Paid*	*Average Pay*
Youngstown	Other Residential	No	No	C	$8,716.85	$0.00	2	$8,716.85	$4,358.43
Youngstown	Other Residential	No	No	C	$9,466.04	$0.00	2	$9,466.04	$4,733.02
Canfield	Other Non-Residential	No	No	A02	$0.00	$11,343.93	2	$11,343.93	$5,671.97
Youngstown	Single Family	No	No	B	$2,138.49	$4,084.75	2	$6,223.24	$3,111.62
Youngstown	Other Residential	Yes	No	C	$30,213.13	$0.00	3	$30,213.13	$10,071.04
Youngstown	Other Residential	Yes	No	C	$36,354.93	$0.00	3	$36,354.93	$12,118.31
Youngstown	Other Residential	Yes	No	C	$142,834.90	$0.00	8	$142,834.90	$17,854.36
Austintown	Other Residential	Yes	No	B	$13,035.92	$0.00	2	$13,035.92	$6,517.96
Austintown	Other Residential	Yes	No	B	$16,007.80	$0.00	2	$16,007.80	$8,003.90
Austintown	Other Residential	Yes	No	B	$15,147.89	$0.00	2	$15,147.89	$7,573.95
Austintown	Other Residential	Yes	No	B	$10,860.92	$0.00	2	$10,860.92	$5,430.46
Austintown	Other Residential	Yes	No	B	$10,735.92	$0.00	2	$10,735.92	$5,367.96
Austintown	Other Residential	Yes	No	B	$10,860.92	$0.00	2	$10,860.92	$5,430.46
Youngstown	Other Non-Residential	No	No	C	$11,954.67	$0.00	2	$11,954.67	$5,977.34
Youngstown	Single Family	No	No	A	$4,694.59	$0.00	3	$4,694.59	$1,564.86
Youngstown	Single Family	No	No	A	$4,522.80	$3,793.50	3	$8,316.30	$2,772.10
Totals	Single Family	7	Austintown	6	$435,969.52	$610,848.22	69	$1,046,817.74	$10,696.34
	Other Residential	15	Boardman	1					
	Other Non-Residential	5	Canfield	2					
	Total Properties	27	Poland	1					
			Youngstown	17					

In the county, there has only been one property that has experienced severe repetitive loss.

SEVERE REPETITIVE LOSS PROPERTIES IN MAHONING COUNTY									
City	*Occupancy*	*Mitigated?*	*Insured?*	*Zone*	*Total Building Payment*	*Total Contents Payment*	*Losses*	*Total Paid*	*Average Pay*
Youngstown	Other Non-Residential	No	No	A	$28,223.75	$495,667.27	5	$523,891.02	$104,778.20

PREVIOUS AND ONGOING MITIGATION EFFORTS

Past mitigation efforts to reduce the effects of flooding throughout Mahoning County include the following:

- Require applications for floodplain development permits for all development activities located within, or in contact with, an identified special flood hazard area. Such application shall be made by the owner of the property or his/her authorized agent, prior to the actual commencement of such construction. Where it is unclear whether a development site is in a special flood hazard area, the Floodplain Administrator may require an application for a floodplain development permit to determine the development's location. It shall be unlawful for any person to begin construction or other development activity, including but not limited to, filling; grading; construction; alteration, remodeling, or expanding any structure; or alteration of any watercourse wholly within, partially within or in contact with any identified special flood hazard area, until a floodplain development permit is obtained.
- Several jurisdictions have designated an "NFIP Coordinator". The NFIP Coordinator maintains the jurisdiction's floodplain ordinance and ensures that development is compliant with that ordinance (and, consequently, the NFIP).
- Working with FEMA and the Ohio Emergency Management Agency (OEMA) on the Map Modernization Program to improve FIRMs.
- Working with the municipalities to update all outdated floodplain ordinances.
- Collecting updated information of the number and location of all repetitive loss properties throughout the county and the municipalities.
- Identifying owners of repetitive loss properties who are interested in participating in future property acquisition and relocation projects.
- The distribution of letters to all property owners in the county regarding potential flood hazards as required for participation in the Community Rating System (CRS).
- The development and distribution of public awareness materials concerning flood hazard risks, and updating the county's website to provide hazard related information that is easily accessible.

In the past, the Mahoning County floodplain manager has considered becoming a CRS (community rating system) community but current staffing does not allow for additional

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tasks. For the past 12 years there have only been two to three staff members dedicated to the floodplain in the county.

RISK ASSESSMENT

FLOOD RISK CALCULATION					
Probability			*Severity*		*Risk*
FREQUENT			MARGINAL		HIGH
Events 31	= 1.4	+	There have been no reported injuries or deaths as a result of flooding or flash flooding in Mahoning County, only property or infrastructure damage.	=	The risk assessment matrix categorizes the risk of flood to Mahoning County as high.
Years 22					
There are between one and two flooding or flash flooding events each year in Mahoning County					

MAP AND ASSETS

Flooding is one of the highest risks to the county. The following pages contain maps that show the floodplains in the county, cities, villages, and townships where high risk is a 100-year floodplain, medium risk is the 500-year floodplain, and lowest risk is where no floodplains are identified.

Although there are many structures within the floodplain, as outlined in the repetitive loss section above, only two identified structures from the asset list are within the 100-year floodplain. There are no identified assets from the list within the 500-year floodplain.

ASSETS WITHIN 100-YEAR FLOODPLAIN			
Name	*Address*	*Jurisdiction*	*Type*
Baltimore & Ohio Railroad Terminal	530 Mahoning Avenue	Youngstown	Historic Location
Youngstown WTP	160 North West Avenue	Youngstown	Infrastructure

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MAHONING COUNTY HAZARD MITIGATION PLAN

Flood Risk Map

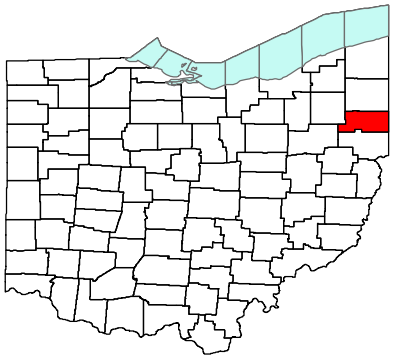
Data Source(s):
DHS/FEMA

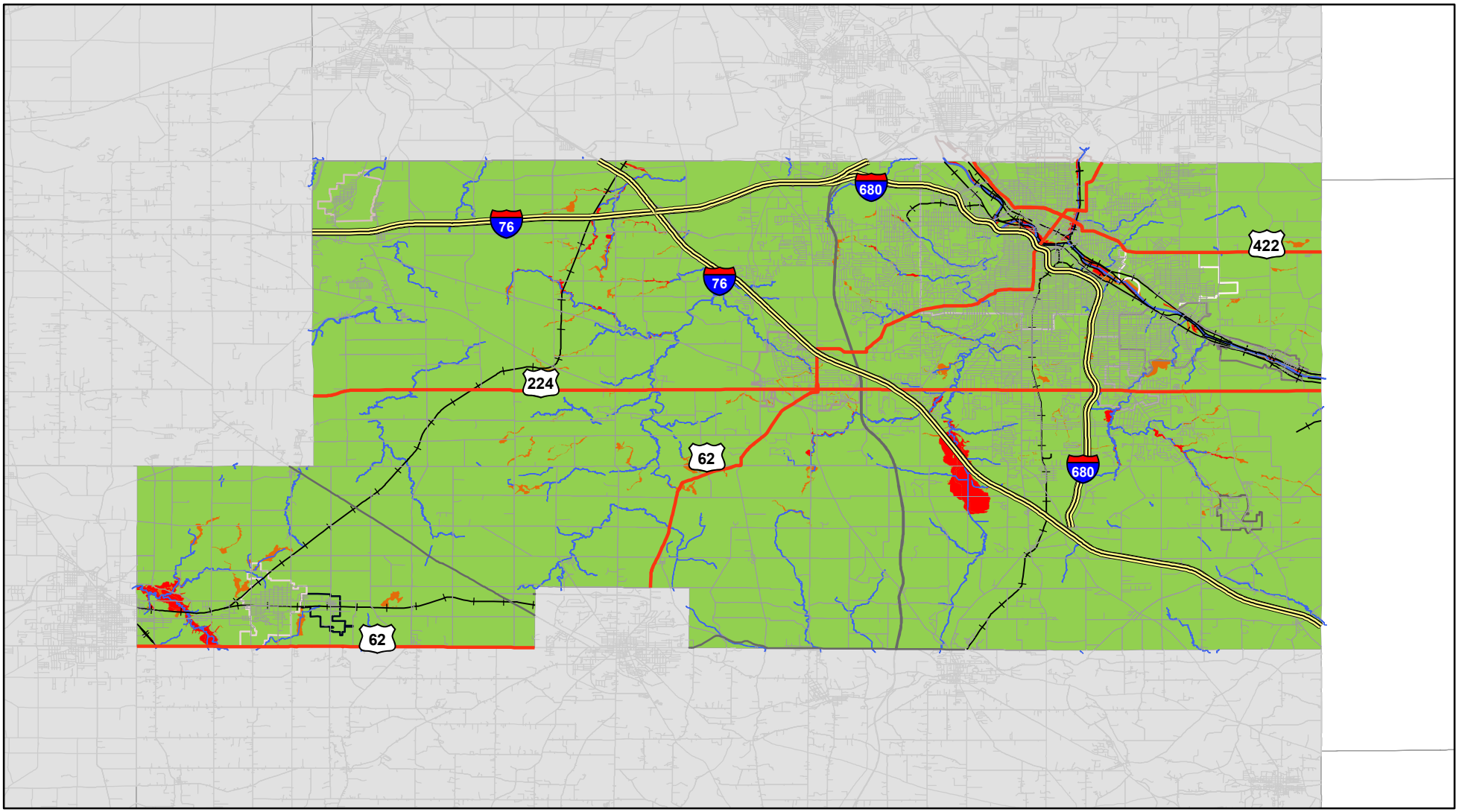
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)

Lowest Risk





MAHONING COUNTY HAZARD MITIGATION PLAN

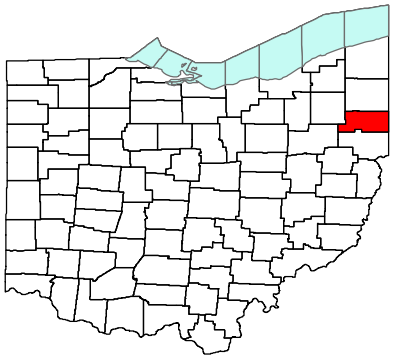
Municipal Flood Risk Map: Campbell

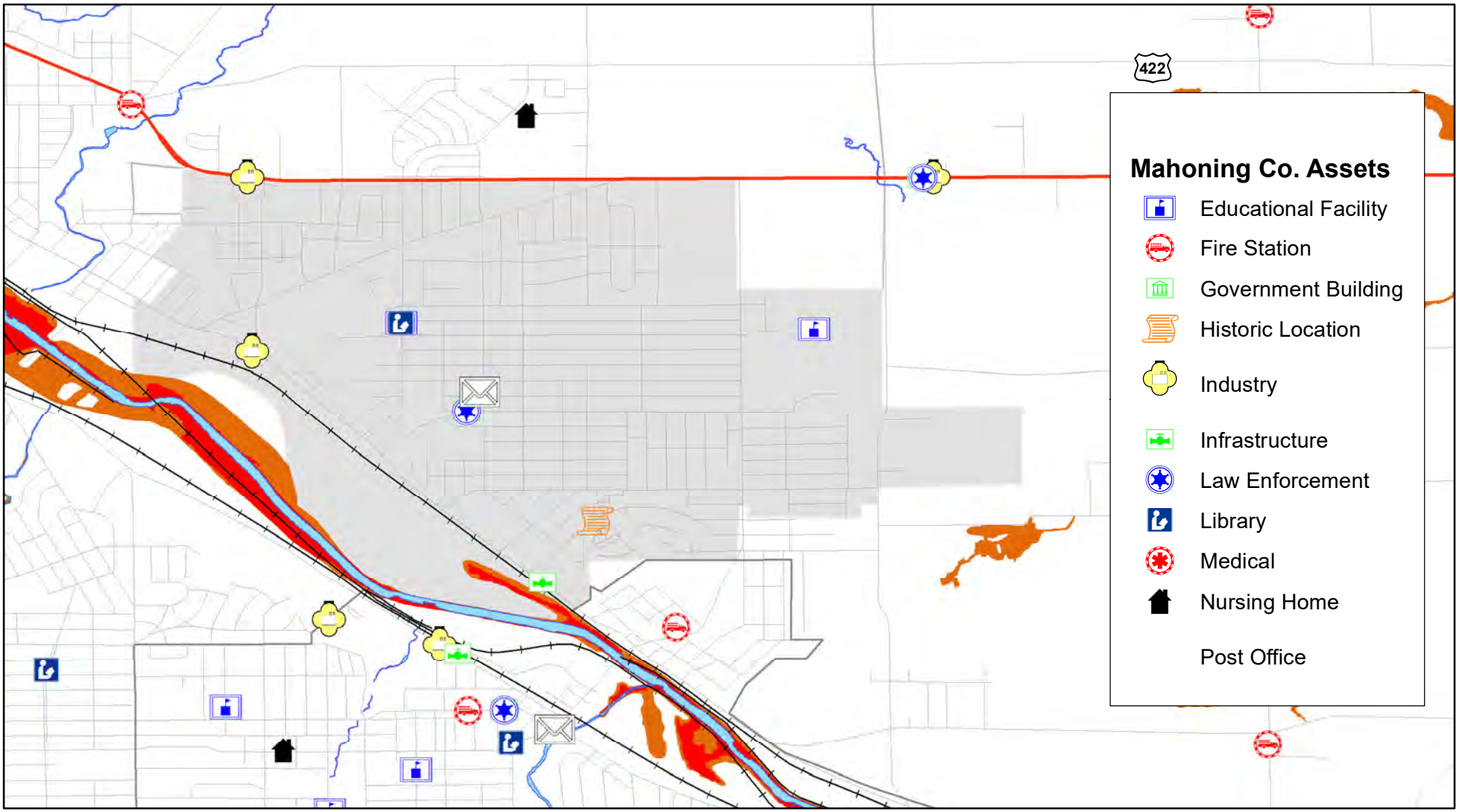
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

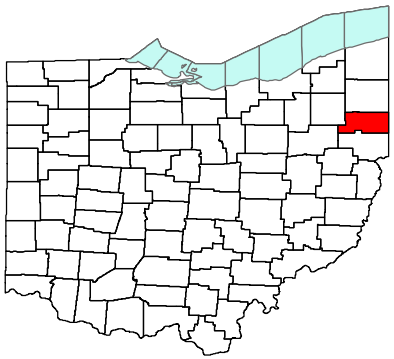
Municipal Flood Risk Map: Canfield

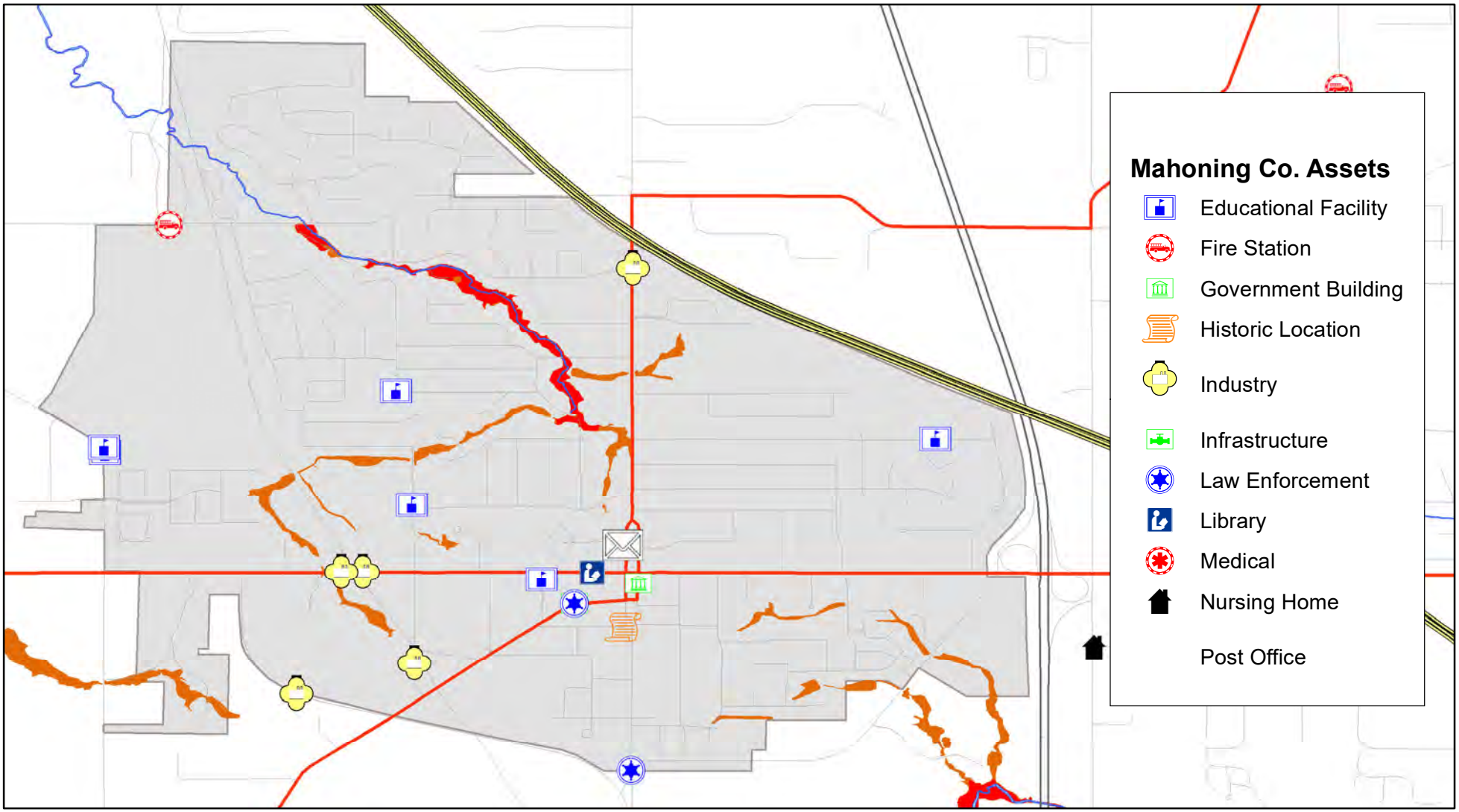
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

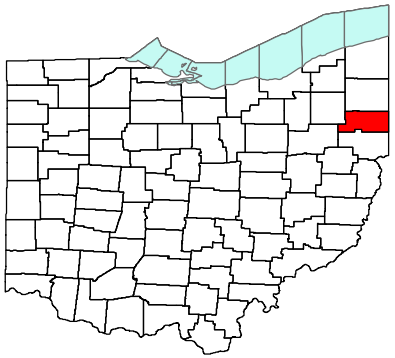
Municipal Flood Risk Map: Struthers

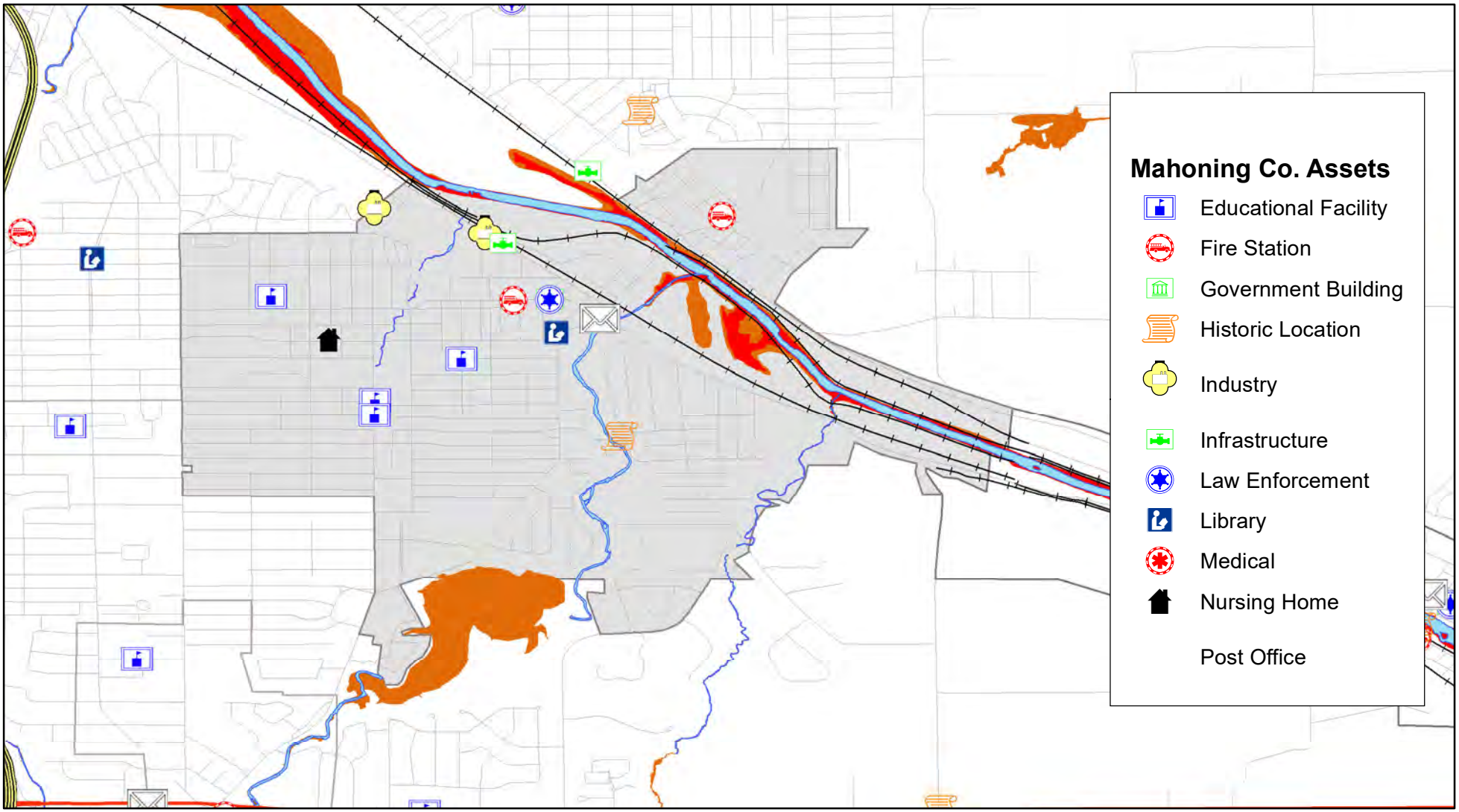
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

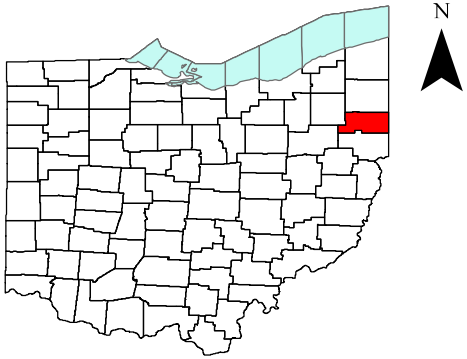
Municipal Flood Risk Map: Youngstown

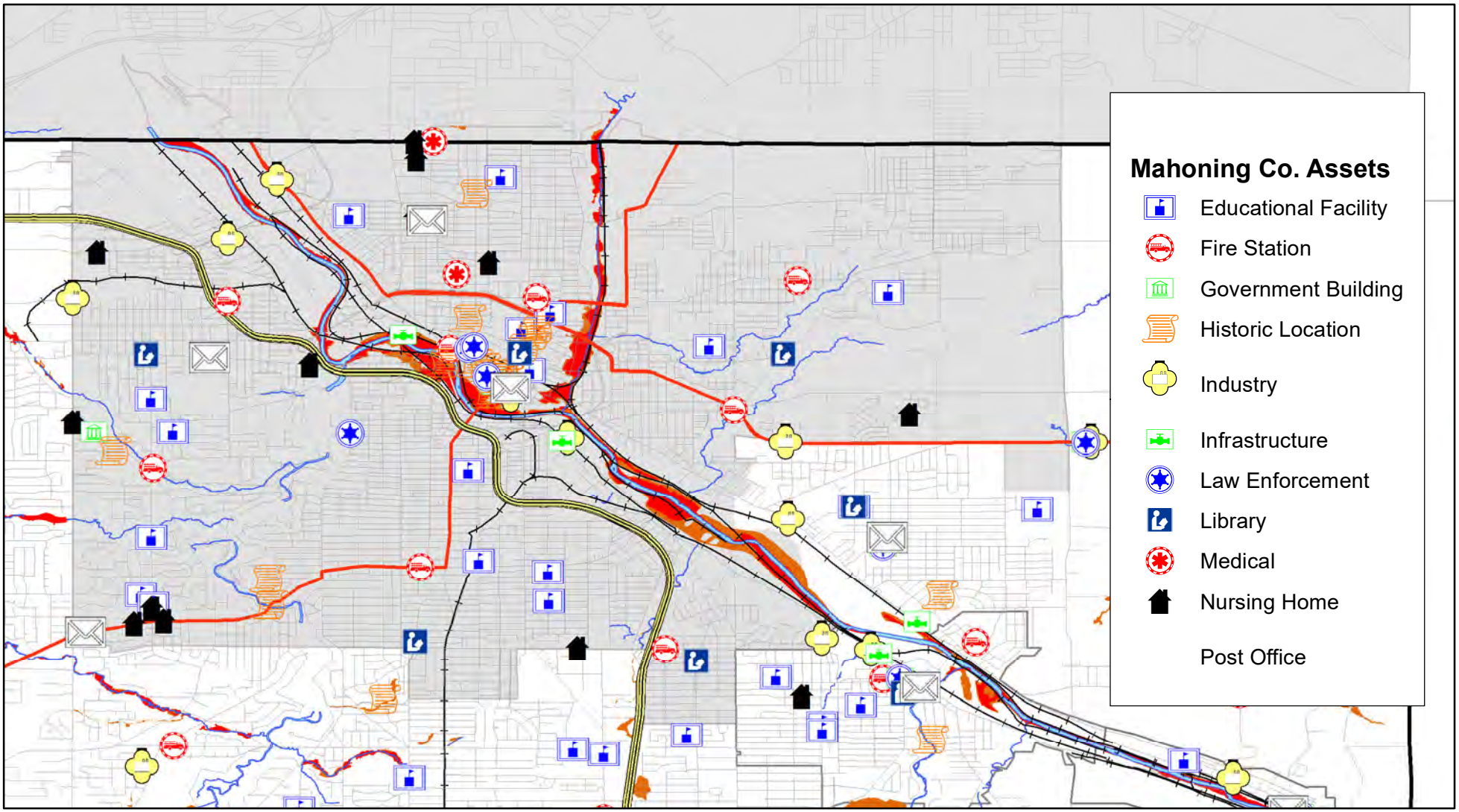
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

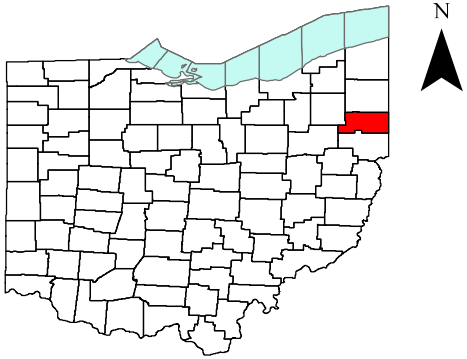
Municipal Flood Risk Map: Beloit

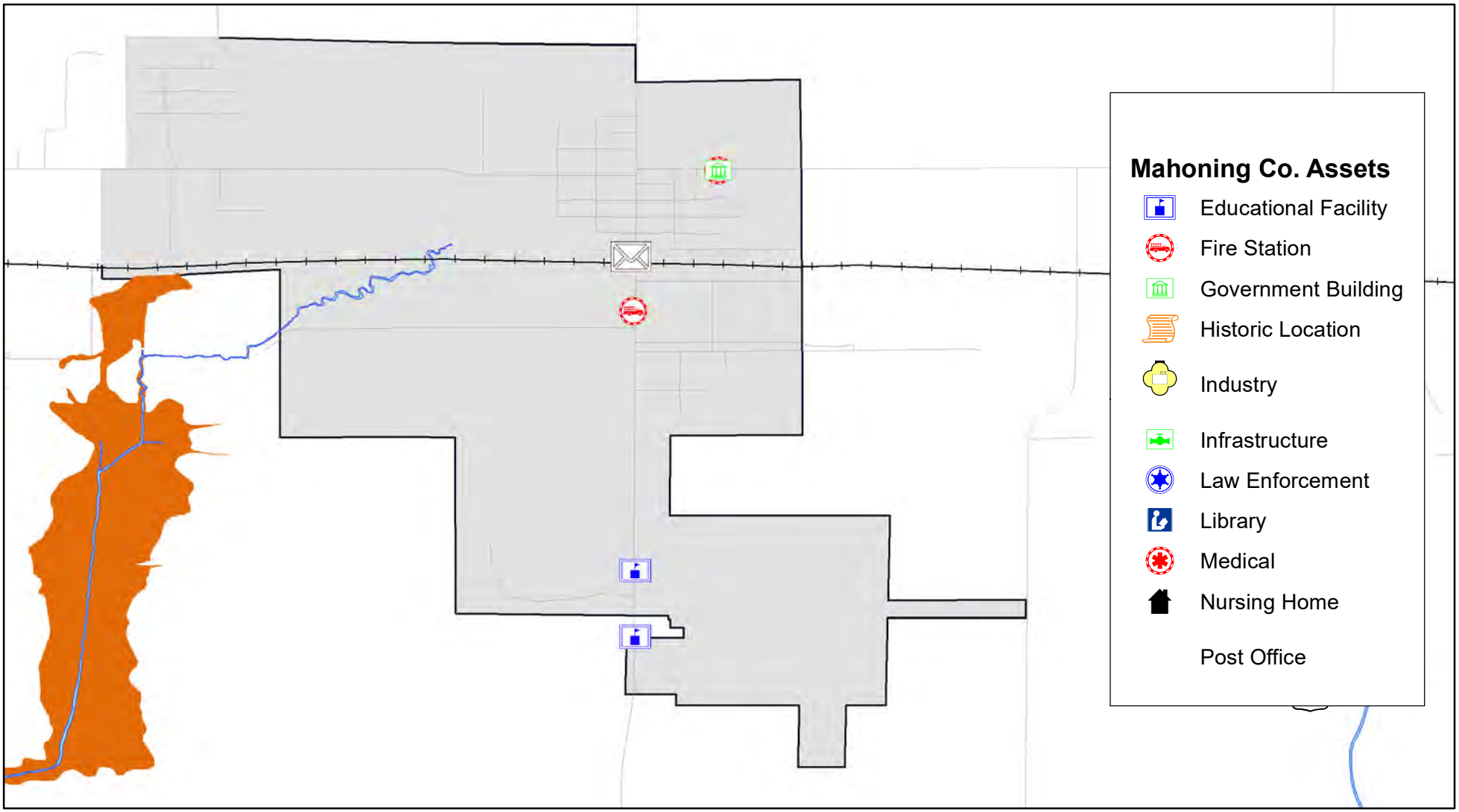
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

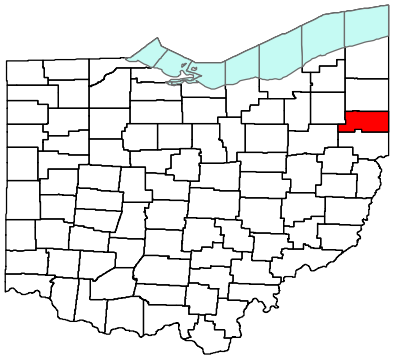
Municipal Flood Risk Map: Craig Beach

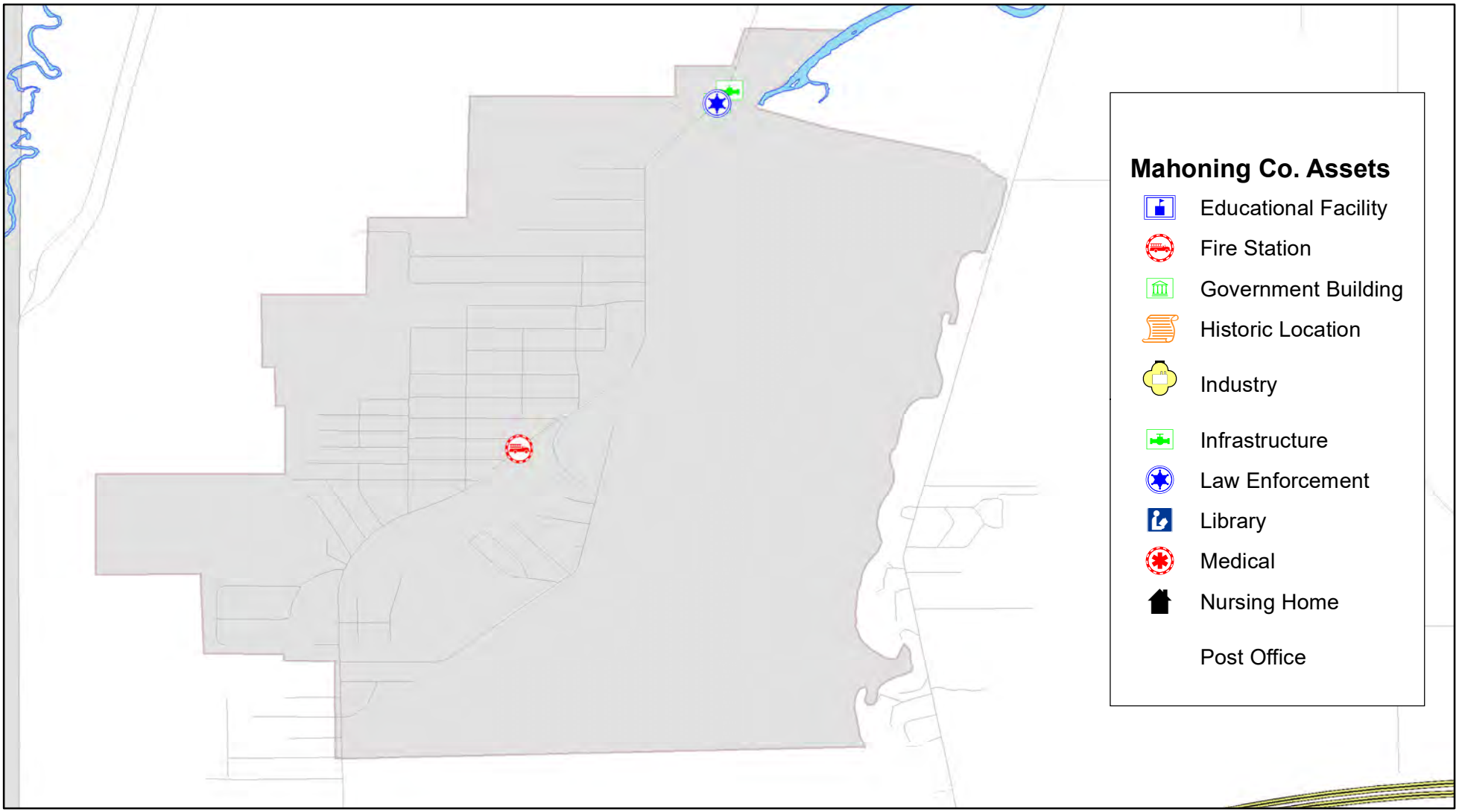
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

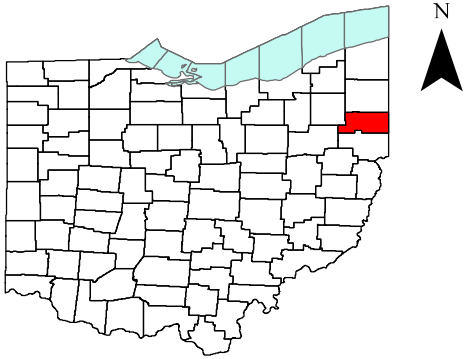
Municipal Flood Risk Map: Lowellville

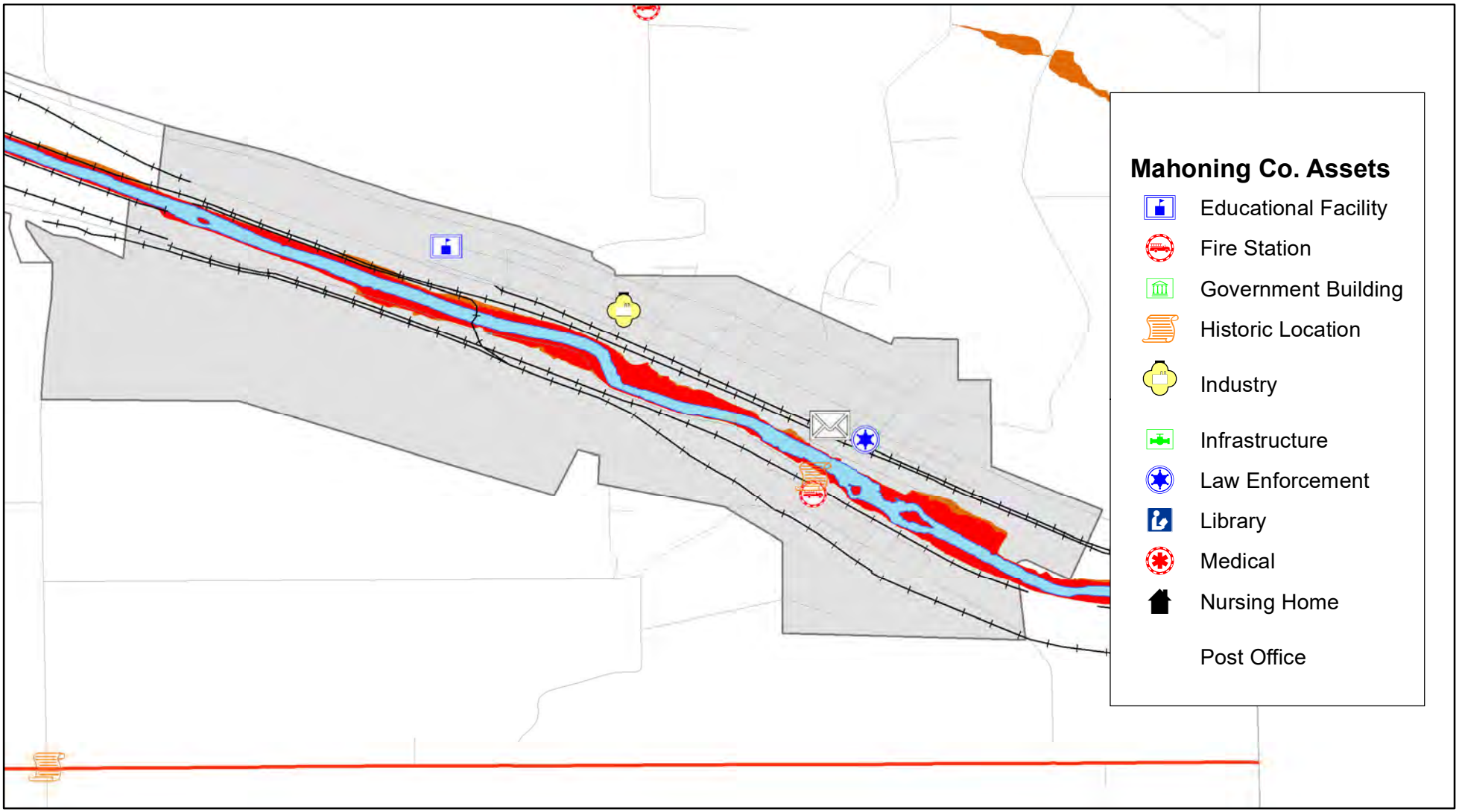
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

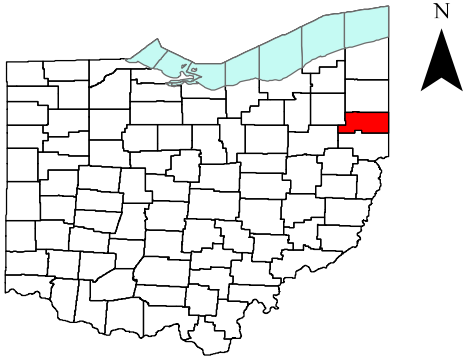
Municipal Flood Risk Map: New Middletown

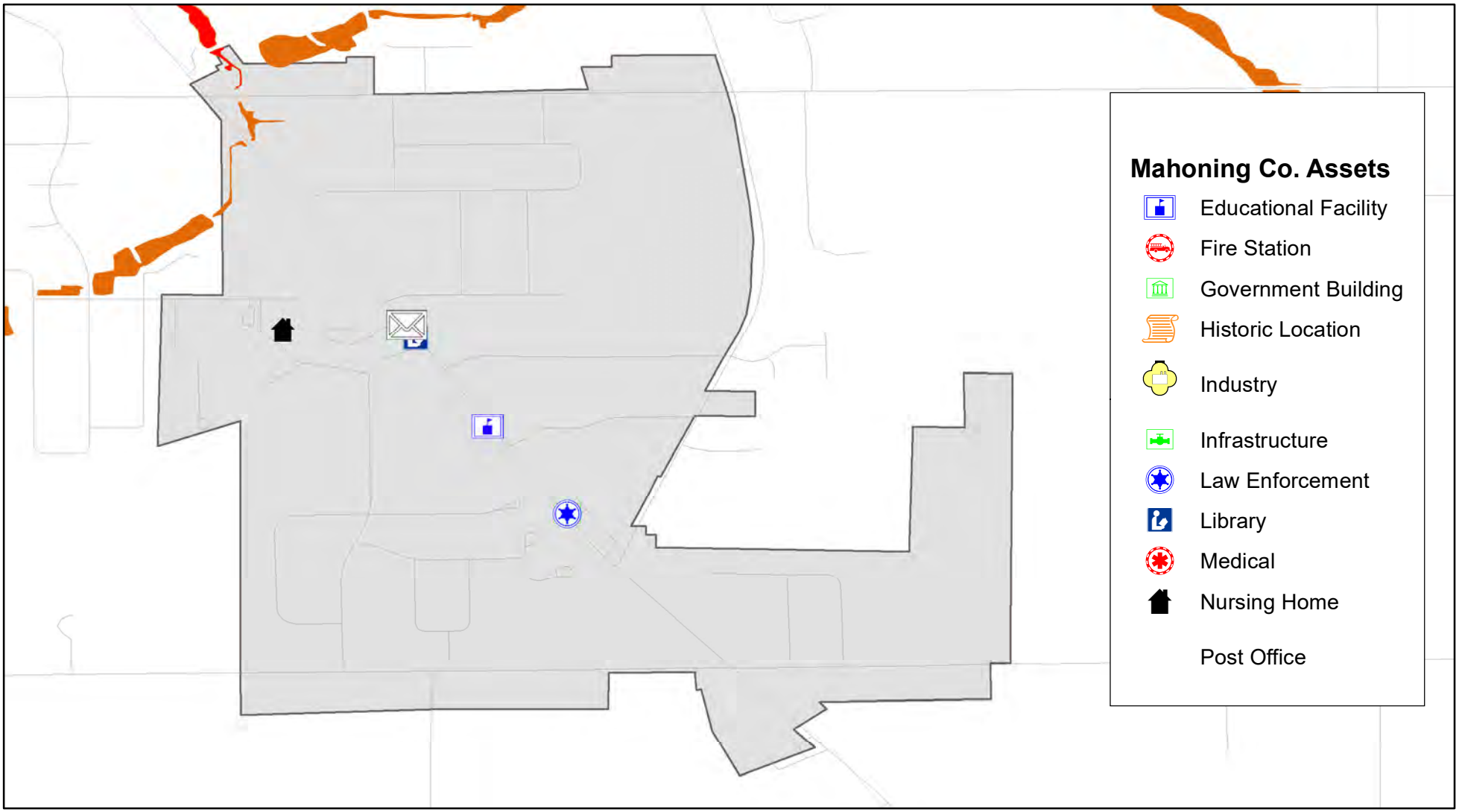
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

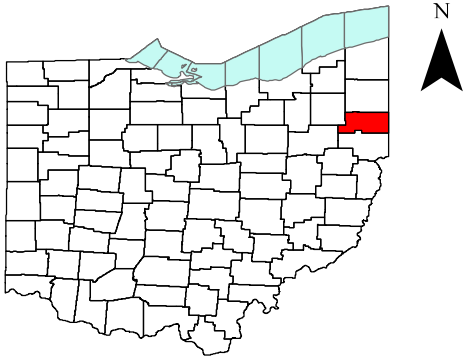
Municipal Flood Risk Map: Poland

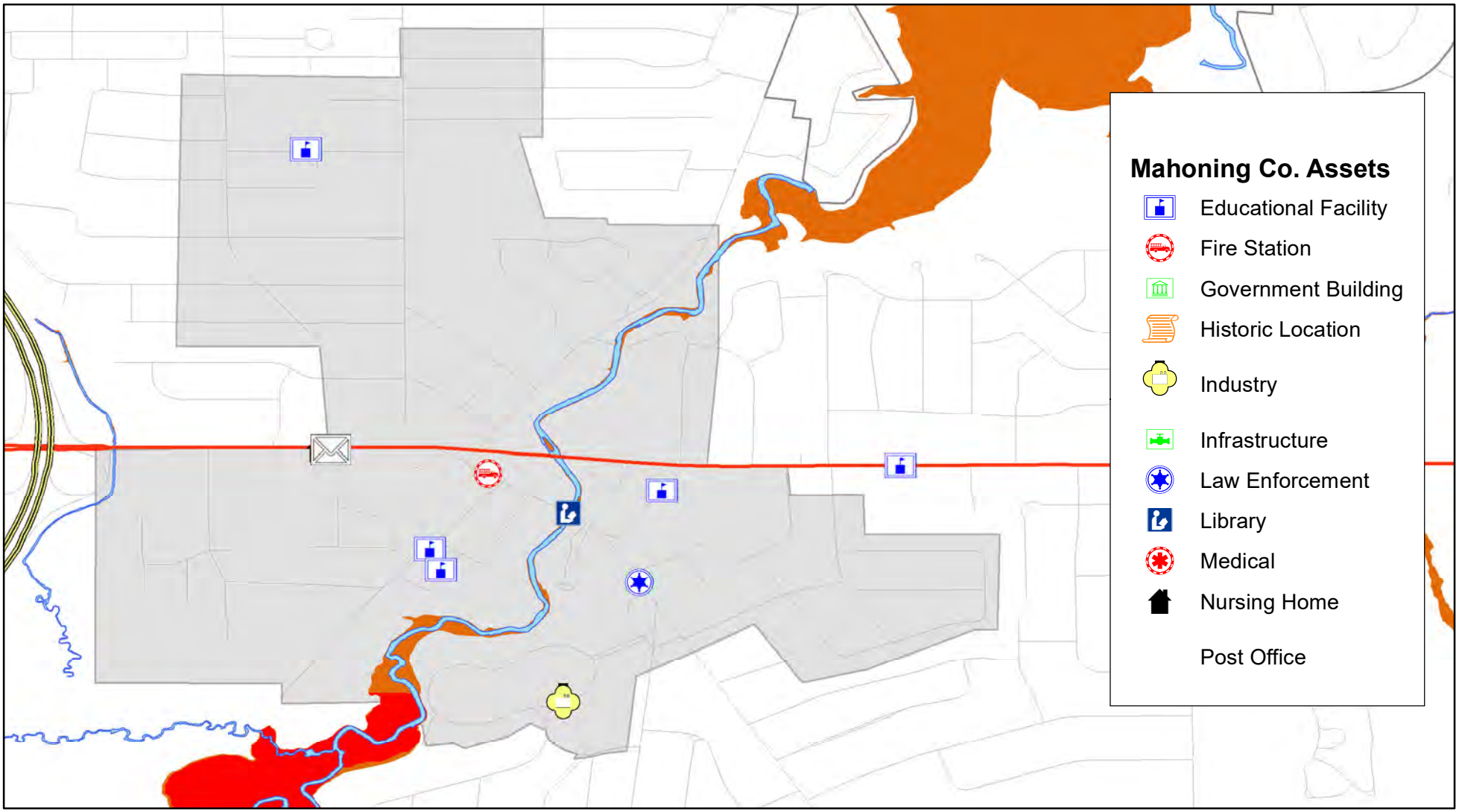
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

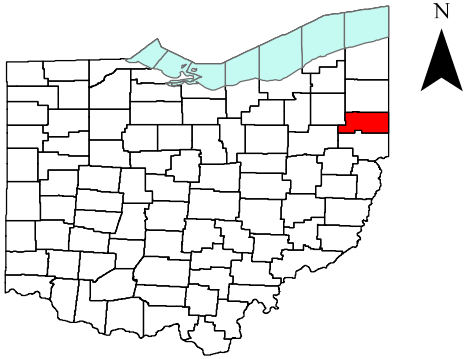
Municipal Flood Risk Map: Sebring

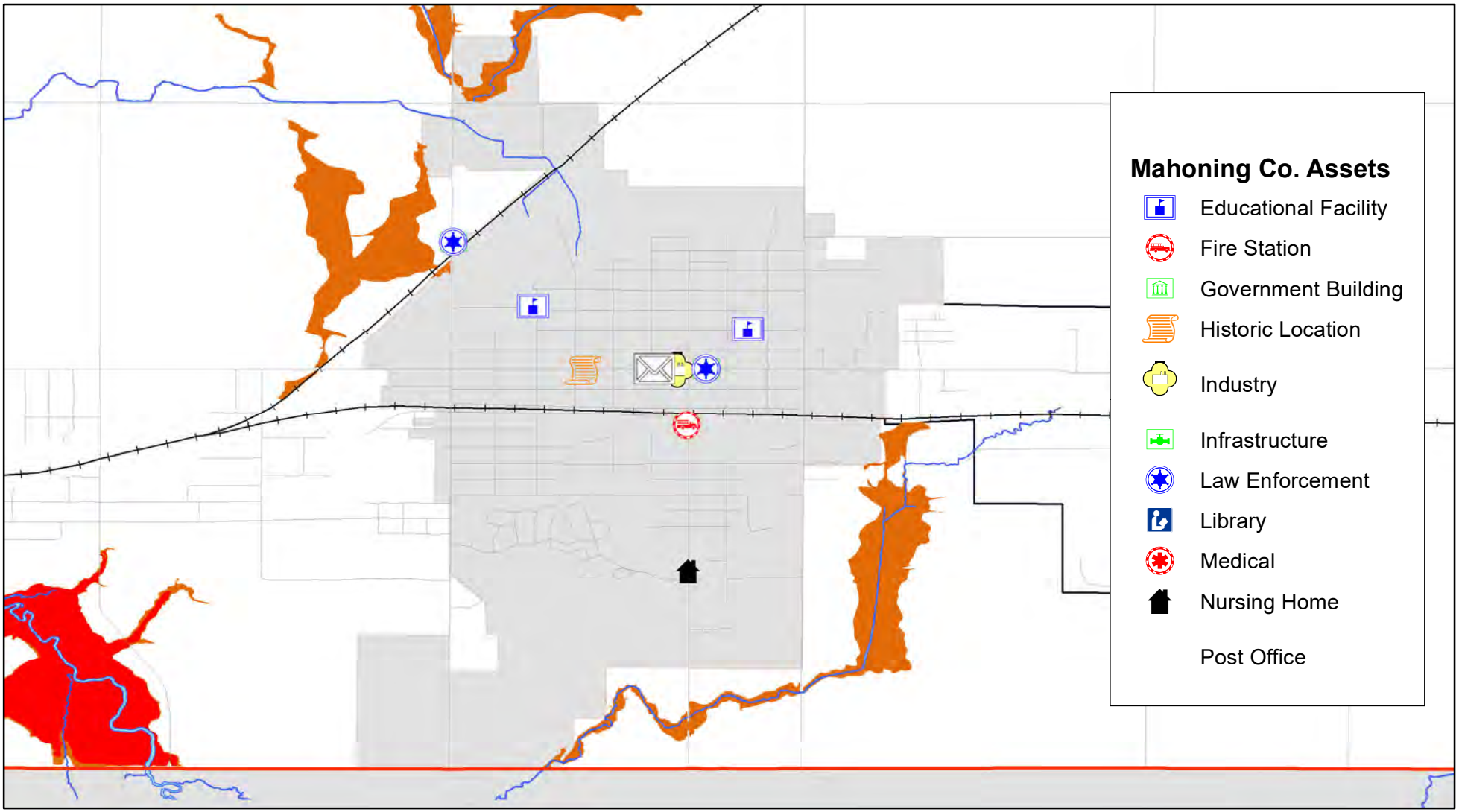
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

Flood Risk Map: Austintown Township

Data Source(s):
DHS/FEMA

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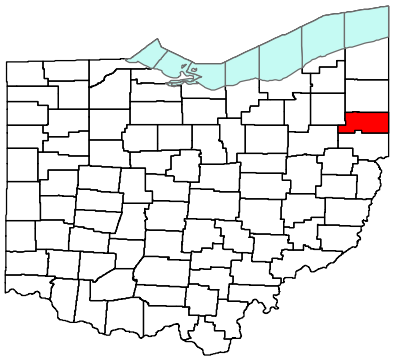
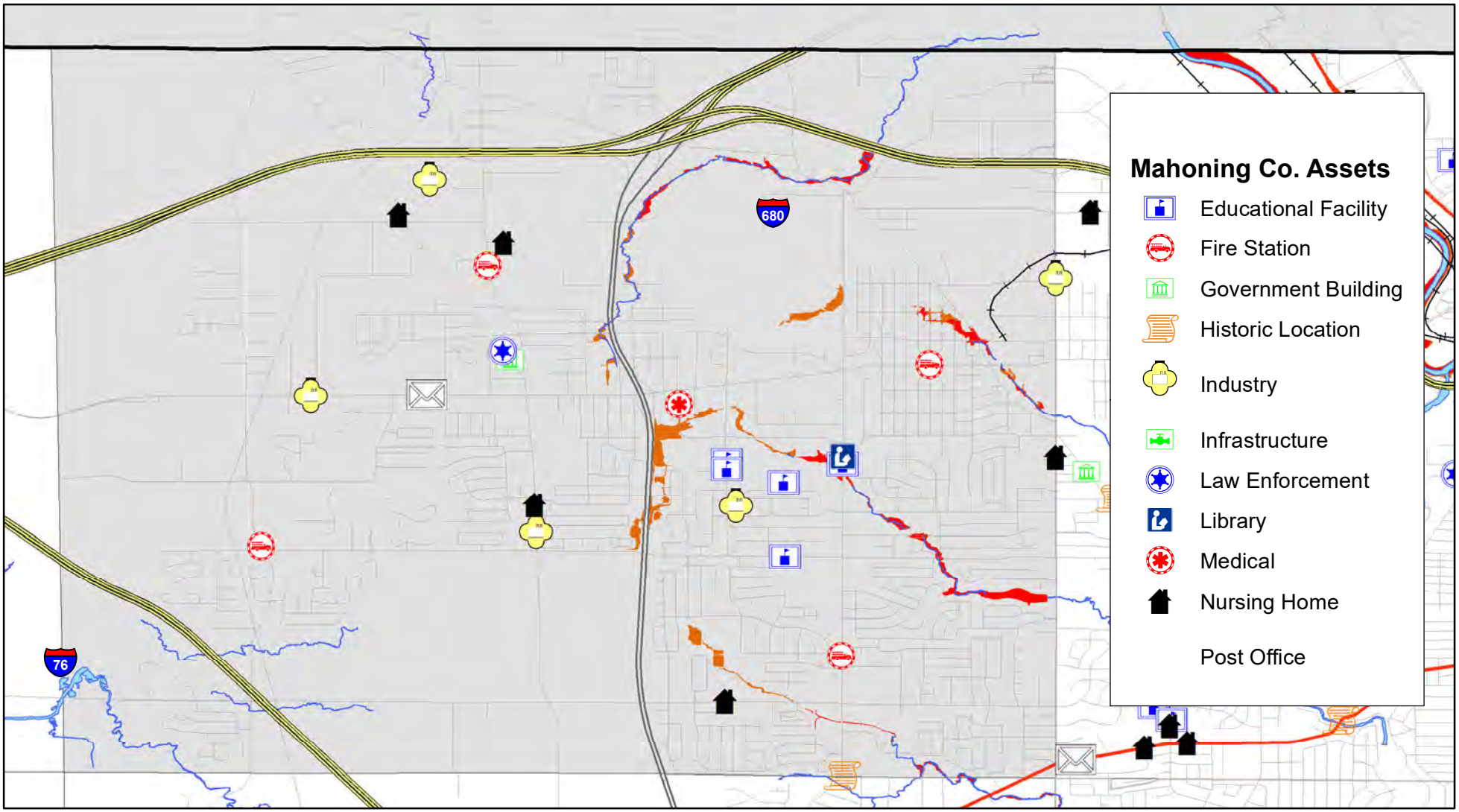
High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

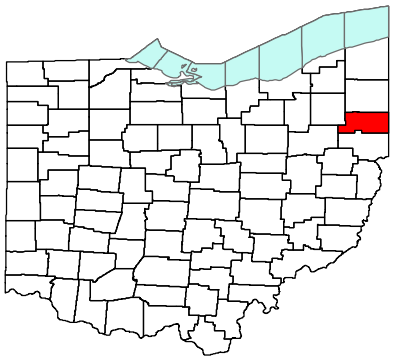
Flood Risk Map: Beaver Township

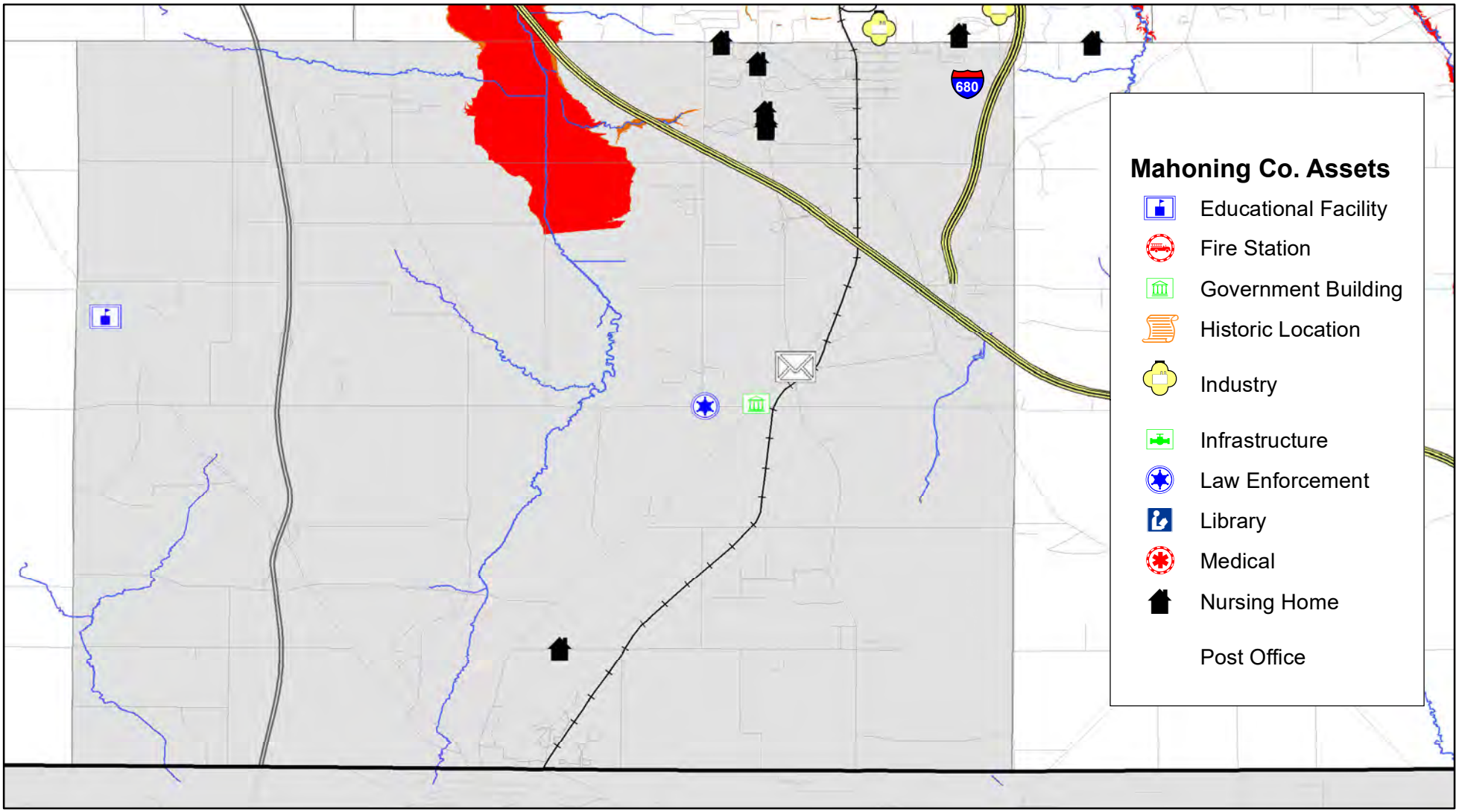
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

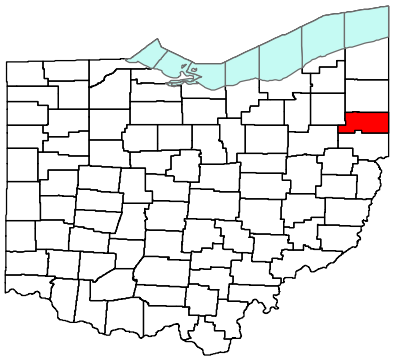
Flood Risk Map: Berlin Township

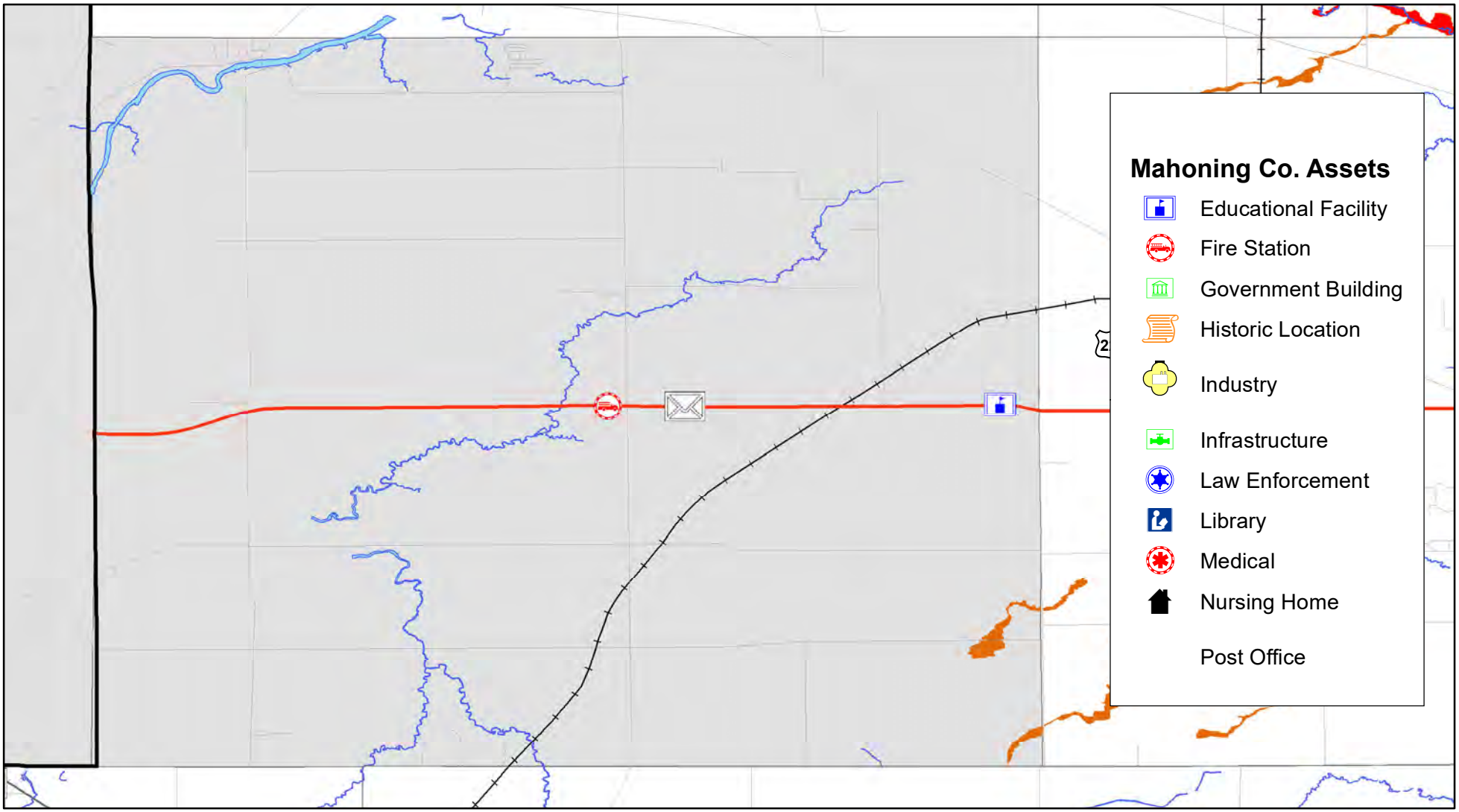
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

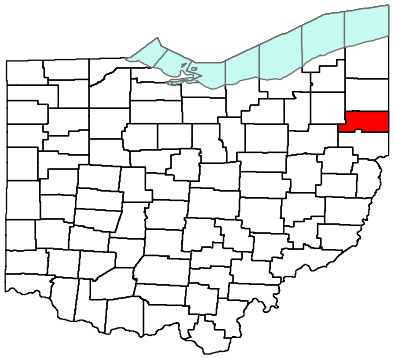
Flood Risk Map: Boardman Township

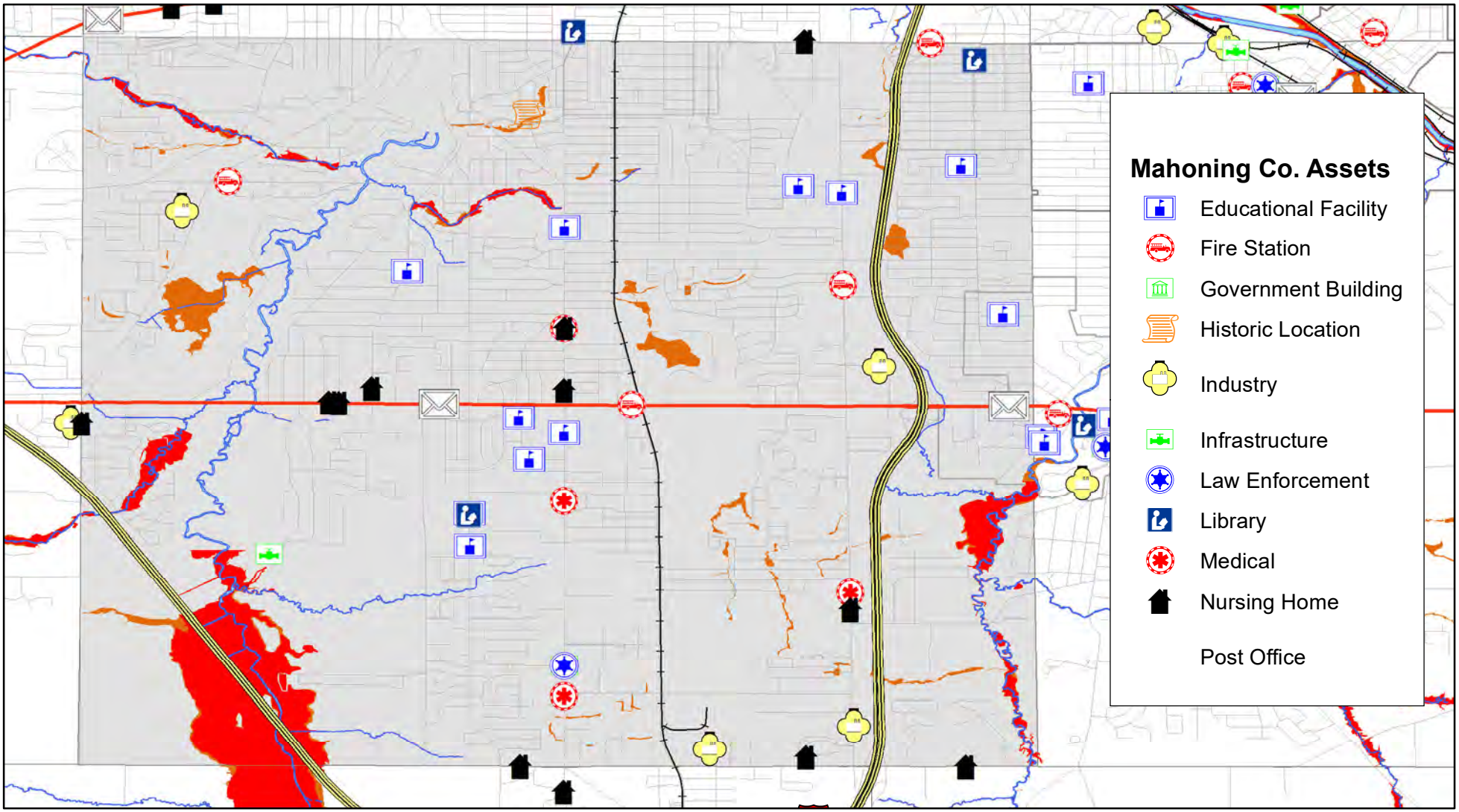
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

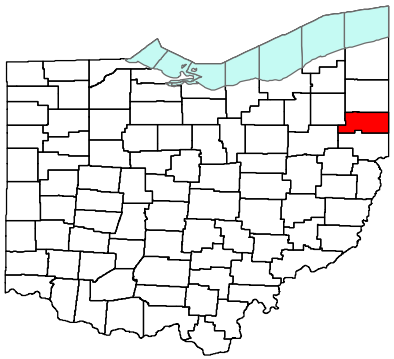
Flood Risk Map: Canfield Township

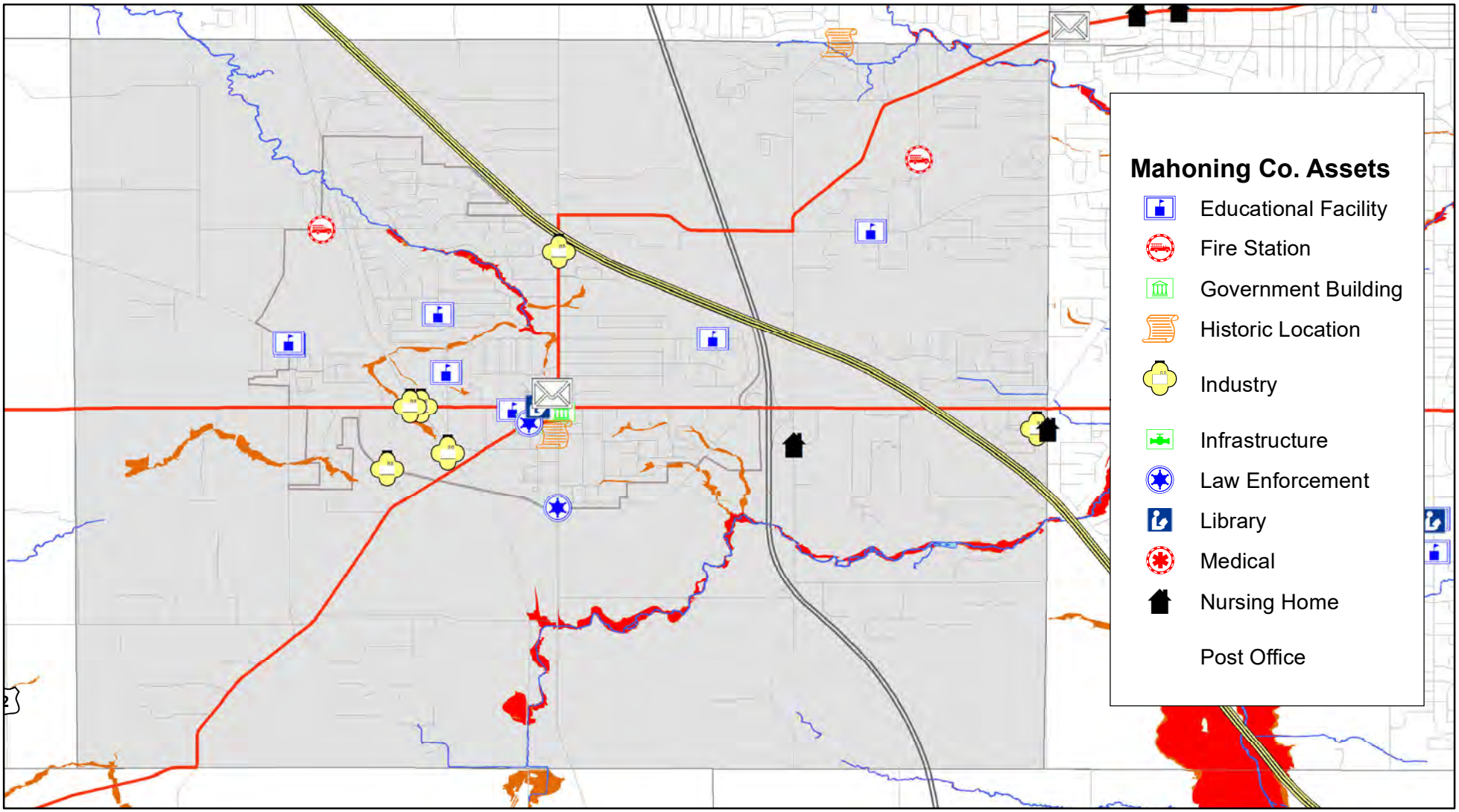
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

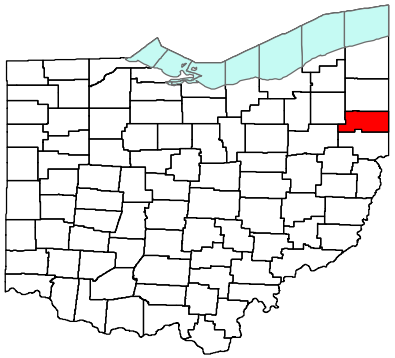
Flood Risk Map: Coitsville Township

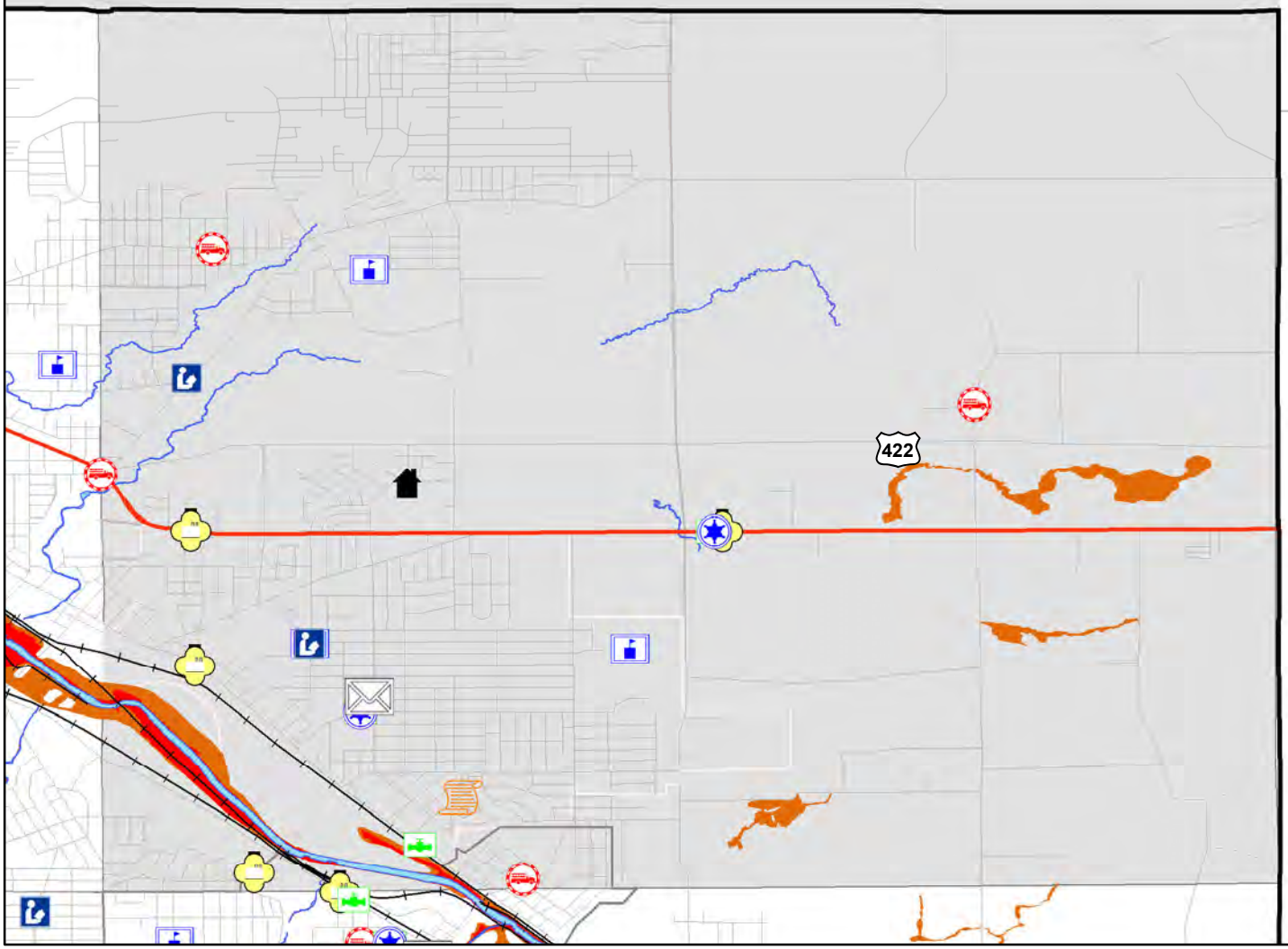
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





Mahoning Co. Assets

- Educational Facility
- Fire Station
- Government Building
- Historic Location
- Industry
- Infrastructure
- Law Enforcement
- Library
- Medical
- Nursing Home
- Post Office

MAHONING COUNTY HAZARD MITIGATION PLAN

Flood Risk Map: Ellsworth Township

Data Source(s):
DHS/FEMA

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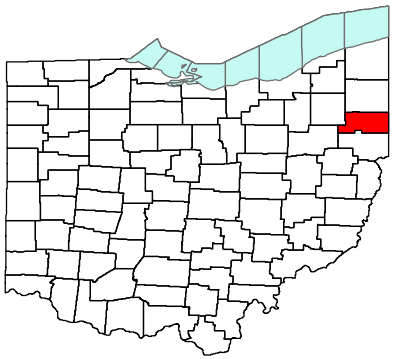
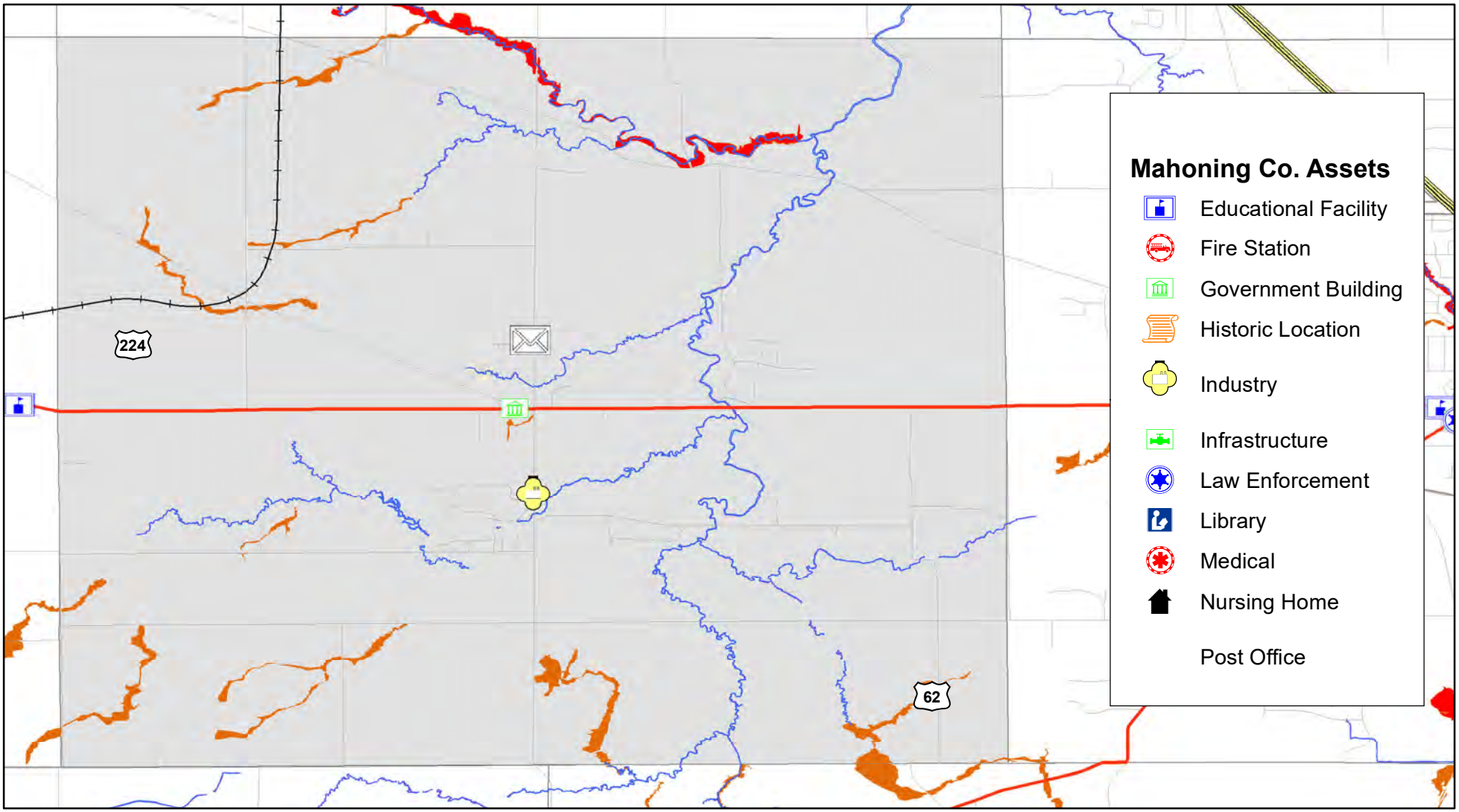
High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

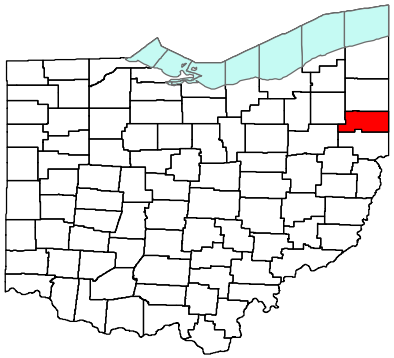
Flood Risk Map: Goshen Township

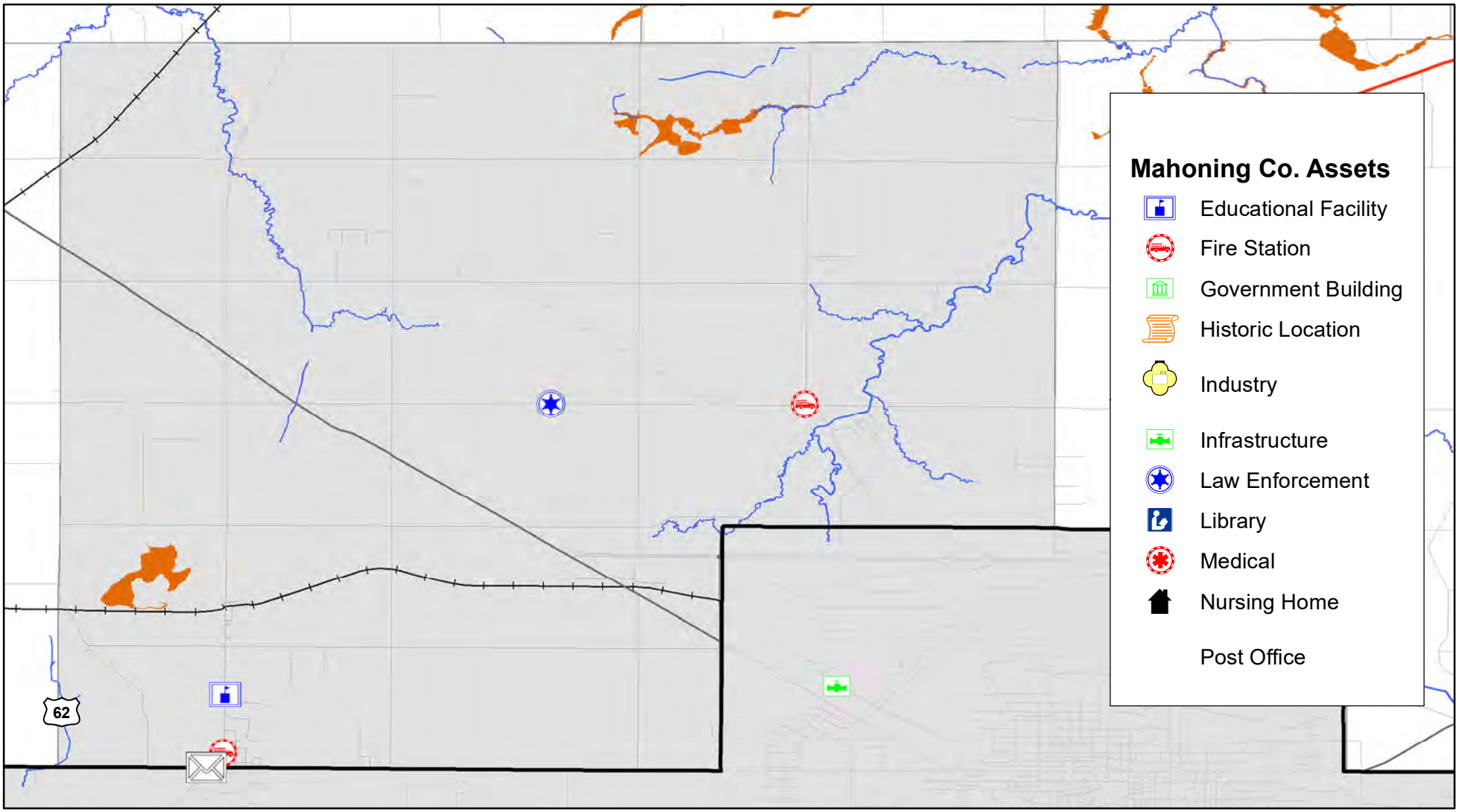
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

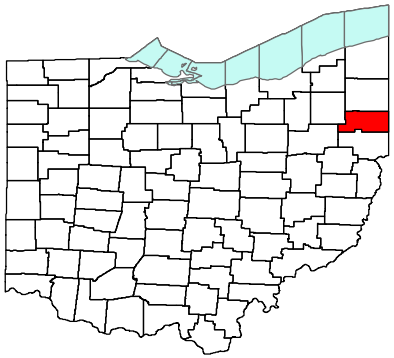
Flood Risk Map: Green Township

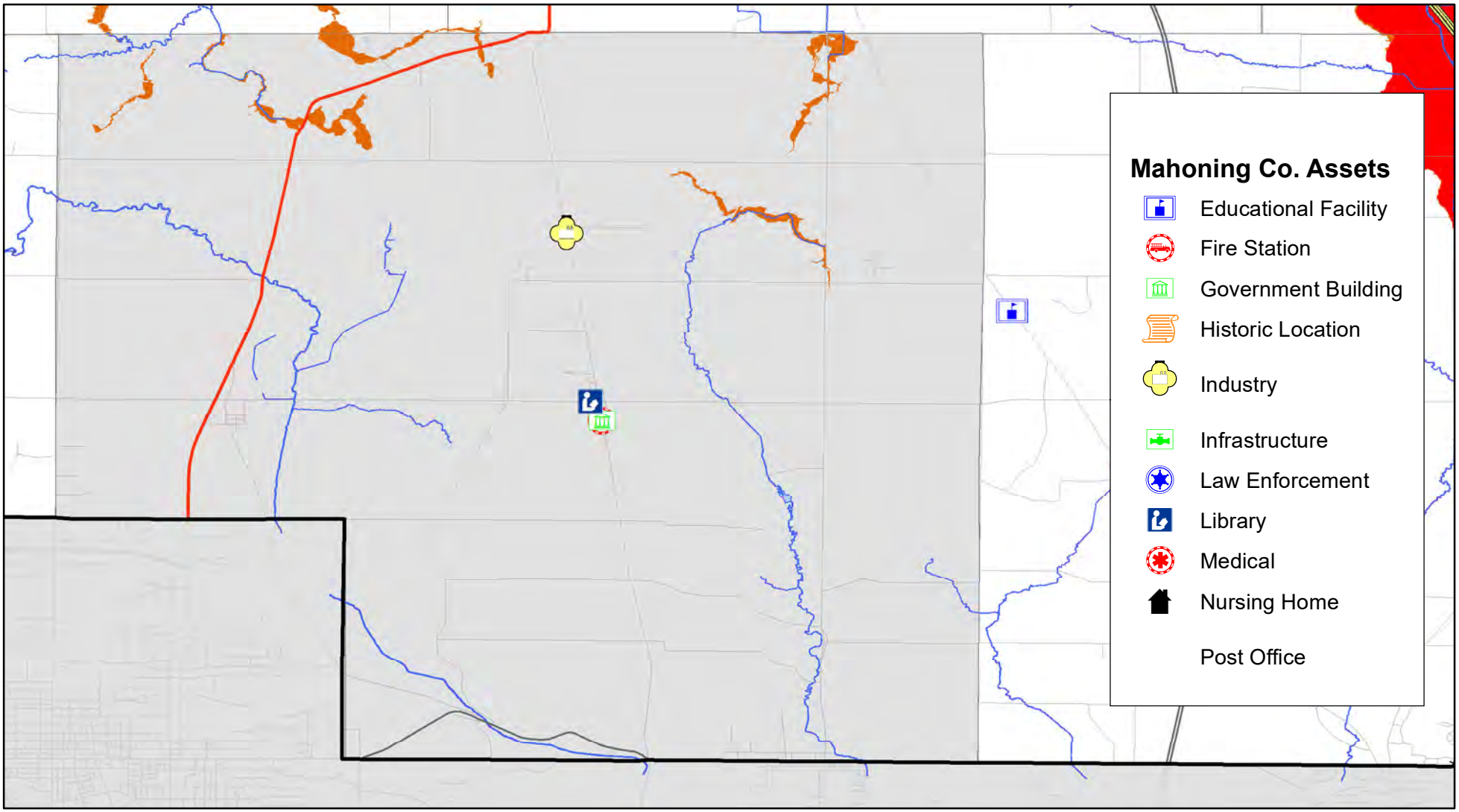
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

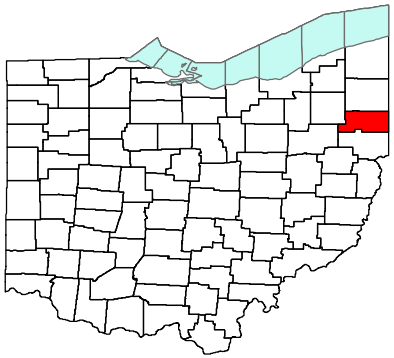
Flood Risk Map: Jackson Township

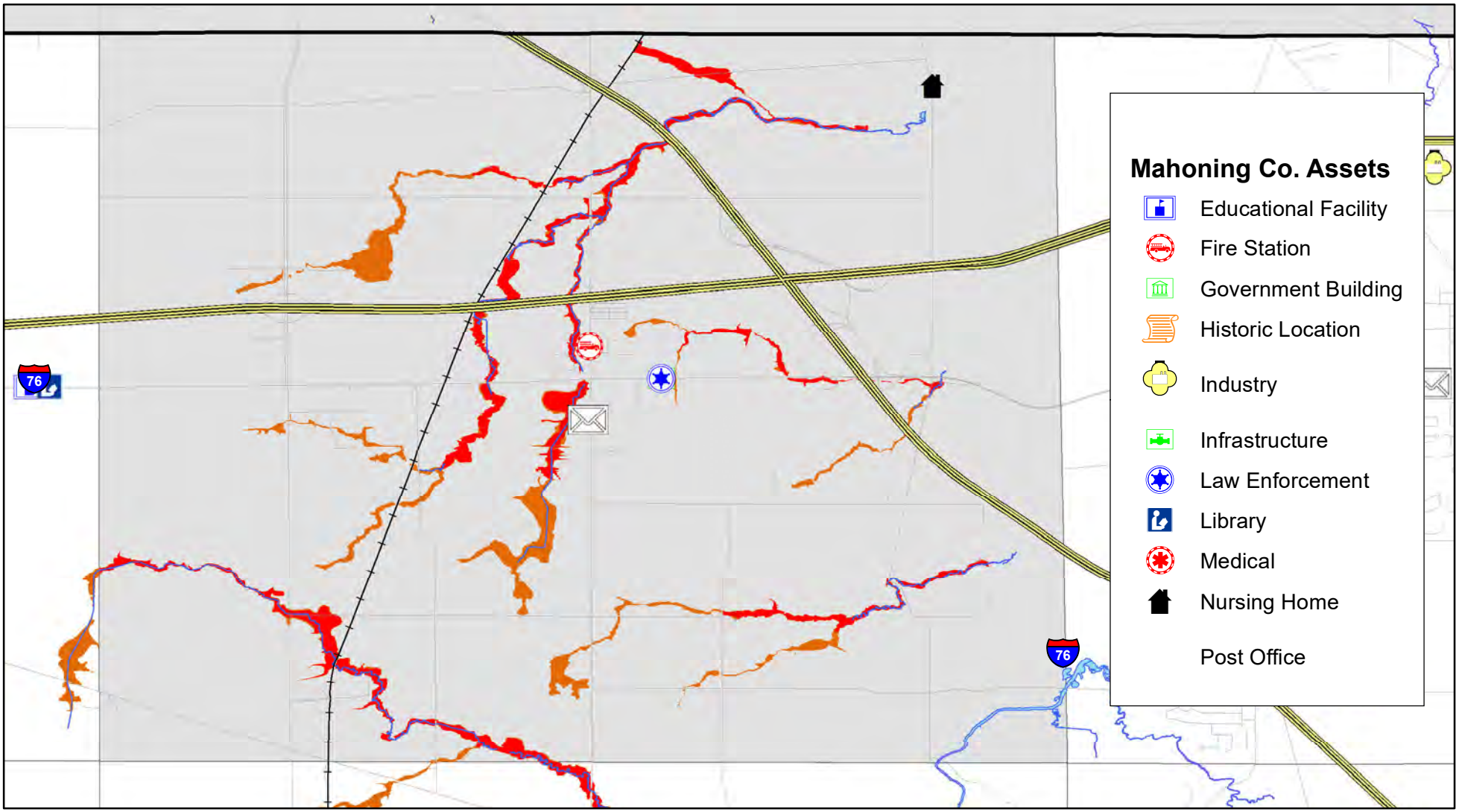
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

Flood Risk Map: Milton Township

Data Source(s):
DHS/FEMA

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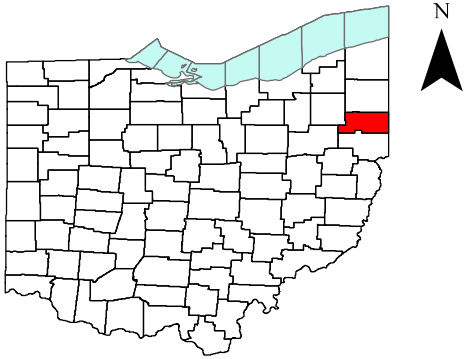
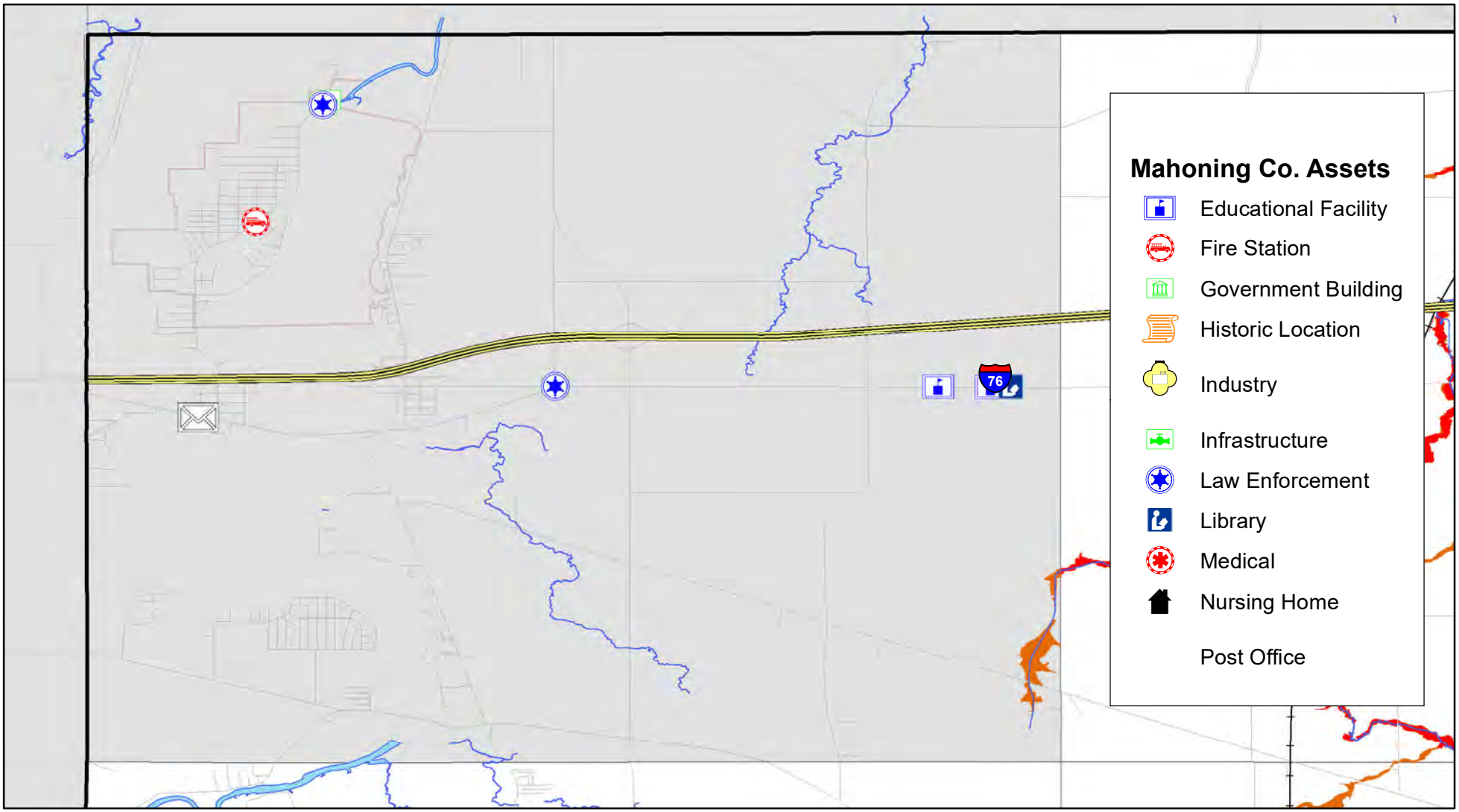
High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

Flood Risk Map: Poland Township

Data Source(s):
DHS/FEMA

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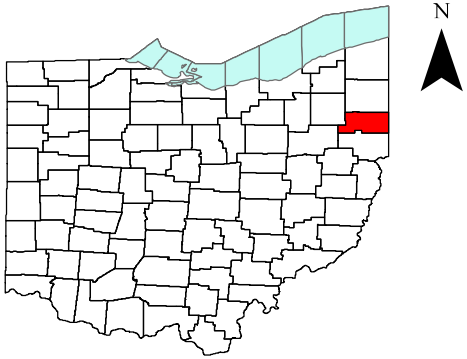
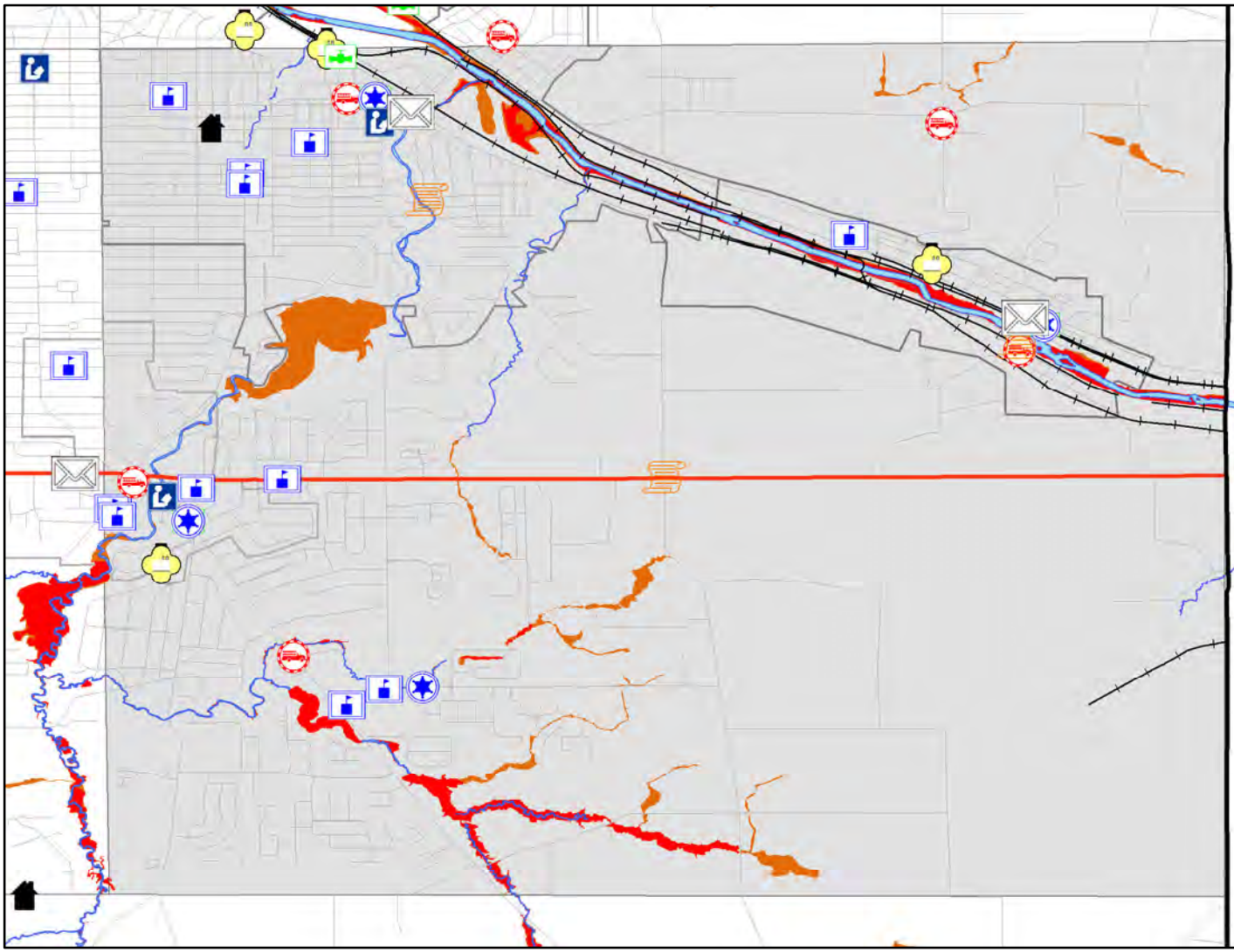
High Risk (100-yr)

Medium Risk (500-yr)





Mahoning Co. Assets

- Educational Facility
- Fire Station
- Government Building
- Historic Location
- Industry
- Infrastructure
- Law Enforcement
- Library
- Medical
- Nursing Home
- Post Office

MAHONING COUNTY HAZARD MITIGATION PLAN

Flood Risk Map: Smith Township

Data Source(s):
DHS/FEMA

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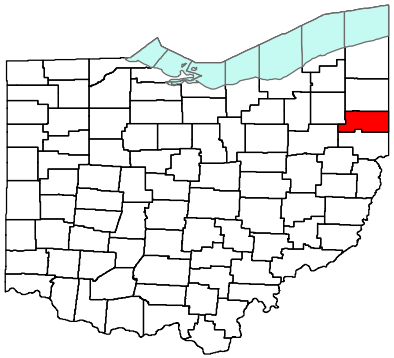
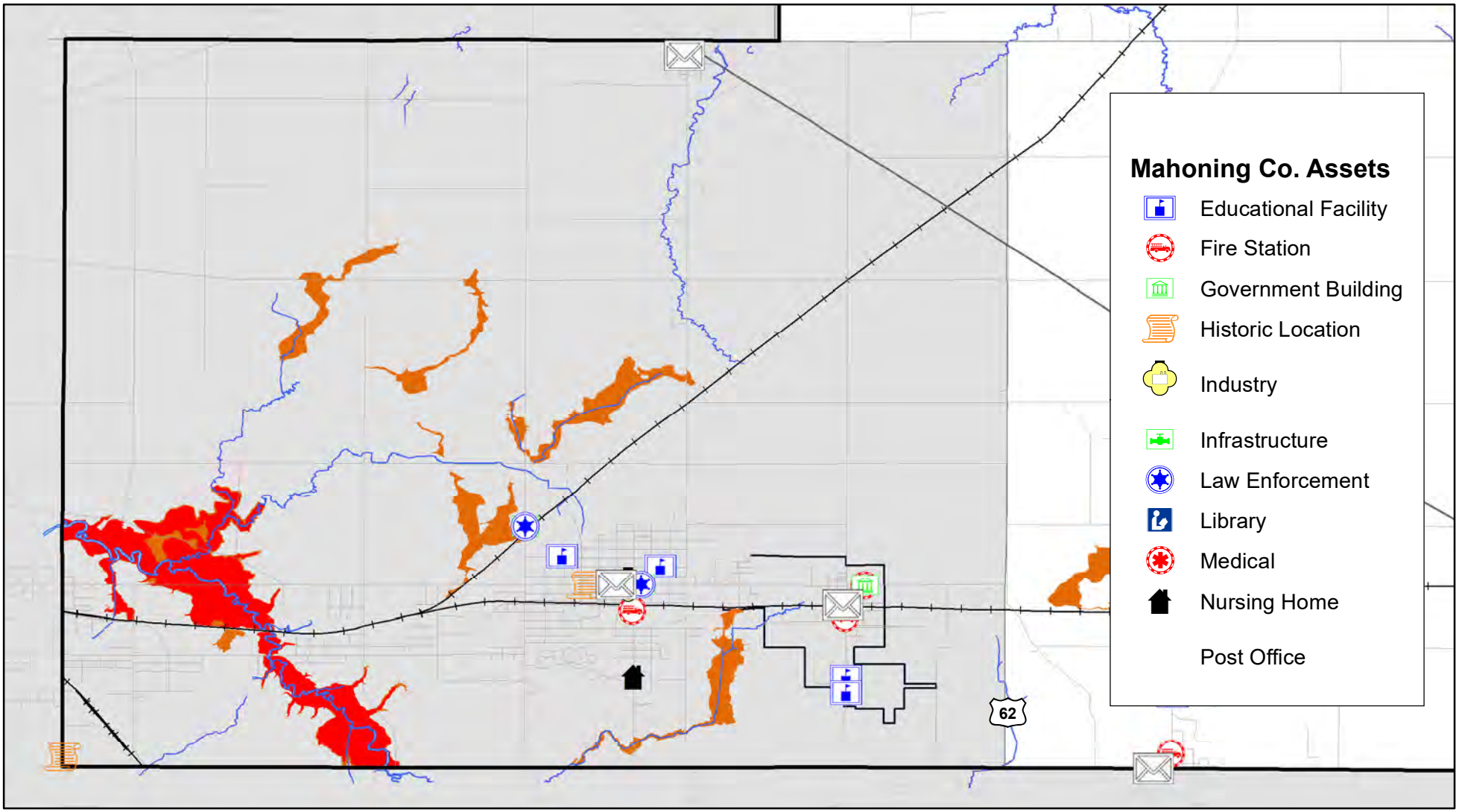
High Risk (100-yr)

Medium Risk (500-yr)





MAHONING COUNTY HAZARD MITIGATION PLAN

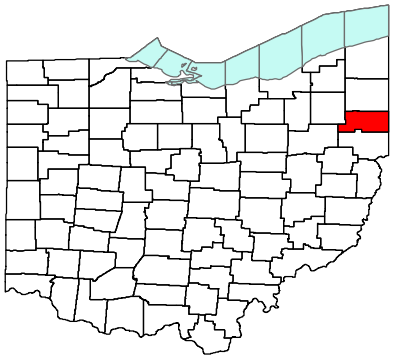
Flood Risk Map: Springfield Township

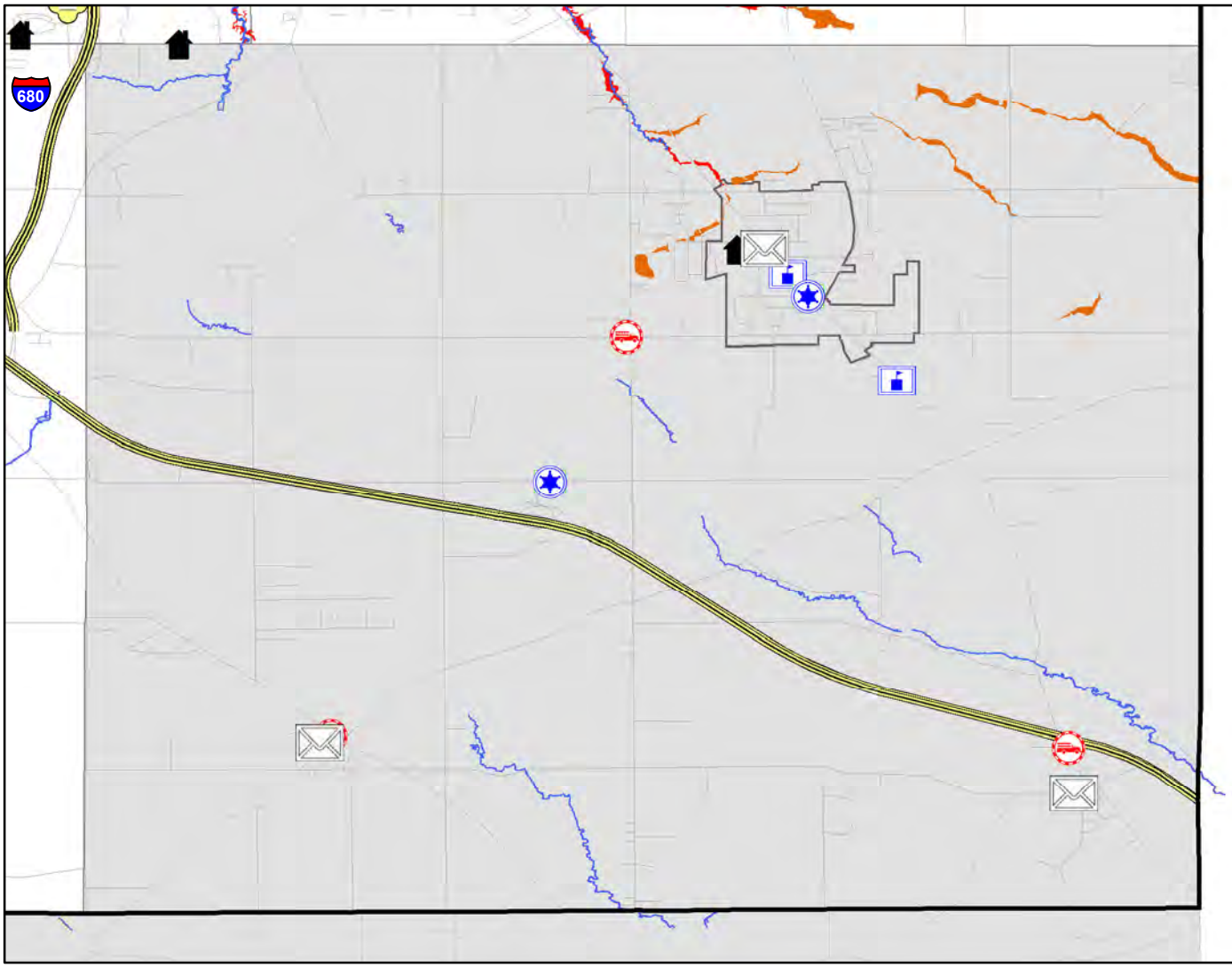
Data Source(s):
DHS/FEMA

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk (100-yr)

Medium Risk (500-yr)





Mahoning Co. Assets

- Educational Facility
- Fire Station
- Government Building
- Historic Location
- Industry
- Infrastructure
- Law Enforcement
- Library
- Medical
- Nursing Home
- Post Office

2.4.7 Land and Mine Subsidence

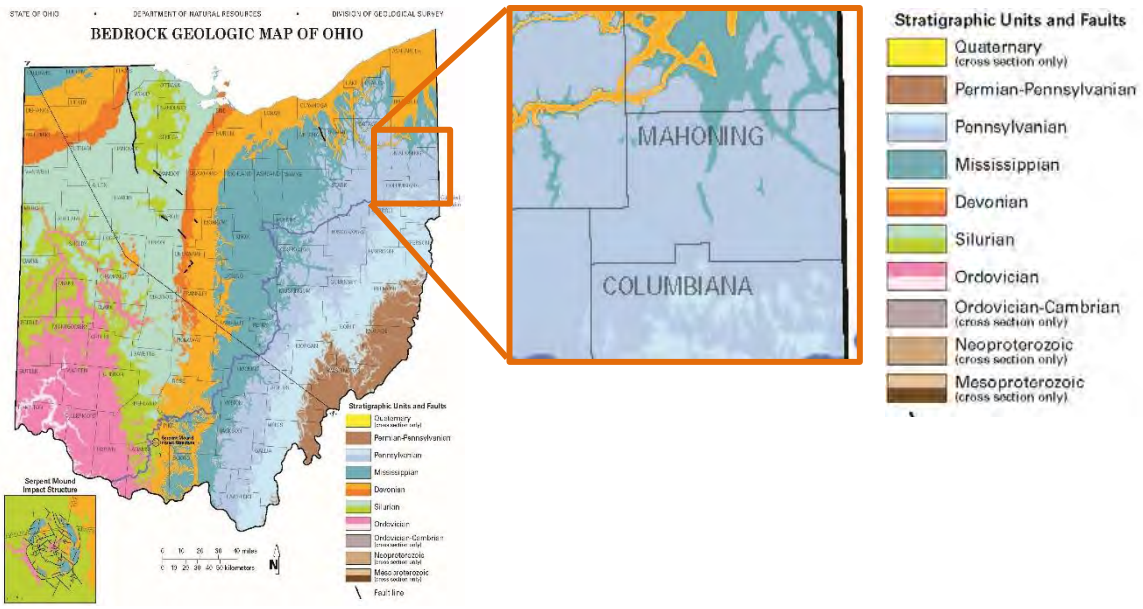
HAZARD OVERVIEW

Land subsidence (commonly named sinkholes) refers to any failures in the ground that cause collapses in the earth's surface.				
Vulnerability HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time	Overall Hazard Ranking:	**4**
	Warning Time:	Weeks to minutes	State Risk Ranking:	Frequency: Highly likely Impact: Limited Ranking: 4 - High
	Probability:	Remote	Severity:	Critical
	Type of Hazard:	Natural and human-caused	Disaster Declarations:	None

Land subsidence is a general term for a variety of collapses in the earth's surface. Some can be rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop. Subsidence, in the context of underground mining, is the lowering of the Earth's surface due to collapse of bedrock and unconsolidated materials (i.e., sand, gravel, silt, and clay) into underground mined areas.

There are two types of subsidence: (1) pit, also called sinkhole or pothole, and (2) sag or through. (The term "sinkhole" more properly refers to solution collapse features in limestone). Pit subsidence is characterized by an abrupt sinking of the surface resulting in a circular, steep-sided, craterlike feature that has an inward drainage pattern, which is illustrated in figure 2.8e. It is often associated with the roof collapse of mines that have total overburden (overlying unconsolidated material and rock) of less than 165 feet, weak roof rock of shale or mudstone, and a ratio of unconsolidated-material thickness to rock thickness of less than 1:2. Sag subsidence is a gentle, gradual settling of the surface. It is associated with pillar crushing or pillar punching in deeper mines (overburden of more than 75 feet). Sag subsidence features may fill with water if the surface of the subsidence intersects the water table.

The state of Ohio has a variety of bedrock types; in Mahoning County, the most prevalent is the Pennsylvanian and Mississippian as seen in the map on the next page. Pennsylvanian bedrock consists of sedimentary rocks, mainly shale, sandstone, siltstone, mudstone, limestone, and some coal. The Mississippian is similar and also contains conglomerate. Between the two layers of bedrock there was a period of widespread erosion.



POSSIBLE CAUSES

Land subsidence can be caused by natural processes, such as the dissolving of limestone underground, and earthquake, or volcanic activity. It can also be the result of human actions such as withdrawal of subsurface fluids or underground mining; unplanned commercial, residential, or industrial developments; roadway construction; etc. Land subsidence occurs when large amounts of ground water have been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rocks fall into the void. Land subsidence can go unnoticed because it can occur over large areas rather than in a small spot.

Land subsidence is a global problem and, in the United States, more than 17,000 square miles in 45 states, an area roughly the size of New Hampshire and Vermont combined, have been directly affected by subsidence. More than 80% of the identified subsidence in the nation has occurred because of exploitation of underground water, and increasing development of land and water resources threatens to exacerbate existing land-subsidence problems and initiate new ones.

IMPACTS AND VULNERABILITY

Land subsidence causes many problems including: changes in elevation and slope of streams, canals, and drains; damage to bridges, roads, railroads, electric power lines,

storm drains, sanitary sewers, canals, and levees; damage to private and public buildings; failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems. Safety problems for residents caused by sinkholes and subsidence initiated by abandoned underground mines are a growing concern.

Mine subsidence, like an earthquake, is a geologic hazard that can strike with little or no warning and can result in catastrophic and costly damages. Unlike an earthquake, mine subsidence normally only affects few people. However, if a mine collapses under an interstate highway, several lives and industries are subjected to potential damage. Mine subsidence can also cause foundation damage to buildings, disrupt underground utilities, and be a potential risk to human life.

HISTORICAL OCCURRENCES

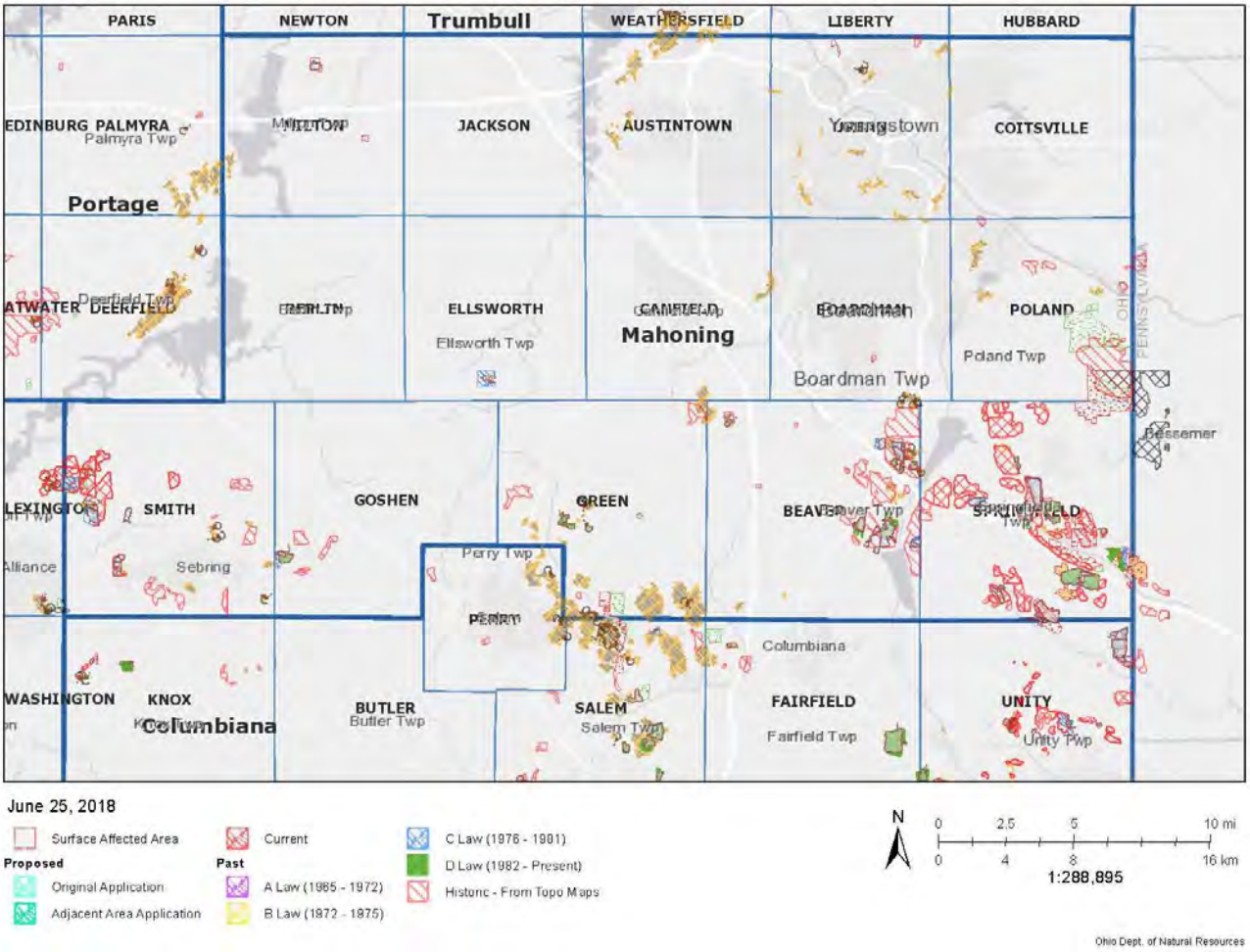
On March 5, a 12-foot section of Interstate Route 70 in Guernsey County suddenly collapsed due to abandoned underground mine subsidence. This collapse resulted in near tragedy and the subsequent closure of the roadway for four months. Portions of Interstates 76 and 680 in Mahoning County have been undermined.

LOCATION AND EXTENT

Mahoning County lies on a geological formation containing evaporite rocks such as salt and gypsum. According to nationalatlas.gov, sinkholes and other subsidence are not predicted to be extensive in the areas of northeastern Ohio containing these formations.

According to the Ohio Department of Natural Resources (ODNR), Division of Geological Survey (Mineral Resources Management), there are a few abandoned underground mine in Mahoning County, one of which is located near the Village of Sebring, at the south western portion of the county. There are also small underground mines located near Beloit and Lowellville. The following map from ODNR shows the location of mine openings, coal mining, industrial minerals mining and surface affected area in Mahoning County.

According to Youngstown State University professor, Ann Harris, there are 238 abandoned coal mines (shafts, slopes, or drifts) in Mahoning County; these are distributed in townships in the following way. Austintown,39, Beaver, 35, Boardman, 7, Canfield, 11, Coitsville, 1, Ellsworth, 2, Goshen, 8, Green, 56, Jackson, 2, Milton, 3, Poland, 13, Smith, 16, Springfield, 30, and Youngstown, 42 (Harris, n.d.).



LOSS AND DAMAGES

The Ohio Enhanced Hazard Mitigation Plan estimates the potential losses due to a landslide in each county; in Mahoning County, it estimates that there would be $89,779 in losses. It also indicates that the average structure value is $89,779, making the total structural losses, one.

According to Mahoning County GIS, there are 176,602 buildings in the county; of those, 10,756 are located within the land and mine subsidence risk areas. This number includes all types of buildings.

One of the most common types of repair to buildings from subsidence includes repairing the foundation. Based on data from Home Advisor (n.d.) the average cost of repair for a residential foundation in Ohio is $3,989. If, for the purpose of estimation, all the buildings were residential, the cumulative loss of all the buildings in a known hazard area would be around $42.9 million.

PREVIOUS AND ONGOING MITIGATION EFFORTS

Efforts to mitigate the effects of land and mine subsidence in Mahoning County have included the review of existing regulations, comprehensive plans, and capital improvement plans, to ensure adequacy in reducing the amount of future development in areas identified as prone to land and mine subsidence. The ODNR has also developed GIS based, on-line mapping which illustrates the areas in Mahoning County that have been undermined.

Ohio legislature enacted a law in 1987 that established the Ohio Mine Subsidence Insurance Fund; this fund allowed individuals residing in certain counties to purchase insurance for protection from losses due to mine subsidence. In 1993, coverage became optional or mandatory; one of the counties with mandatory coverage included Mahoning County (ODNR, n.d.).

ODNR has encouraged taking several steps to prevent mine subsidence damage: making underground mine maps available, incorporating underground mine maps into comprehensive planning and development, utilizing subdivision regulations, gathering detailed information about subsurface conditions through geotechnical investigations, among many others.

RISK ASSESSMENT

LAND AND MINE SUBSIDENCE RISK CALCULATION				
Probability		*Severity*		*Risk*
REMOTE		CRITICAL		LOW
This hazard is categorized as remote due to the lack of historical events but because there is still a risk due to the presence of mines in the county.	+	The destruction a mine or land subsidence event could cause would be mainly damaging to structures.	=	The risk assessment matrix categorizes the land and mine subsidence risk to be low for Mahoning County.

MAP AND ASSETS

The map below shows the soils that are prone to subsidence and areas that are under-mined; these areas are shown in orange. There are several assets that fall within the higher risk area as well as other businesses and residences not listed. The following table lists the assets.

ASSETS IN THE LAND AND MINE SUBSIDENCE RISK AREA			
Name	*Address*	*Jurisdiction*	*Type*
Austintown Fire Dept, Station 4	1690 South Turner Road	Austintown	Fire Station
Canfield Plastics	10670 Lisbon Road	Canfield	Industry
Crandall Medical Center/Copeland Oaks	800 South 15th Street	Sebring	Nursing Home
Damascus Fire Dept, Station 2	11990 Stratton Road	Salem	Fire Station
Globex Corporation	3620 Stutz Drive	Canfield	Industry
Mahoning County Sanitary Engineer	11020 North Kiwatoni Trail	Canfield	Industry
Pembrooke Place	850 East Midlothian Boulevard	Youngstown	Nursing Home
Springfield Fire Dept, Station 23	13885 Youngstown-Pittsburgh Road	Petersburg	Fire Station
Struthers, Middle School	800 Fifth Avenue	Struthers	Educational Facility
WRJFD, Station 92	7519 Youngstown-Pittsburgh Road	Poland	Fire Station

MAHONING COUNTY HAZARD MITIGATION PLAN

Land & Mine Subsidence Risk Map

Data Source(s):
NRCS, ODNR, USGS

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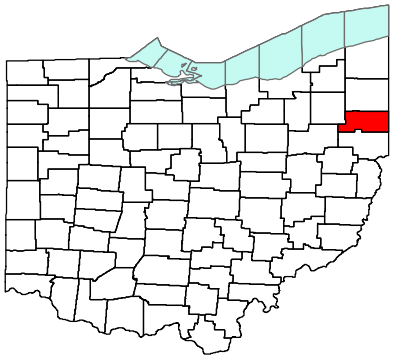
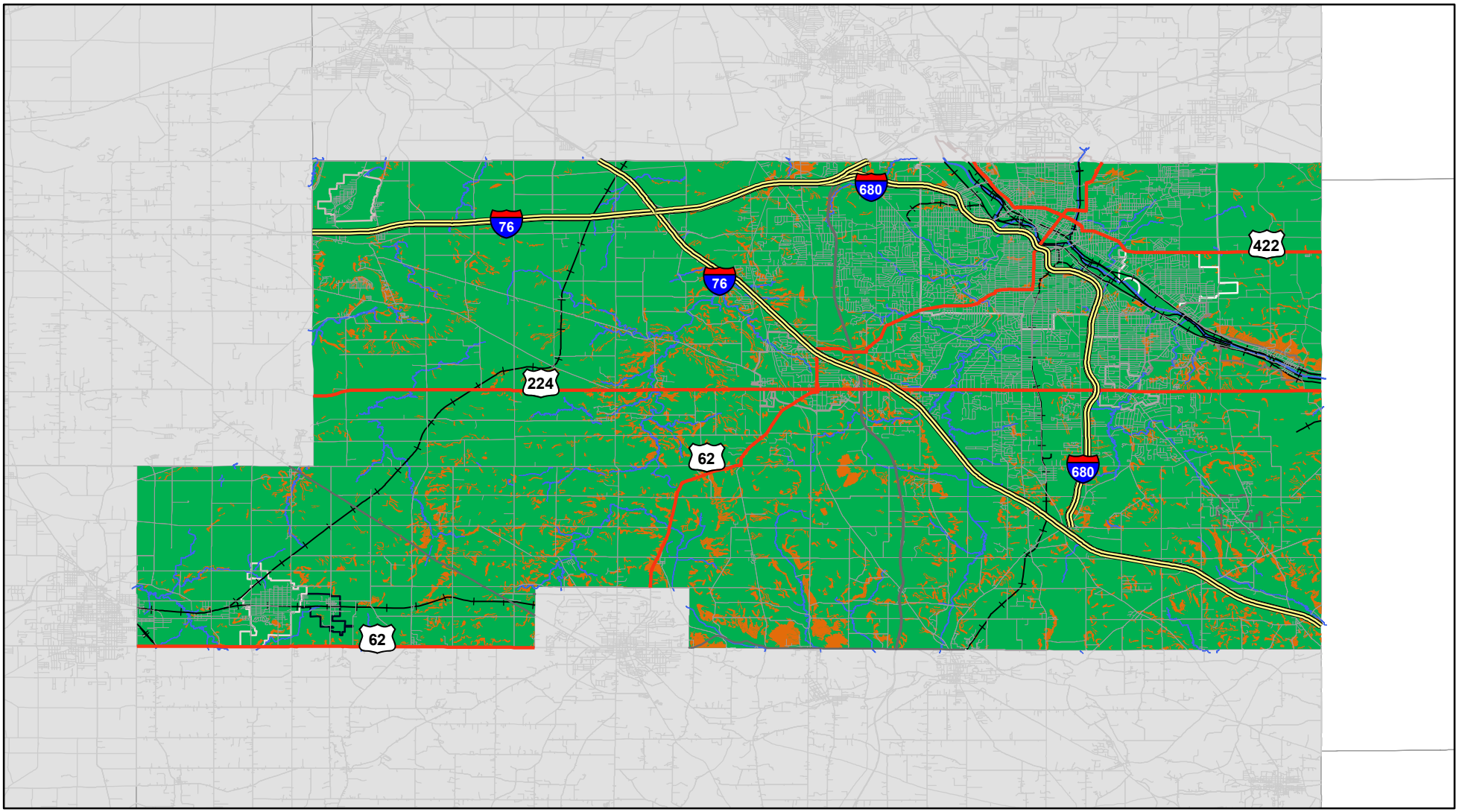
Remote, Critical Risk

Low Risk





2.4.8 Severe Thunderstorm and Hail

HAZARD OVERVIEW

A severe thunderstorm is one that produces a tornado, winds in excess of 58 mph, or hail of 1" diameter or larger.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time, typically during the summer months	Overall Hazard Ranking:	**2**
	Warning Time:	Days to hours	State Risk Ranking:	Frequency: Highly likely Impact: Negligible Ranking: 2 - Low
	Probability:	Frequent	Severity:	Critical
	Type of Hazard:	Natural	Disaster Declarations:	None

A thunderstorm is a local storm that is produced by a cumulonimbus cloud, accompanied by lightning and thunder, often accompanied by gusty winds, heavy rain, and occasionally by hail, and sometimes is violent at the surface (NWS, FEMA, 2001).

TYPES OF THUNDERSTORMS				
Type	*Description*	*Duration*	*Wind Speeds*	*Associated Hazards*
Single Cell	Uncommon	20 - 30 minutes		• Non-damaging hail • Microbursts • Weak tornadoes
Multi Cell	Common, organized cluster of two or more single cells.	Each cell lasts approximately 20 minutes	Downbursts of up to 80 mph	• Heavy rainfall • Downbursts • Hail • Weak tornadoes
Mesoscale Convective System (MCS)	Well organized system of thunderstorms	Up to 12 hours or more	55 mph or more	• Torrential rainfalls • Derechos • Tornadoes
Squall Lines	May extend over 250 to 500 miles and 10 to 20 miles wide	Individual cells last from 30 to 60 minutes		• Significant rain after the storm • Derechos
Super Cells	Most dangerous storms, visible with Doppler radars	1 - 6 hours	Updrafts and downdrafts of more than 100 mph	• Tornadoes • Hail

Sources: IS-271 Anticipating Hazardous Weather and Community Risk
Keller & DeVecchio, 2015
National Weather Service, 2009

A thunderstorm that produces a tornado, winds of at least 58 mph (50knots), and/or hail at least 1" in diameter is a severe thunderstorm (NWS, 2009). Thunderstorm-associated natural hazards include lightning, hail, heavy rain, damaging winds, and tornadoes. This

profile includes descriptions on lightning and hail; section 2.4.4 describes severe winds and tornadoes associated with thunderstorms. Because the potential damage severe winds and tornadoes cause and the difference in mitigation actions relating to the hazard, this profile does not include a detailed description of them. Furthermore, the IS-271 FEMA course *Anticipating Hazardous Weather and Community Risk* describes thunderstorms and tornadoes separately.

- **Lightning**: Lightning is a giant spark of electricity between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground; however, when the differences in the charges becomes too great, this insulating capacity of the air breaks down, and there is a rapid discharge of electricity known as lightning (NWS). Individual lightning strikes occur with no warning and kill between 75 and 100 Americans every year (Haddow, Bullock, & Coppola, 2014, p.51.) Lighting can reach a significant distance from a storm, up to 25 miles according to the National Severe Storms Library (NSSL). While lightning is a common occurrence and can be seen in most thunderstorms, only about 20% of the lighting observed in a storm will strike the ground.
- **Hail**: Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into balls of ice; the drops of ice can move upwards and downwards within the draft and become larger. When the hailstone is heavy enough, it will fall to the ground (NSSL, n.d.). In 1986, Jonathan Webb, a member of the Tornado and Storm Research Organization (TORRO) in England, developed the TORRO Hailstorm Intensity Scale as a way to measure and categorize hailstorms (Voss Law Firm, n.d.).

TORRO HAILSTORM INTENSITY SCALE					
Intensity		*Typical Hail Diameter (mm)*	*Typical Hail Diameter (in)*	*Typical Damage*	*Example Size Description*
H0	Hard Hail	5	Up to 0.33	No damage.	Pea
H1	Potentially Damaging	5-15	0.33 – 0.60	Slight general damage to plants, crops.	Mothball
H2	Significant	10-20	0.60 – 0.80	Significant damage to fruit, crops, vegetation.	Marble, Grape, Dime
H3	Severe	20-30	0.80 – 1.2	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored.	Walnut, Nickel to Quarter

TORRO HAILSTORM INTENSITY SCALE					
Intensity		*Typical Hail Diameter (mm)*	*Typical Hail Diameter (in)*	*Typical Damage*	*Example Size Description*
H4	Severe	25-40	1.2 – 1.6	Widespread glass damage, vehicle bodywork damage.	Pigeon's egg > squash ball
H5	Destructive	30-50	1.6 – 2.0	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries.	Golf ball > Pullet's egg
H6	Destructive	40-60	2.0 – 2.4	Bodywork of grounded aircraft dented, brick walls pitted.	Hen's egg
H7	Destructive	50-75	2.4 – 3.0	Severe roof damage, risk of serious injuries.	Tennis ball > Cricket ball
H8	Destructive	60-90	3.0 – 3.5	(Severest recorded in the British Isles) Severe damage to aircraft bodywork.	Large orange > Soft ball
H9	Super Hailstorms	75-100	3.5 – 4.0	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.	Grapefruit
H10	Super Hailstorms	>100	4.0+	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open.	Melon

POSSIBLE CAUSES

Hail forms when water droplets are carried upward into extremely cold areas of the atmosphere. Hailstones grow by colliding with super cooled water drops. Super cooled water will freeze on contact with ice crystals, frozen raindrops, or dust. Thunderstorms that have a strong updraft keep lifting hailstones up toward the top of the cloud where they continue to grow. The hail eventually falls when the updraft can no longer lift the weight of the hailstone. Hail cannot form without an extremely cold upper atmosphere (NSSL, 2018).

Lightning is an electrical currents that start from the clouds. When the ground is hot, it heats the air above it; as the warm air rises, water vapor cools and forms into a cloud. When the warm air continues to rise, the cloud will grow. The top of the cloud has a temperature below freezing, which means water vapor turns to ice. As the water vapor freezes, the cloud becomes a thundercloud, and the frozen particles collide with each other creating an electric charge. Positively charged particles will rise to the upper part of the cloud, and the negatively charged particle will sink to the lower portion of the cloud. When the charges grow large enough, a spark or lightning will occur. This process may vary. Cloud-to-ground lightning occurs where the cloud is negatively charged, and the ground is positively charged, thus making a spark (Plant-science.com, 2018).

DRAFT

IMPACTS AND VULNERABILITY

There are many impacts of severe summer weather. Here are a few listed under each category.

- **Lightning:** Can cause injury and even death. In some cases, lightning is known to cause fires in structures and open land or forests.
- **Hailstorms:** Can cause injury to humans and animals if directly exposed, damage to vegetation and infrastructure.
- **Tornadoes:** Cause damage to trees, property; they can also cause severe injury and death.
- **Wind:** Causes respiratory illnesses, damage to the vegetation (fallen trees), and can cause damage to infrastructure due to flying debris.
- **Thunderstorms:** Include all of the above-mentioned impacts.

As with all hazards, severe summer weather hazards can also affect the mental health of the population causing anxiety, panic attacks, and post-traumatic stress. Vulnerable populations can include those who are unable to evacuate during a severe weather event, those with health issues that may be exacerbated, as well as children and elderly adults. If poor populations are unable to obtain necessary shelter during an event, they will be at higher risk and may be more vulnerable to the effects of that event.

HISTORICAL OCCURRENCES

NCEI reports that since 1979 there have been 106 hail events in Mahoning County of 0.75" in diameter or larger, and three lightning events, two of which caused deaths. The following table summarizes the data NCEI has available. In some instances, there is more than one event in a day, which indicates that there was more than one event in the county that day. Events with the most damages, largest magnitude hail, injuries, or death are described below the table; these are indicated with an asterisk (*).

LIGHTNING AND HAIL EVENTS IN MAHONING COUNTY 1979-2018						
Event Date	*Event Type*	*Magnitude*	*Deaths*	*Injuries*	*Damage to Property*	*Damage to Crops*
5/12/1979	Hail	1.75	0	0	$0	$0
7/8/1980	Hail	1.75	0	0	$0	$0
7/21/1980	Hail	1	0	0	$0	$0
3/28/1985	Hail	1	0	0	$0	$0
3/28/1985	Hail	1	0	0	$0	$0

LIGHTNING AND HAIL EVENTS IN MAHONING COUNTY 1979-2018						
Event Date	*Event Type*	*Magnitude*	*Deaths*	*Injuries*	*Damage to Property*	*Damage to Crops*
5/27/1985	Hail	1	0	0	$0	$0
5/27/1985	Hail	0.75	0	0	$0	$0
5/31/1985	Hail	1	0	0	$0	$0
5/31/1985	Hail	1	0	0	$0	$0
6/16/1986	Hail	1	0	0	$0	$0
5/30/1987	Hail	1.75	0	0	$0	$0
5/15/1988	Hail	1	0	0	$0	$0
3/2/1991	Hail	0.75	0	0	$0	$0
4/15/1993	Hail	0.75	0	0	$500	$0
7/6/1994	Hail	0.75	0	0	$0	$0
7/6/1994	Hail	0.75	0	0	$0	$0
9/25/1994	Hail	1.75	0	0	$5,000,000	$50,000
9/25/1994	Hail	1.25	0	0	$0	$50,000
6/3/1995	Hail	0	0	0	$0	$0
7/16/1995	Hail	0.75	0	0	$0	$0
5/1/1996	Hail	1	0	0	$0	$0
6/12/1996*	Lightning	N/A	1	3	$0	$0
4/16/1998	Lightning	N/A	0	0	$30,000	$0
6/2/1998	Hail	1.75	0	0	$0	$0
6/2/1998	Hail	1.75	0	0	$0	$0
6/12/1998	Hail	0.75	0	0	$0	$0
6/13/1998	Hail	0.75	0	0	$0	$0
9/7/1998	Hail	0.75	0	0	$0	$0
7/28/1999	Hail	2	0	0	$0	$0
5/18/2000	Hail	0.88	0	0	$0	$0
6/2/2000	Hail	0.75	0	0	$0	$0
4/9/2001	Hail	0.75	0	0	$0	$0
4/9/2001	Hail	0.75	0	0	$0	$0
4/9/2001	Hail	0.75	0	0	$0	$0
4/9/2001	Hail	0.75	0	0	$0	$0
4/9/2001	Hail	0.75	0	0	$0	$0
4/9/2001	Hail	0.75	0	0	$0	$0
4/15/2002	Hail	0.75	0	0	$5,000	$0
4/28/2002	Hail	0.75	0	0	$5,000	$0
5/30/2002	Hail	1	0	0	$15,000	$0
5/30/2002	Hail	0.75	0	0	$5,000	$0
5/31/2002	Hail	0.88	0	0	$10,000	$0
6/5/2002	Hail	1	0	0	$5,000	$0
8/3/2002	Hail	0.75	0	0	$0	$0
11/10/2002	Hail	1	0	0	$5,000	$0
5/10/2003	Hail	0.88	0	0	$2,000	$0
5/10/2003	Hail	0.75	0	0	$0	$0
7/7/2003	Hail	0.88	0	0	$2,000	$0
6/14/2004	Hail	0.75	0	0	$0	$0
6/17/2004	Hail	0.75	0	0	$0	$0

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LIGHTNING AND HAIL EVENTS IN MAHONING COUNTY 1979-2018						
Event Date	*Event Type*	*Magnitude*	*Deaths*	*Injuries*	*Damage to Property*	*Damage to Crops*
6/24/2004	Hail	0.75	0	0	$0	$0
8/27/2004	Hail	0.75	0	0	$0	$0
5/13/2005	Hail	0.75	0	0	$0	$0
6/28/2005	Hail	0.88	0	0	$5,000	$0
6/29/2005	Hail	0.75	0	0	$0	$0
6/30/2005	Hail	0.75	0	0	$0	$0
4/12/2006	Hail	1	0	0	$1,000	$0
4/12/2006	Hail	0.75	0	0	$0	$0
4/12/2006	Hail	0.75	0	0	$0	$0
6/22/2006	Hail	0.88	0	0	$3,000	$0
6/22/2006	Hail	0.88	0	0	$0	$0
6/22/2006	Hail	0.75	0	0	$0	$0
6/28/2006	Hail	0.75	0	0	$0	$0
7/10/2006	Hail	1	0	0	$2,000	$0
7/10/2006	Hail	1	0	0	$0	$0
7/10/2006	Hail	0.88	0	0	$0	$0
8/3/2006	Hail	0.75	0	0	$0	$0
5/1/2007	Hail	0.88	0	0	$0	$0
5/1/2007	Hail	0.75	0	0	$0	$0
6/8/2007*	Hail	1.5	0	0	$250,000	$0
6/8/2007*	Lightning	N/A	1	0	$0	$0
6/13/2007	Hail	1	0	0	$10,000	$0
6/13/2007	Hail	0.75	0	0	$0	$0
6/10/2008	Hail	0.75	0	0	$0	$0
6/21/2008	Hail	1	0	0	$0	$0
6/21/2008	Hail	1	0	0	$0	$0
6/21/2008	Hail	0.75	0	0	$0	$0
6/21/2008	Hail	0.88	0	0	$0	$0
6/23/2008	Hail	0.75	0	0	$0	$0
7/22/2008	Hail	1	0	0	$0	$0
7/26/2008	Hail	0.75	0	0	$0	$0
7/26/2008	Hail	0.75	0	0	$0	$0
7/26/2008	Hail	0.88	0	0	$0	$0
6/17/2009	Hail	0.88	0	0	$0	$0
7/21/2009	Hail	0.88	0	0	$0	$0
7/21/2009*	Hail	1.25	0	0	$0	$0
7/21/2009	Hail	1.25	0	0	$0	$0
7/21/2009	Hail	1	0	0	$0	$0
5/25/2011	Hail	0.75	0	0	$0	$0
5/25/2011	Hail	1	0	0	$0	$0
5/7/2012	Hail	1	0	0	$0	$0
5/29/2012	Hail	0.88	0	0	$0	$0
7/3/2012	Hail	0.75	0	0	$0	$0
7/26/2012	Hail	1	0	0	$0	$0
7/26/2012	Hail	1	0	0	$0	$0

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LIGHTNING AND HAIL EVENTS IN MAHONING COUNTY 1979-2018						
Event Date	*Event Type*	*Magnitude*	*Deaths*	*Injuries*	*Damage to Property*	*Damage to Crops*
7/26/2012	Hail	1	0	0	$0	$0
7/27/2012	Hail	0.75	0	0	$0	$0
9/7/2012	Hail	1	0	0	$0	$0
5/14/2014	Hail	0.88	0	0	$0	$0
5/14/2014	Hail	0.75	0	0	$0	$0
5/14/2014	Hail	0.88	0	0	$0	$0
5/14/2014	Hail	1	0	0	$0	$0
6/11/2015	Hail	1	0	0	$0	$0
6/11/2015	Hail	1	0	0	$0	$0
6/11/2015	Hail	1	0	0	$0	$0
6/11/2015	Hail	1	0	0	$0	$0
6/14/2015	Hail	0.88	0	0	$0	$0
3/30/2017	Hail	1	0	0	$0	$0
8/19/2017	Hail	1	0	0	$0	$0
Totals			2	3	$5,355,500	$100,000

Source: NCEI

- **June 12, 1996**: Four men were injured when struck by lightning at the Diamond Back Golf Course. One of them died 17 days later, on June 29th.
- **June 8, 2007**: A strong cold front moved through the area during the afternoon and early evening hours of the 8th. Numerous severe thunderstorms developed ahead and along this cold front. Severe weather occurred throughout most counties in the area stretching from Lucas County to Mahoning County. Hail ranging from walnut size to nickel size was observed. Some vehicles sustained damage from the hail. Damage to property reached $250,000 from hail. Severe thunderstorms moved across northern Ohio on June 8th. Lightning from one of the thunderstorms killed a 66 year old man in Mahoning County.
- **July 21, 2009**: A cluster of thunderstorms developed during the afternoon hours of July 21st. A few of the stronger storms became severe. Hail the size of half dollars was observed.

LOCATION AND EXTENT

Severe weather is a hazard that can affect all areas and jurisdictions of the county. Mahoning, as well as surrounding counties and states, is at similar risk of exposure to these types of severe summer weather events. Severe summer weather events have the potential

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of lasting seconds (i.e., lightning), a few minutes (i.e., tornadoes), several hours (i.e., thunderstorms, hailstorms, etc.), or even days (i.e., high winds).

LOSS AND DAMAGES

According to data from NCEI, there have been over $5M in damages to property and $100K in damages to crops since 1979; this averages out to around $139K annually over the past 39 years.

PREVIOUS AND ONGOING MITIGATION EFFORTS

Organizations around the county recognize the risk of extreme weather and have implemented various projects throughout their service area. One example is Eastgate's green infrastructure project in the Mill Creek Metropark. Here they have implemented "some safeguards for handling stormwater runoff". Eastgate has taken advantage of their presence on social media to educate the public about these types of projects.

Other ways the county has become better prepared for severe storm events is by partnering with the National Weather Service and the local media. The county EMA has also coordinated with I Heart Radio in Boardman to issue local Emergency Alert System notifications.

RISK ASSESSMENT

LIGHTNING AND HAIL RISK CALCULATION					
Probability			*Severity*		*Risk*
FREQUENT			CRITICAL		HIGH
Events 109	= 2.79	+	Although there have been deaths and injuries as a result of lightning in the past, generally, the damages are critical at most.	=	The risk assessment matrix categorizes the risk of lightning and hail to be the highest.
Years 39					
According to data from NCEI, there are approximately between two and three events each year involving large sized hail and lightning.					

MAP AND ASSETS

The map on the following page shows a high risk to the entire county; this is because weather patterns are often similar across the entire region. Therefore, all assets could be equally at risk, but impacted in different ways depending on the location of the severe thunderstorm and hail. For a full list of assets, refer to Section 1.2.10 Asset Inventory.

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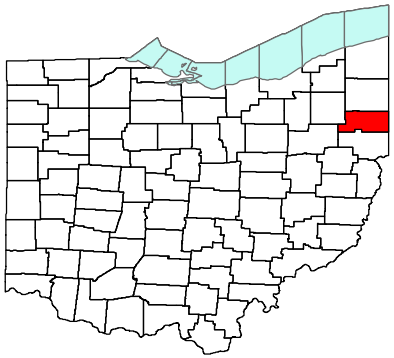
MAHONING COUNTY HAZARD MITIGATION PLAN

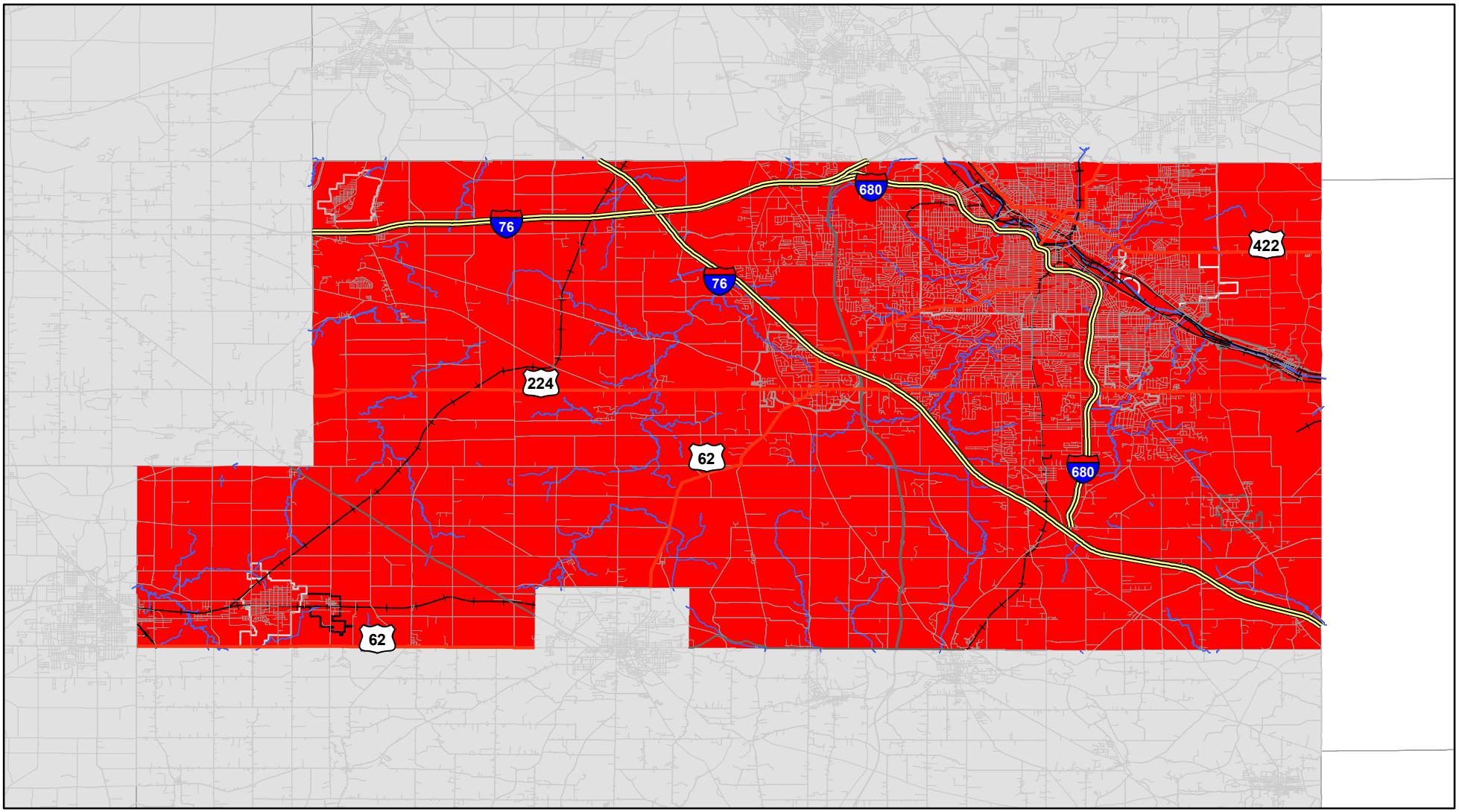
Severe Thunderstorm & Hail Risk Map

Data Source(s):
NOAA NCEI

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

High Risk





2.4.9 Severe Wind and Tornado

HAZARD OVERVIEW

Wind resulting from severe thunderstorms in excess of 58 mph and tornadoes are included in this profile.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time, typically during severe summer weather events.	Overall Hazard Ranking:	**3**
	Warning Time:	Hours to minutes	State Risk Ranking:	Frequency: Highly likely Impact: Critical Ranking: 4 - High
	Probability:	Occasional	Severity:	Critical
	Type of Hazard:	Natural	Disaster Declarations:	DR-870 DR-951 DR-1478 DR-1484 DR-1519 DR-1556

This profile discusses two types of wind that stem from severe thunderstorms (see Section 2.4.8 Severe Thunderstorm and Hail for background information), severe wind and tornadoes.

- **Severe Wind:** Non-tornadic, damaging winds from thunderstorms include four common types (NWS & FEMA, 2001).
  - **Straight-Line Winds or Derechos**: Winds having little or no curvature or rotation, capable of affecting a larger geographic area than a tornado.
  - **Downbursts**: Localized downward gusts of air from a thunderstorm. These winds can be very damaging on and near the ground and tend to cover areas of just a few miles.
  - **Microbursts**: Minimized downbursts affecting areas less than 2.5 miles in diameter. Microbursts induce a strong wind shear and can produce winds over 150 mph.
  - **Gust Fronts**: Cool, gusty air that flows out of the base of a thunderstorm and spreads along the ground ahead of the thunderstorm cell.

One of the first scales to estimate wind speeds and the effects was created by Britain's Admiral Sir Francis Beaufort (1774-1857). He developed the scale in 1805 to help sailors estimate the winds via visual observations. The scale starts with 0 and

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goes to a force of 12. The Beaufort scale is still used today to estimate wind strengths (NOAA, n.d.).

BEAUFORT WIND SCALE					
Force	*Wind Speed*			*Appearance of Wind Effects*	
	(mph)	*(knots)*	*Description*	*On the Water*	*On Land*
0	0-1	0-1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-7	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	13-18	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	19-24	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	25-31	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	32-38	38-33	Near Gale	Sea heaps up, waves 13-19 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	39-46	34-40	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	47-54	41-47	Strong Gale	High waves (23-32 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	55-63	48-55	Storm	Very high waves (29-41 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	64-72	56-63	Violent Storm	Exceptionally high (37-52 ft) waves, foam patches cover sea, visibility more reduced	
12	72-83	64-71	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

- **Tornado**: A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Normally thunderstorms and associated tornadoes develop in warm, moist air in advance of strong eastward-moving cold fronts in late winter and early spring. Tornadoes can also occur along a “dryline” which separates very warm, moist air to the east from hot, dry air to the west. Both of these scenarios are common in the Central Plains. Another way that tornadoes can be created occurs when warm moist air flows upslope. Under the right temperature and moisture conditions, intense thunderstorms can produce tornadoes in higher terrain. Tornadoes can occur in every state, although the mid-west states have by far the greatest potential for this type of event. Tornadoes are ranked by intensity using the

Enhanced Fujita (EF) Scale, replacing the original Fujita Scale devised by Dr. Theodore Fujita at the University of Chicago in 1971. This scale is an update to the original scale and is listed in Table 31. The EF scale is broken into six categories from F-0 to F-5. F-0 relates to a tornado having a wind speed up to 72 miles per hour, while an F-5 tornado would have winds up to 318 mph.

ENHANCED FUJITA SCALE		
#	*3-Second Gust (mph)*	*Examples of Possible Damage*
0	45-78	Light Damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to signboards.
1	79-117	Moderate Damage. Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	118-161	Considerable Damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
3	162-209	Severe Damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
4	210-261	Devastating Damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	262-317	Incredible Damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked; incredible phenomena will occur.

FEMA's wind zone map of the United States classifies the territory into wind zones. As seen in the graphic to the right, the whole state of Ohio, and consequently Mahoning County, are in Zone IV, which means that buildings should be designed for 3-second gusts of up to 250 mph.

POSSIBLE CAUSES

The causes of thunderstorm strength winds and tornadoes are thunderstorms. Wind is caused by differences in atmospheric pressure; when there is a difference in pressure, air moves higher resulting in wind. See Section 2.4.8 Severe Thunderstorms and Hail for more information.

IMPACTS AND VULNERABILITY

While tornadoes are relatively short-lived in duration, they are intensely focused, making them one of the most destructive forces in nature. As previously discussed above, Mahoning County is located in the "Zone IV" wind zone. This wind zone places Mahoning County in a category that could experience severe tornadoes. Such winds would cause significant damage to structures, such as roofs torn off frame houses, mobile homes demolished, and boxcars pushed over.

Mahoning County has endured an F3 tornado in the past. An F3 tornado is considered a significant tornado with wind speeds well in excess of 150 mph, and these types of tornados leave behind significant destruction. Damages from F3 tornados can include the roofs of well-constructed houses blown off; trains overturned; trees uprooted; heavy cars lifted off the ground and thrown; structures with weak foundations can be badly damaged. Localized geographic conditions can exacerbate the damages from high winds and cause increases in wind intensity.

Severe wind events can cause a variety of secondary, or cascading, hazard events. For instance, the wind may blow limbs from trees down knocking out electric power or blocking roadways. Wind often results in damages to roofs and other home finishings (such as siding, etc.). Damage and loss of life could be severe and overwhelm the ability of local responders to address the emergency.

HISTORICAL OCCURRENCES

The following table outlines the tornado events in Mahoning County between 1955 and 2018. When data is available, particularly costly or deadly events are described in more detail below; described events are marked with an asterisk (*) on the tables.

TORNADO EVENTS IN MAHONING COUNTY 1955 - 2018						
Event Date	*Scale*	*Deaths*	*Injuries*	*Damage to Property*	*Tornado Length (mi)*	*Tornado Width (ft)*
3/1/1955	F3	1	6	$250,000	2.5	40
3/22/1955	F1	0	3	$0	5.1	400
8/5/1956	F3	2	0	$250,000	0	33
4/19/1963	F2	0	0	$250,000	15.3	33
2/16/1976	F2	0	0	$250,000	1.5	600
6/22/1981	F1	0	6	$2,500,000	2	200
6/27/1987	F2	0	0	$250,000	1.5	40
7/22/1990	F0	0	0	$25,000	0.5	50
7/22/1990	F0	0	0	$25,000	1	50

TORNADO EVENTS IN MAHONING COUNTY 1955 - 2018						
Event Date	*Scale*	*Deaths*	*Injuries*	*Damage to Property*	*Tornado Length (mi)*	*Tornado Width (ft)*
7/23/1991	F0	0	0	$0	0.5	30
7/23/1991	F0	0	0	$25,000	2	50
4/15/1993	F1	0	0	$0	7	30
7/15/1995	F0	0	0	$20,000	0.1	15
7/9/1999	F1	0	0	$150,000	4	40
4/9/2001	F2	0	0	$200,000	4	75
7/21/2003*	F1	0	0	$1,000,000	8	75
7/8/2014	EF0	0	0	$225,000	5.39	200
Totals/Average		3	15	$5,420,000	3.8	122.6

Sources: NCEI & The Tornado History Project

NCEI reports 208 high wind events in the database since 1966; however, not all of these events meet the criteria for severe thunderstorm winds of a minimum of 58 miles per hour. Events with 58mph winds or above are included in the table to the right. Many of the reports do not include the magnitude of the wind event and have been excluded from this list.

WIND EVENTS IN MAHONING COUNTY 1980-2018		
Event Date	*Magnitude (mph)*	*Damage to Property*
7/17/1980	65	$0
7/21/1983	74	$0
7/16/1996	60	$100,000
7/22/1998	61	$0
4/9/2001	85	$40,000
9/16/2010	61	$25,000
4/30/2017*	61	$500,000
5/1/2017	61	$10,000
5/1/2017	70	$150,000
11/5/2017*	83	$500,000
Total/Average	68.1	$1,325,000

Source: NCEI

- **July 21, 2003**: A tornado touched down just southwest of the Mahoning River between Gibson and Poland Avenues on the northeast side of Youngstown. The tornado then skipped northeast for approximately eight miles before dissipating on the eastern edge of the city just south of the Trumbull County border. The damage path was 50 to 100 yards in width and was intermittent in nature. Ten businesses and around 80 homes were damaged by the tornado. One business was destroyed, and of the 80 homes, 60 had major damage. Two railroad cars were overturned and hundreds of trees were toppled along the damage path.
- **April 30, 2017**: A warm front lifted north across the Upper Ohio Valley causing a line of showers and thunderstorms to develop. A couple of the stronger storms became severe. A downburst hit portions of Mahoning County causing extensive damage in Boardman.
- **November 5, 2017**: A thunderstorm downburst with winds estimated to be as much as 95 mph caused extensive damage in Boardman. A mile long damage path began

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in the Hitchcock Woods area and stretched across a neighborhood bordered by Glenwood Avenue to the west and Market Street to the east. Around 20 homes were damaged in that neighborhood with the damage most concentrated along Shorehaven Drive. Most of the damage was caused by fallen trees landing on homes. At least one home had a tree penetrate the roof. Other homes had missing siding or roofing material. The damage path continued across Market Street where several businesses were damaged. An automobile dealership sustained the worst damage. It lost most of its roof and had some cinder block walls collapse. Many trees were knocked down in the area and widespread power outages were reported.

LOCATION AND EXTENT

In general, all areas in the county are equally at risk to severe wind and tornadoes even though tornadoes are localized events. Wind events typically span several counties and states at the same time, for varying durations.

LOSS AND DAMAGES

NCEI data provides some indication of damages properties have sustained due to high winds and tornadoes. The data suggests that since 1955 there have been over $10 million in damages to property for all events (including the events not listed in the tables above).

The State of Ohio Enhanced Hazard Mitigation Plan (2014) estimates potential damages for different types of buildings; these are outlined below.

- **Residential Losses**: 112,133 residential units with an average value of $97,300 each, including over 1,500 mobile homes. The total potential residential loss estimate is $9 million.
- **Commercial Losses**: 1,097 commercial units with an average value of $291,900 each. The total potential commercial loss estimate is $320 million.
- **Governmental Losses**: 44 governmental units with an average value of $389,200 each. The total potential commercial loss estimate is $17 million.

PREVIOUS AND ONGOING MITIGATION EFFORTS

Similarly to severe thunderstorms and hail, mitigation efforts for severe wind and tornadoes focus on partnerships between the county EMA and the National Weather Service and local media. Additionally, schools now required to have emergency plans per

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the Ohio Department of Education and Ohio EMA; since the requirements, all schools in the county have updated their response plans.

RISK ASSESSMENT

SEVERE WIND AND TORNADO RISK CALCULATION					
Probability			*Severity*		*Risk*
OCCASIONAL			CRITICAL		MEDIUM
Events 27 Years 63	= 0.42	+	The potential damages from tornadoes and high winds exceed what can be calculated through NCEI reports such as power outages and cleanup costs.	=	The risk assessment matrix categorizes this hazard as a medium risk to Mahoning County.
There have been 27 severe wind and tornado events since 1955.					

MAP AND ASSETS

The map on the following page shows the whole county at a medium risk of wind and tornado events. In addition, the historic tornadoes, touchdowns and those with paths are shown. Because the location of wind events and tornadoes is so unpredictable, all assets within the county are at equal risk and within the risk area. For a full list of assets, refer to Section 1.2.10 Asset Inventory.

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MAHONING COUNTY HAZARD MITIGATION PLAN

Severe Wind & Tornado Risk Map

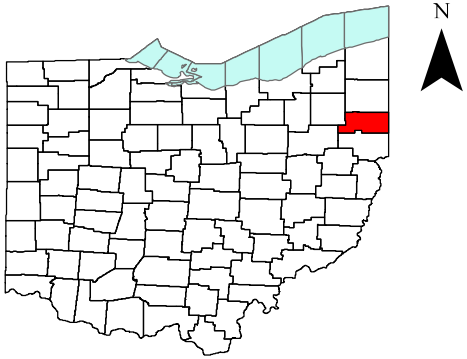
Data Source(s):
NOAA NCEI, Tornado History Project

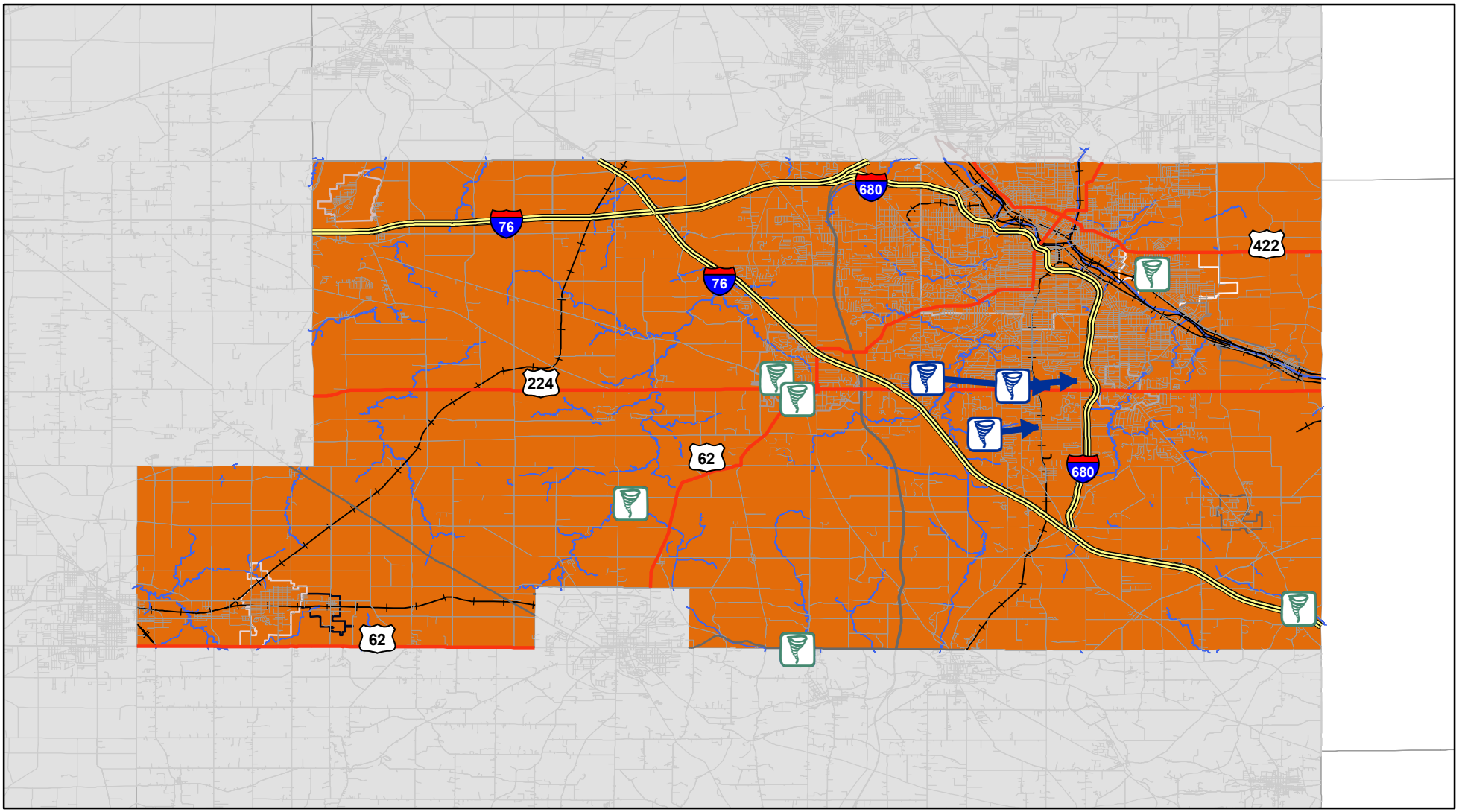
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Touchdowns (Only)

Tornado (w/ Path)

Medium Risk





2.4.10 Severe Winter Storm

HAZARD OVERVIEW

A combination of heavy snow, blowing snow and/or dangerous wind chills that could be threatening or life or property.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time, typically during winter months.	Overall Hazard Ranking:	**3**
	Warning Time:	Days	State Risk Ranking:	Frequency: Highly likely Impact: Critical Ranking: 4 - High
	Probability:	Frequent	Severity:	Negligible
	Type of Hazard:	Natural	Disaster Declarations:	None

In the winter months, weather patterns continue throughout the area; these can generate storms. However, three elements that must be present to generate a winter storm (NSSL, n.d.).

- **Cold Air**: Below freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- **Lift**: Something to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountainside.
- **Moisture**: To form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is an excellent source of moisture.

During the winter, there are many instances of cold weather, snow and storms. This profile considers only those winter storms that are damaging enough to be considered *severe*; these include blizzards and ice storms.

- **Blizzards**: Blizzards are severe winter storms that have low visibilities, also known as whiteouts, for an extended period of time due to high winds blowing falling snow or snow on the ground (ground blizzards) (Keller, DeVecchio, 2015). Ground blizzards are preceded by unseasonably warm air, which can cause people to let their guard down. People may venture outside without proper winter clothing. This

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relatively warm weather does not last long. The ground blizzard occurs when an Arctic cold front moves through the region, causing temperatures to drop and winds to increase, often reaching gusts of 50 to 60 mph. If there are several inches of deep fresh snow on the ground, this strong wind will quickly pick up the snow and create whiteout conditions (NWS, n.d.). In the U.S. storms that produce blizzards typically come from the North Pacific and come onto land along the west coast. The different routes these storms can take are called storm tracks; storm tracks are named for geographic origin or the direction of the prevailing winds (e.g., Alberta Clipper, and Nor'easter). Sustained wind or frequent gusts to 35 mpg or greater and considerable falling and/or blowing snow reducing visibility to less than ¼ mile are the conditions for defining a blizzard (NWS & FEMA, 2001).

- **Alberta Clippers**: Alberta Clippers are winter "storms that often form over the providence of Alberta, Canada, east of the Rocky Mountains" (Rice, 2015). Typically, this type of storm moves quickly to the southeast across the northern Plains and finally to the Atlantic Coast. These storms usually are drier and have less snow but extremely cold temperatures.
- **Nor'easter:** A Nor'easter is a storm along the East Coast of the U.S., so called because the winds over the coastal area are generally progressing northeastward and typically attain maximum intensity near New England and the Maritime Provinces of Canada. These storms may occur at any time of year but are most frequent and most violent between September and April. They nearly always bring precipitation in the form of heavy rain or snow, as well as winds of gale force, rough seas, and, occasionally, coastal flooding to the affected regions. The warm waters of the Gulf Stream help keep the coastal waters relatively mild during the winter, which in turn helps warm the cold winter air over the water. This difference in temperature between the warm air over the water and cold Arctic air over the land is the fuel that feeds Nor'easters (NWS, n.d.).

- **Ice Storms**: Ice storms are prolonged periods of freezing rain where ice can accumulate on cold surfaces (Keller, DeVecchio, 2015).

The Weather Channel (TWC) has named some severe winter storms, similar to the naming of hurricanes, since 2012. However, the National Weather Service (NWS) does not officially name winter storms and issued a statement requesting their offices and other news

channels to refrain from naming storms (Panovich, 2012). The naming of hurricanes makes sense because they are well-defined storms which follow a path that can be tracked and predicted. Hurricanes affect a specific area of impact in all four quadrants, located around the eye. By contrast, winter storms are often erratic, affecting different areas unevenly; they often develop, dissipate, and reform with two to three centers, often delivering snow in only one quadrant, while places not too far away from a blizzard may experience rain or fog, or nothing at all. As a result, the public will not know what action to take when there is a "named" storm or may take the wrong action (AccuWeather, 2012).

While the Fujita and Saffir-Simpson Scales characterize tornadoes and hurricanes respectively, there is no widely used scale to classify snowstorms. Paul Kocin and Louis Uccellini of the National Weather Service developed the Northeast Snowfall Impact Scale (NESIS) that characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10-inch snowfall accumulations and greater. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS indicates a storm's societal impacts. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

NORTHEAST SNOWFALL IMPACT SCALE (NESIS)		
Category	*NESIS Value*	*Description*
1	1-2.499	Notable
2	2.5-3.99	Significant
3	4-5.99	Major
4	6-9.99	Crippling
5	10.0+	Extreme

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories (NOAA, n.d.).

POSSIBLE CAUSES

Severe winter weather varies due to different aspects.

- **Cold Air:** Below-freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice (NSSL, 2018).
- **Lift:** The process of moist air being raised into the atmosphere and causing precipitation. This process of lifting happens by warm and cold air colliding, causing a front, or when the air is lifted by flowing up a mountainside (NSSL, 2018).

- **Moisture:** Air traveling across bodies of water, such as lakes and oceans (NSSL, 2018). This cause associates with lake effect. Warm lake temperatures produce more moisture in the air. This moisture mixed with cold atmospheric temperatures causes more potential for snow (Climaterealityproject.org, 2018).
- **Extratropical Cyclone:** A low-pressure area where rising warm air collects and mixes with cold air masses and strong winds (Weatherquestions.com, 2018).

IMPACTS AND VULNERABILITY

According to the NSSL (n.d.), most deaths from winter storms are not directly related to the storm itself; people die in traffic accidents on icy roads, of heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold. During severe winter storms, everyone is potentially at risk; the actual threat depends on specific situations. Recent observations show that of injuries related to ice and snow, about 70% occur in automobiles, about 25% are people caught out in the storm, and the majority of victims are males over 40 years old. Of injuries related to exposure to cold, 50% are people over 60 years old, over 75% are males, and about 20% occur in the home.

Another reason these blizzards are dangerous is the cold temperatures that follow behind the Arctic front. Anyone stranded in their vehicle or forced to walk outside is at risk of frostbite or hypothermia (NWS, n.d.).

Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. Ice can disrupt communications and power for days while utility companies repair extensive damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NWS, n.d.).

HISTORICAL OCCURRENCES

From data currently available, there is little if any way to determine the NESIS category of a storm; for this reason, all heavy snow and winter storms are included that NCEI includes in its database. These are also all included because they all have damages associated with them. The table below outlines heavy snow and winter storm events in Mahoning County since 1996. Those that are the costliest events are denoted with an asterisk (*) and described below in more detail.

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- **December 22, 2004**: A potent winter storm affected northern Ohio on December 22nd and 23rd. Low pressure developed over eastern Texas early on the 22nd and then moved quickly northeast. The low eventually tracked across eastern Ohio during the morning hours of the 23rd after dumping nearly two feet of snow on portions of Ohio. The snow began in northeastern Ohio late on the morning of the 22nd and then intensified during the afternoon. Visibilities during the evening hours were near zero at times. After midnight, warmer air moved into the area and caused the snow to first mix with, and then change completely to freezing rain. Temperatures briefly climbed above freezing around daybreak on the 23rd causing the freezing rain to change to rain. Colder air working in behind the low changed the rain back to light snow later in the morning. Periods of snow then persisted through the middle portion of the afternoon. Snowfall accumulations ranged from 12 to 16 inches over Lake, Geauga and northern Ashtabula Counties, and 4 to 6 inches in southern Mahoning County. In addition, most of the area saw at least a quarter inch of ice accumulation with as much as one half inch of ice over most of Mahoning and southern Trumbull Counties. Scattered power outages resulted from the ice accumulation. Travel during this event was very treacherous with hundreds of accidents reported. It took several days for road and power company crews to completely clean up after this event. Damage and cleanup costs for this storm were in the millions.

WINTER EVENTS IN MAHONING COUNTY 1996-2018		
Event Date	*Event Type*	*Property Damage*
1/2/1996	Heavy Snow	$300,000
1/7/1996	Heavy Snow	$200,000
1/2/1999	Winter Storm	$15,000
1/8/1999	Winter Storm	$2,000
1/13/1999	Winter Storm	$2,000
1/14/1999	Heavy Snow	$25,000
12/13/2000	Winter Storm	$75,000
3/24/2002	Winter Storm	$75,000
12/24/2002	Heavy Snow	$150,000
2/16/2003	Heavy Snow	$750,000
12/5/2003	Winter Storm	$300,000
2/5/2004	Winter Storm	$150,000
3/16/2004	Heavy Snow	$300,000
12/22/2004*	Winter Storm	$2,200,000
4/2/2005	Winter Storm	$250,000
2/13/2007	Winter Storm	$40,000
2/12/2008	Winter Storm	$75,000
3/4/2008	Winter Storm	$600,000
3/7/2008*	Winter Storm	$1,200,000
12/19/2008	Winter Storm	$40,000
1/9/2009	Winter Storm	$200,000
1/27/2009	Winter Storm	$400,000
2/5/2010*	Winter Storm	$750,000
2/1/2011	Winter Storm	$300,000
2/21/2011	Winter Storm	$200,000
12/26/2012	Winter Storm	$75,000
11/26/2013	Winter Storm	$250,000
2/4/2014	Winter Storm	$125,000
2/15/2016	Heavy Snow	$500,000
1/12/2018	Winter Storm	$200,000
3/21/2018	Heavy Snow	$100,000
Total		$9,849,000

Source: NCEI

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- **March 7, 2008**: Snow began during the morning hours of the 7th and continued through the day. Snow was light to moderate during the afternoon with visibilities around a half mile. The snow tapered off a bit to flurries during the evening hours. By late evening, snow mixed with sleet and freezing rain. Only trace amounts of ice were reported across the area that evening. Precipitation changed back to primarily snow during the overnight hours, but a mixture of sleet and freezing rain was noted across the area at times through the morning hours. By afternoon, precipitation changed to all snow across the area and then tapered to flurries during the late evening hours. Winds across the area gusted to around 30 mph at times on both the 7th and 8th. Numerous accidents were reported during this storm. Snowfall totals for this event ranged from 8.0 to 12.0 inches across the area with 8.1 inches reported in Austintown. The sleet and freezing rain mixing in with the snow reduced snowfall amounts across the area for this event as compared with locations just to the west.
- **February 2, 2010**: Snow spread into Mahoning County from the south during the early afternoon hours of February 5th and then increased in intensity during the middle part of the afternoon. Moderate to heavy snow then continued through daybreak on the 6th with the snow eventually ending during the morning hours. Snowfall rates during much of this event exceeded an inch per hour. Northeast winds gusted to as much as 30 mph from the evening of the 5th through the early morning hours of the 6th. The snow and strong winds combined to create near blizzard conditions with visibilities less than one quarter mile at times. Snowfall totals during this event ranged from 12 to 16 inches across most of Mahoning County. A member of the broadcast media reported a storm total of 17.0 inches in Boardman and a snow spotter in Austintown also measured 17.0 inches. A cooperative observer at Berlin Lake measured a storm total of 14.0 inches. Drifts two to four feet deep were reported at some locations and travel was nearly impossible at the peak of this event. Many accidents were reported.

LOCATION AND EXTENT

Generally, severe winter weather will affect all counties across the region very similarly. Winter weather can encompass several jurisdictions, counties, and states at the same time for varying durations and severity.

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LOSS AND DAMAGES

NCEI indicates that there has been close to $10 million in damages to property due to winter storms between 1996 and 2018; this averages out to $447 thousand each year. However, the State of Ohio Enhanced Hazard Mitigation Plan (2014) indicates that the 10-year winter storm losses in Mahoning County amount to over $22 million. It is difficult to calculate accurate losses due to the various implications of cost – cleanup, home repair,

loss of wages, etc.

PREVIOUS AND ONGOING MITIGATION EFFORTS

There is little the county can do to mitigate the risk of severe winter storms. However, being prepared for these events will reduce the negative effects from the hazard. For example, the Street Department and the County Engineer partner and coordinate with each other when they need assistance. During storms, the American Red Cross opens warming centers in significant events with prolonged power outages. Additionally, the Mahoning County EMA keeps the public informed by sharing NWS alerts via their social media pages.

RISK ASSESSMENT

SEVERE WINTER WEATHER RISK CALCULATION					
Probability			*Severity*		*Risk*
FREQUENT			NEGLIGIBLE		MEDIUM
Events 31	= 1.5	+	Damages and cascading effects have become more a nuisance than a danger due to the typical winter climate in the county.	=	The risk assessment matrix categorizes this hazard as medium.
Years 22					
There are between one and two severe winter events each year in Mahoning County					

MAP AND ASSETS

The map on the following page identifies the whole county as being at medium risk of severe winter storms. Due to the non-localized nature of winter events, all the assets would be at risk. For a full list of assets, refer to Section 1.2.10 Asset Inventory.

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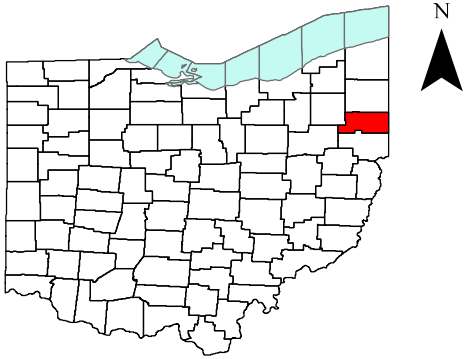
MAHONING COUNTY HAZARD MITIGATION PLAN

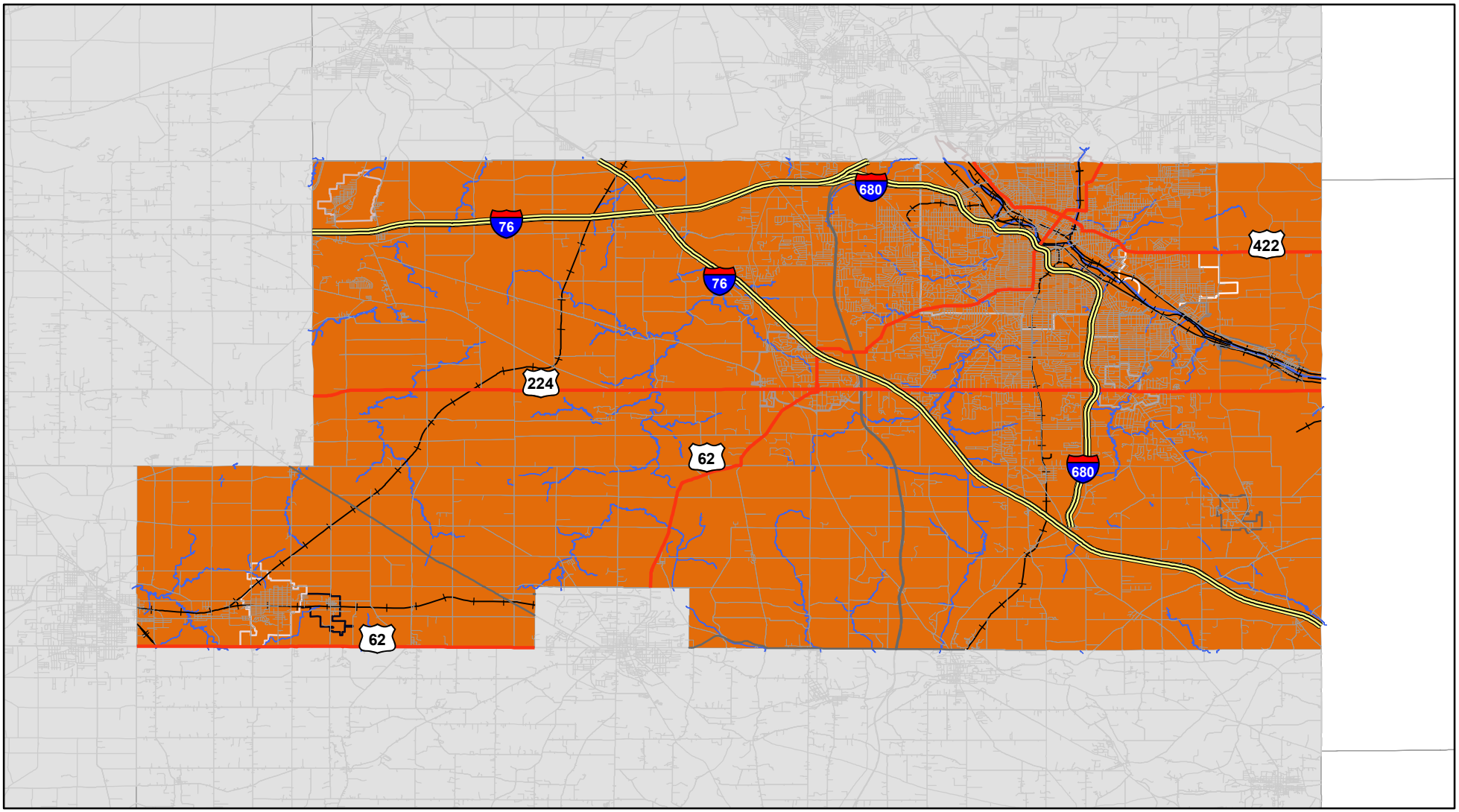
Severe Winter Storm Risk Map

Data Source(s):
NOAA NCEI

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Medium Risk





2.4.11 Violent Disturbances

HAZARD OVERVIEW

Violent disturbances include active shooters, terrorism, and riots.				
Risk HIGHEST HIGH MEDIUM LOW LOWEST	Period of Occurrence:	At any time	Overall Hazard Ranking:	**4**
	Warning Time:	Days to no warning time	State Risk Ranking:	Not ranked
	Probability:	Improbable	Severity:	Catastrophic
	Type of Hazard:	Human-caused	Disaster Declarations:	None

For the purpose of this plan, violent disturbances will include the following types of incidents or events that could occur within Mahoning County.

- **Active Assailant/Shooter**: An active shooter is an individual actively engaged in killing or attempting to kill people in a confined and populated area; in most cases, active shooters use firearms and there is no pattern or method to their selection of victims (USDHS, 2008).
- **Domestic/International Terrorism**: Terrorism is a form of violence aimed at a public audience. The Federal Bureau of Investigation (FBI) defines terrorism as "the unlawful use of force or violence against persons or property to intimidate or coerce a government, civilian population, or any segment thereof in furtherance of political or social objections." More importantly, it is necessary to understand that the objective of terrorism is not destruction or death; it is the psychological impact on the targeted population and world opinion. Disruption to public services, economies, and social patterns, or a feeling of insecurity is the desired goal.
- **Riots**: A riot is a violent disturbance of the peace by a crowd.

POSSIBLE CAUSES

There is no single cause of acts of violence; it is typically a non-rational, complicated, intertwined, series of reasons that have the outcome of violence. In his article *Causes of Terrorism*, Nick Grothaus lays out the most common causes cited by leaders in the field of

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counterterrorism. These categories may apply to other types of violence not related to terrorism.

- **Ethno-Nationalism:** The desire of a population to break away from a government or ruling power and create a state of their own.
- **Alienation/Discrimination:** Individuals or groups face discrimination leading to further feelings of isolation. These people may become jaded towards society and feel excluded.
- **Religion:** Religion as a part of terrorism has been mainly attributed to Islamic fundamentalism although other religions have also had involvement in terrorist activities. For example, Christian Fundamentalists target abortion clinics, the Aryan Nation and the Church of Christ, Christians target the Jews and minorities (Post, 2007, pp. 211-212).
- **Socio-Economic Status:** Individuals and groups may be driven by a sense of relative deprivation and lack of upward mobility within society.
- **Political Grievances:** A lack of political inclusiveness or grievances against a certain political order may cause individuals to join or create terrorist groups.

IMPACTS AND VULNERABILITY

Some individuals may experience severe stress symptoms following a violent incident. Individuals experiencing the following are at a higher risk for posttraumatic stress disorder:

- **Intrusive Re-Experiencing:** Terrifying memories, nightmares, and flashbacks.
- **Extreme Emotional Numbing:** Inability to feel emotions, feeling empty.
- **Extreme Attempts to Avoid Disturbing Memories:** Such as through substance abuse.
- **Hyperarousal:** Panic attacks, rage, extreme irritability, intense agitation, acting out with violence.
- **Severe Anxiety:** Debilitating worry, extreme helplessness, compulsions or obsessions.
- **Severe Depression:** Loss of ability to feel hope, pleasure, or interest; feeling worthless, suicidal ideations or intent.
- **Dissociation:** Fragmented thoughts, spaced out, unaware of surroundings, amnesia (Nation Center for PTSD, 2010).

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Treatment and support are critical to recovery. For most, the memories will not go away, but survivors can learn to manage responses to their memories. There are several methods for that can be used to help survivors cope including, psychotherapy, medication, support groups and self-care (Riggs, 2017).

HISTORICAL OCCURRENCES

In Ohio, there have been 10 active shooter incidents from 2000 to 2017, as outlined in an FBI report; although none have occurred in Mahoning County itself, the possibility exists due to the nature of the businesses and institutions, primarily located in Youngstown.

ACTIVE SHOOTER INCIDENTS IN OHIO 2000-2017						
City/Town	*Date*	*Event*	*Type*	*Killed*	*Wounded*	*Description*
Cleveland	5/9/2003	Case Western Reserve University, Weatherhead School of Management	Education	1	2	On May 9, 2003, at 3:55 p.m., a male, 62, armed with a rifle and a handgun, began shooting in the Weatherhead School of Management building at Case Western Reserve University in Cleveland, Ohio. One person was killed; two were wounded. The shooter was wounded during an exchange of gunfire with police.
Andover	8/19/2003	Andover Industries	Commerce	1	2	On August 19, 2003, at 8:20 a.m., a male, 32, armed with four handguns, began shooting in the Andover Industries facility in Andover, Ohio, after his boss threatened to fire him. One person was killed; two were wounded. The shooter committed suicide before police arrived.
West Chester	11/6/2003	Watkins Motor Lines	Commerce	2	3	On November 6, 2003, at 9:57 a.m., a male, 50, armed with two handguns, began shooting in the offices of Watkins Motor Lines in West Chester, Ohio. He had been employed by the Atlanta,Georgia, office of Watkins Motor Lines until he resigned in 2001. Two people were killed; three were wounded. The shooter was apprehended by police in Indiana later that day.
Toledo	1/26/2005	DaimlerChrysler's Toledo North Assembly Plant	Commerce	1	2	On January 26, 2005, at 8:34 p.m., a male, 54, armed with a shotgun, returned from his lunch break and began shooting in DaimlerChrysler's Toledo North Assembly plant in Toledo, Ohio. He took a woman hostage before beginning to shoot at his co-workers. One person was killed; two were wounded. The shooter committed suicide before police arrived.
Perrysburg	8/8/2007	Liberty Transportation	Commerce	2	0	On August 8, 2007, at 3:15 p.m., a male, 43, armed with at least two handguns and two rifles, began shooting at his co-workers in the Liberty Transportation facility in Perrysburg, Ohio. He had just been fired. Two people were killed; no one was wounded. The shooter fled the scene and was apprehended by police two hours later.
Cleveland	10/10/2007	SuccessTech Academy	Education	0	4	On October 10, 2007, at 1:02 p.m., a male, 14, armed with two handguns, began shooting in SuccessTech Academy in Cleveland, Ohio. No one was killed; four were wounded. The shooter committed suicide before

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ACTIVE SHOOTER INCIDENTS IN OHIO 2000-2017						
City/Town	*Date*	*Event*	*Type*	*Killed*	*Wounded*	*Description*
						police arrived.
Columbus	3/9/2010	The Ohio State University, Maintenance Building	Education	1	1	On March 9, 2010, at 3:30 a.m., a male, armed with two handguns, began shooting in the maintenance building at The Ohio State University in Columbus, Ohio. He had just been fired for allegedly lying on his job application. One person was killed; one was wounded. The shooter committed suicide before police arrived.
Copley Township	8/7/2011	Copley Township Neighborhood, Ohio	Residence	7	1	On August 7, 2011, at 10:55 a.m., a male, 51, armed with two handguns, began shooting in a neighborhood in Copley Township, Ohio, where many of his girlfriend's family members were present. Seven people were killed; his girlfriend was wounded. The shooter was killed by police.
Chardon	2/27/2012	Chardon High School	Education	3	3	On February 27, 2012, at 7:30 a.m., a male, 17, armed with a handgun, began shooting in the cafeteria at Chardon High School in Chardon, Ohio. The shooter was chased out of the building by a school coach. Three people were killed; three were wounded. The shooter was apprehended by police near the school.
Middletown	2/29/2016	Madison Junior/Senior High School	Education	0	4	On February 29, 2016, at 11:30 a.m., a male, 14, armed with a handgun, allegedly began shooting in the cafeteria of Madison Junior/Senior High School in Middletown, Ohio. He shot two students before fleeing the building. No one was killed; four students were wounded (two from shrapnel). The shooter was apprehended near the school by law enforcement officers.

Source: FBI

There have been no acts of terrorism, domestic or international, within the borders of Mahoning County.

LOCATION AND EXTENT

Due to the high unpredictability of violent acts, any location could be a target of an attack. The extent of damages or impact from an attack is also unpredictable. However, there may be areas or types of locations that may be more prone to attacks. For example, based on the information for Ohio, five incidents of active shooters have been in educational facilities, four at commerce locations or places of business, and one at a residence. This indicates that shootings occur more often in educational institutions and places of business.

LOSS AND DAMAGES

As opposed to other types of hazards, violent disturbance aims to cause mainly injury and death. At times structures and infrastructure can also be damaged beyond repair. However, according to FEMA's benefit cost analysis tool, the value of a human life is $6.9

million. Calculating the amount of deaths in Ohio from active shooters alone (21), the amount of losses would be close to $144.9 million.

Calculation of the property damages would be the cost of repair or replacement of the building itself and its contents. Health costs for the injured would also need to be included in the losses.

PREVIOUS AND ONGOING MITIGATION EFFORTS

In Youngstown, there is a Community Initiative to Reduce Violence (CIRV) which is a partnership of law enforcement, social service agencies, and the community to reduce gun. Its mission is to create an effective delivery system to offer individuals a circle of support enabling them to choose a non-violent path in life. Their goals are the following (City of Youngstown, n.d.).

- Reduce gun violence perpetrated by violent gangs/groups.
- Deliver a focused deterrence message through robust law enforcement initiatives to target chronic violent offenders.
- Offer support services to those violent offenders willing to change.
- Offer violence prevention programming to youth in the community.
- Engage and solicit community participation in delivering violence-deterrence message.

RISK ASSESSMENT

VIOLENT DISTURBANCE RISK CALCULATION				
Probability		*Severity*		*Risk*
IMPROBABLE		CATASTROPHIC		LOW
There have been no cases of violent disturbance in Mahoning County to date.	+	If even one event were to occur, the damages would be catastrophic due to the high potential of injury and loss of lives.	=	The risk assessment calculates violent disturbance to be a low risk to the county.

MAP AND ASSETS

The map on the following page identifies potential hotspots around high profile facilities (e.g. schools, government buildings, churches, etc.). Violent disturbance is highly unpredictable; therefore, any asset could be at risk. For a full list of assets, refer to Section 1.2.10 Asset Inventory.

MAHONING COUNTY HAZARD MITIGATION PLAN

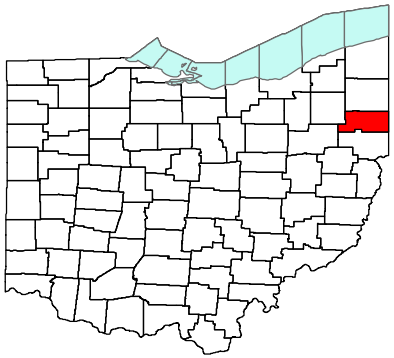
Violent Disturbance Risk Map

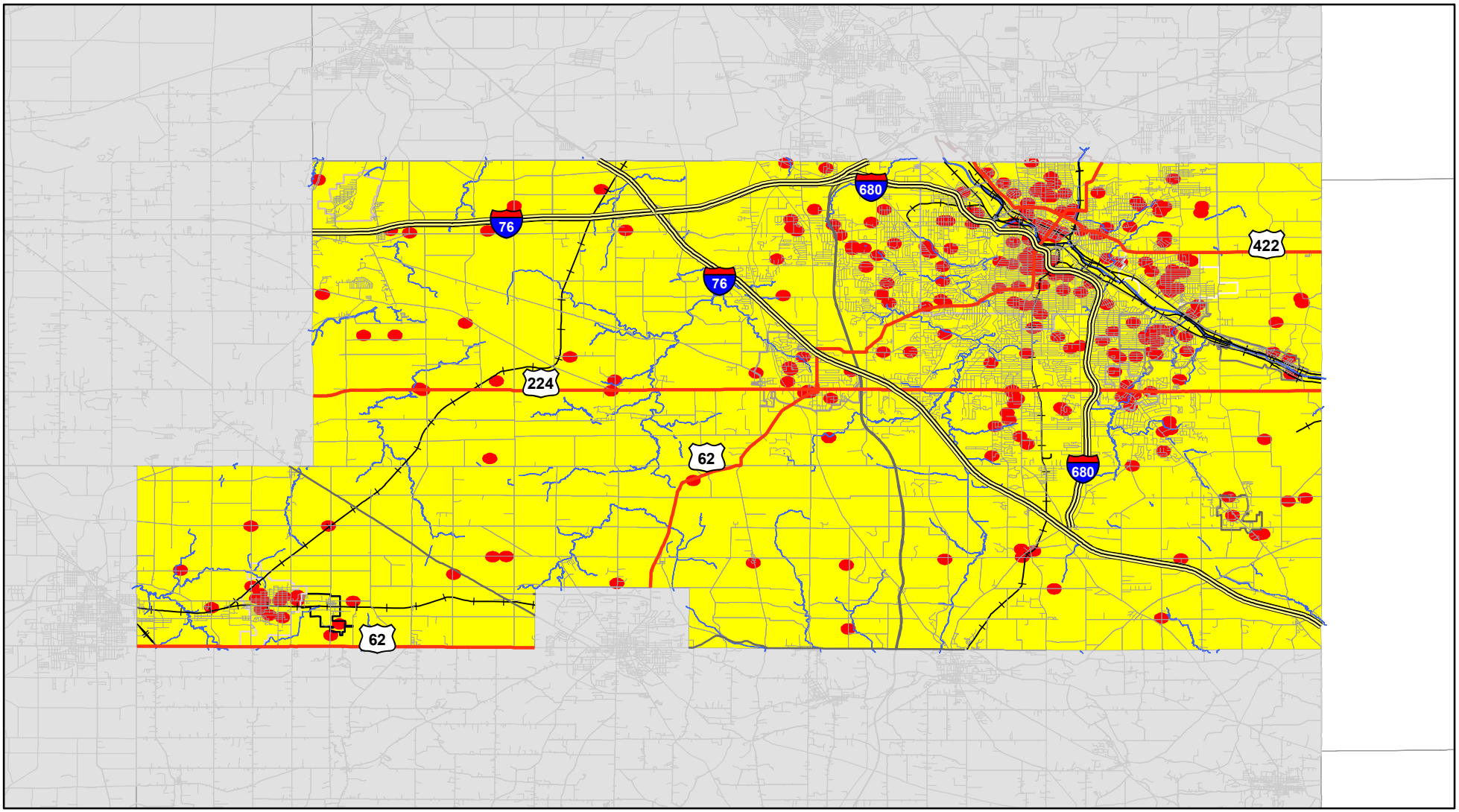
Data Source(s):
Planning Committee Input

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Improbable, Catastrophic Risk

Low Risk





3.0 MITIGATION STRATEGY

§ 201.6(c)(3)	A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.
§ 201.6(c)(3)	A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

According to FEMA (2013), "the mitigation strategy is made up of three main required components: mitigation goals, mitigation actions, and action plan for implementation. These provide the framework to identify, prioritize, and implement actions to reduce risk to hazards".

This section contains the aforementioned items; it describes the updated goals and objectives for this mitigation plan, it outlines the action items or projects for each jurisdiction within Mahoning County that is included in this plan, and each project identifies the agency responsible for completing the project as well as a general timeline for completion.

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3.1 MITIGATION GOALS

§ 201.6(c)(3)(i)	A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

"Mitigation goals are general guidelines that explain what the community wants to achieve with the plan. They are usually broad policy-type statements that are long-term, and they represent visions for reducing or avoiding losses from the identified hazards" (FEMA, 2013).

In 2011, the hazard mitigation plan contained 11 goals for Mahoning County and one goal for each jurisdiction (cities and villages), a total of 21 goals for the plan. The list included the City of Girard, currently removed from the list in this update because the city is not within the geographical boundaries for the county. This update also includes the City of Canfield, not included previously for unknown reasons.

The goals and objectives in the previous plan all referenced a hazard. The committee decided at the first meeting to establish new goals for the plan; the committee felt that the number of goals was excessive and decided to focus the goals on broad, all-hazard-encompassing descriptions of goals that applied to the entire geographical area rather than each jurisdiction. This would make the mitigation strategy more unified across all jurisdictions. For reference, the following table outlines the goals for the 2011 plan.

MAHONING COUNTY HAZARD MITIGATION PLAN GOALS OF 2011
Goal 1: Reduce the potential for significant damages as a result of dam failures in Mahoning County.
Goal 2: Protect Mahoning County's agricultural assets from the negative effects of drought.
Goal 3: Reduce the potential effects of earthquakes in Mahoning County.
Goal 4: Reduce the negative effects of flooding in Mahoning County.
Goal 5: Reduce or eliminate the negative effects of land/mine subsidence in Mahoning County.
Goal 6: Reduce damages from severe thunderstorms and hail in Mahoning County.
Goal 7: Reduce damage from severe wind and tornadoes in Mahoning County.
Goal 8: Reduce the effects of severe winter storms in Mahoning County.
Goal 9: Protect Mahoning County's population from heat waves.
Goal 10: Protect the general public in Mahoning County from biological, chemical, or Weapons of Mass Destruction (WMD) terrorist events.
Goal 11: Reduce or eliminate the negative effects of various other hazards in Mahoning County.
Goal 1A: Reduce the amount of potential damage from severe winter storms in the City of Campbell.
Goal 1B: Reduce the negative effects of severe wind events in the City of Girard.
Goal 1C: Reduce damage as a result of flooding throughout the City of Struthers.
Goal 1D: Reduce damage as a result of flooding throughout the City of Youngstown.
Goal 1E: Reduce the economic impact of drought in the Village of Beloit.

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MAHONING COUNTY HAZARD MITIGATION PLAN GOALS OF 2011
Goal 1F: Reduce the amount of potential damage from a dam failure near the Village of Craig Beach.
Goal 1G: Reduce the negative effects of flooding in the Village of Lowellville.
Goal 1H: Reduce the negative effects of drought on the agricultural assets of New Middletown.
Goal 1I: Reduce the negative effects of flooding in the Village of Poland.
Goal 1J: Reduce the potential for damage as a result of an earthquake in the Village of Sebring.

After reviewing the previous goals, the committee revised them to include all jurisdictions within the county and to not be hazard-specific due to the fact that one project can reduce the impacts or loss from several hazards at once.

The committee decided upon the goal and objectives after reviewing the risk assessment portion of the plan, attending public meetings, and discussing priorities. The committee determined that one overarching goal would be adequate for the plan but would utilize objectives to target more concrete paths toward achieving the goal.

Reduce the impacts from hazards in Mahoning County and its cities, villages, and townships through mitigation prior to disasters to become a more resilient county.

- Improve public information, warning, and notification throughout the county.
- Educate and train the public and officials on mitigation and preparedness measures for all hazards.
- Develop, review, and maintain county and jurisdictional plans, ordinances, and regulations that relate to hazard mitigation and risk reduction.
- Develop partnerships with agencies and organizations that can aide in mitigating, responding to, and recovering from disasters.
- Identify and eliminate physical hazards to areas along roads, infrastructure, and buildings to avoid repetitive damages from weather hazards.
- Protect the natural environment such as green spaces and rivers from harmful activities, weather, and substances.

3.1.1 Changes in Priorities

As evidenced by the change in the structure of the goals and objectives, the priorities in Mahoning County have changed over the years. The previous plan's goals suggest that the overall priority is to reduce the negative effects of specific hazards. Currently, the main priority is to utilize mitigation actions to become more resilient to all hazards overall. By rearranging the goals in this way, Mahoning County and all its jurisdictions have agreed to all work toward one common goal, rather than several goals, or single jurisdictional goals that do not work well together.

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3.2 MITIGATION ACTIONS

§ 201.6(c)(3)(ii)	A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.
§ 201.6(c)(3)(iii)	An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

"A mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan's mission and goals. The actions to reduce vulnerability to threats and hazards form the core of the plan and are a key outcome of the planning process" (FEMA, 2013).

There are four primary types of mitigation actions: local plans and regulations; structure and infrastructure projects; natural systems protection; and education and awareness programs. Projects that fall under these types of actions aim to reduce or even eliminate long-term risk from identified hazards; they lessen the need for preparedness, response, or recovery activities in the future. However, there are other projects that will inevitably fall under preparedness activities because mitigation activities are difficult, or impractical.

For this plan every city and village has at least two mitigation actions they will be responsible for implementing. The townships will fall under the county's jurisdiction and are therefore classified under Mahoning County; when projects are specific to a township, they will be identified as the primary agency responsible for the action or project.

3.2.1 Project Prioritization

The committee established a method to prioritize the projects for each jurisdiction. They decided to include a variety of factors or criteria that would determine the overall priority of each project. The criteria are described in the following table.

Each project is scored against this criterion on a scale of 1 to 5, 5 being the highest. For example, if a project is "easy to implement" it will receive a high score of 4 or 5. The scores for each project are added and the highest score will receive the highest priority. If two or more projects tie, they will have the same priority.

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For the project prioritization matrix for each project, refer to Appendix 4: Project Prioritization.

PROJECT PRIORITIZATION CRITERIA	
Criteria	*Defining Questions*
Ease of Implementation	Do local policies and capabilities currently allow for the implementation of the project? Are programs available to assist in funding the implementation of the project?
Cost Effectiveness	Is sufficient funding available to implement the project at a cost manageable by the local government? If not, is funding available? Will the costs of implementing the project be significantly less than the cumulative future costs potentially incurred by an un-corrected situation?
Social Impacts	Will the public perceive the project as positively lessening hazard-related losses? Will implementing the project adversely affect any segment of the population?
Political Impacts	Will implementing the project create negative political issues?
Economic Impacts	Is the cost/benefit ratio of implementing the project acceptable? Will implementing the project adversely affect the local economy?
Overall Positive Impact	Do local leaders generally agree that implementing the project will be beneficial to the community?

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MAHONING COUNTY MITIGATION PROJECTS										
Jurisdiction	*Hazard of concern*	*Project/Strategy*	*Priority*	*Status*	*Mitigation Type*	*Potential Funding Source*	*Cost Estimate*	*Timeline for Completion*	*Coordinating Agency*	*Support Agency(ies)*
Beloit	Flood	Consider rejoining the NFIP as the village currently does not participate.	1	New	Local Plans and Regulations	No additional funding necessary.	N/A	3 years	Village Floodplain Manager & Council	County Floodplain Manager
Beloit	Drought	Consider developing ordinances to prioritize or control water use, and encourage residents to take water-saving measures such as installing low flow shower heads and toilets during new construction. (Strategy 1E.1.1)	2	Ongoing from previous plan	Local Plans and Regulations	No additional funding necessary.	N/A	2 years	Village Council, water distribution systems	N/A
Campbell	Severe winds	Require new construction and retrofits to adhere to current building code standards to withstand severe winds.	1	New	Local Plans and Regulations	No additional funding necessary.	N/A	3 years	City Council	N/A
Campbell	Heavy snow	Purchase adequate snow removal equipment.	2	New	Structure and Infrastructure Projects	Local funding	Cost will depend on type and amount of equipment	3 years	City Street Department	City Council
Campbell	Flood	Replace problem-area sections of the stormwater system at Wilson Avenue.	3	New	Structure and Infrastructure Projects	CDBG	Cost will depend on scope of project	5 years	City Council	Mahoning County Engineer
Campbell	Severe winds	Identify and demolish old vacant homes that have been condemned to reduce the risk from severe winds.	4	New	Structure and Infrastructure Projects	Local funding	Cost will depend on amount of buildings	5 years	City Council	N/A
Canfield	Flood	Conduct a drainage study of Briarcliff and Bradford area to address persistent flooding issues	1	New	Structure and Infrastructure Projects	Planning Grant Water Resource Restoration Sponsor Program	Cost of a study will depend on contractor and scope	4 years	City Council	Mahoning County Engineer, Private Contractors
Craig Beach	Wind	Work with the power company to replace old wires and poles that cause problems during emergencies.	1	New	Structure and Infrastructure Projects	Partnerships would require no additional funding.	No additional funding necessary.	1 year, ongoing	Village Council	Utility Companies
Craig Beach	Dam failure	Continue to inspect and maintain the dam. Purchase rescue boat.	2	New	Structure and Infrastructure Projects	ODNR	No additional funding necessary for inspection. Funding for boat would depend on type.	1 year, ongoing	Ohio DNR	Village Council
Craig Beach	Dam Failure	Regulate future development in the hydrological shadow of Berlin Lake Dam and the Lake Milton Dam. (Strategy 1F.1.1)	3	Ongoing from previous plan	Local Plans and Regulations	Part of current budget for the village.	No additional funding necessary.	Immediately	Village, County Zoning Department	N/A
Lowellville	Heavy snow	Purchase adequate snow equipment and vehicles for first responders	1	New	Structure and Infrastructure Projects	Local funding	Cost depends on amount and type of equipment	5 years	Safety Department	Village Council
Lowellville	Flood	Employ techniques of erosion control within the watershed area (i.e., proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.). (Strategy 1G.1.1)	2	Ongoing from previous plan	Structure and Infrastructure Projects	Up to $65,000 to $150,000	PDM, HMGP	5 years	Floodplain coordinator, Village Council	N/A
Mahoning County	Earthquake	Perform an annual re-assessment of the vulnerability of county facilities to natural disasters based on past year experience to determine mitigation needs. (Strategy 3.2.1)	1	Ongoing from previous plan	Local Plans and Regulations	Local Funding, PDM	Unknown, contingent upon local media rates that are subject to frequent change. During emergencies, EPI may be distributed at a reduced rate.	Annually	EMA	N/A

MAHONING COUNTY MITIGATION PROJECTS										
Jurisdiction	*Hazard of concern*	*Project/Strategy*	*Priority*	*Status*	*Mitigation Type*	*Potential Funding Source*	*Cost Estimate*	*Timeline for Completion*	*Coordinating Agency*	*Support Agency(ies)*
Mahoning County	Flood	Educate local officials on sources of information that can be used to monitor flooding, storm and other weather information (IFLOWS, U.S.G.S. gage data, etc.). (Strategy 4.1.3)	2	Ongoing from previous plan	Education and Awareness Programs	Local funding	Up to $3,200	1 Year	EMA	N/A
Mahoning County	Severe wind and tornado	Reduce the risk of mobile home damage by suggesting the use of tie-downs with ground anchors appropriate for the soil type. (Strategy 7.2.2)	3	Ongoing from previous plan	Structure and Infrastructure Projects	Encouragement would require no significant additional funding.	Up to $75 per tie down kit	As needed	EMA	Municipal Zoning/Building Inspection Departments
Mahoning County	All hazards	Trim or remove trees on roads and power line right of ways	4	New	Structure and Infrastructure Projects, Natural Systems Protection	Utility Company	The utility company should trim trees as part of their activities	Ongoing	Goshen Twp	Mahoning County
Mahoning County	Dam Failure	Coordinate with the Ohio Department of Natural Resources, Division of Soil & Water – Dam Safety Section, in accordance with ORC Section 1512.062, to periodically reclassify any dam within Mahoning County as a result of a change in circumstances not in existence at the time of the dam's initial classification to ensure adequate safety according to the potential for downstream damage. (Strategy 1.1.1)	4	Ongoing from previous plan	Local Plans and Regulations	ODNR quite possibly has items such as this budgeted as this project would fall under the responsibilities of ODNR personnel.	ODNR	As needed	ODNR	Dam Owners
Mahoning County	Dam Failure	Coordinate with the ODNR, Dam Safety Engineering Program to conduct regular safety inspections of existing dams in Mahoning County. (Strategy 1.1.3)	6	Ongoing from previous plan	Local Plans and Regulations	ODNR	No funding should be required per ODNR's normal operating budget.	Annually	Affected jurisdiction	Dam owner, ODNR
Mahoning County	Flood	Integrate site specific disaster mitigation issues into storm water planning initiatives. (Strategy 4.3.1)	6	Ongoing from previous plan	Structure and Infrastructure Projects	CDBG, HMGP	Up to $60,000	1 year	County Floodplain Administrator	EMA
Mahoning County	Severe wind and tornado	Add additional tornado siren warning system capacity (need for 20 sirens). Update siren system to be used for warnings for all hazards. (Strategy 7.1.2)	6	Ongoing from previous plan	Structure and Infrastructure Projects	USDA Rural Development	Up to $25,000 per siren	5 years	EMA	N/A
Mahoning County	Flood	Participate in the Community Rating System (CRS) on a countywide basis to reduce flood insurance rates. (Strategy 4.3.2)	9	Ongoing from previous plan	Local Plans and Regulations	No additional funding necessary, but may require additional staffing.	Participating in the program requires no funding.	5 years	Planning	County Commission
Mahoning County	Flood	Consider installing, re-routing, or increasing the capacity of existing storm drainage systems, which may involve detention and retention ponds. (Strategy 4.5.1)	9	Ongoing from previous plan	Structure and Infrastructure Projects	CDBG, HMGP, PDM	Up to $250,000?	5 years	MC Sanitary Engineer	Affected Jurisdictions
Mahoning County	Land and mine subsidence	Coordinate with the Ohio Department of Natural Resources, Division of Mineral Resources Management, Office of Abandon Mine Lands and Reclamation to undertake reclamation projects if subsidence occurs at a specific location. (Strategy 5.1.1)	11	Ongoing from previous plan	Local Plans and Regulations	Coordination should require no significant additional funding; however, a project would require significant funding, primarily from ODNR through the AML&R program.	Up to $2,000,000	As Needed	Affected jurisdiction, ODNR	N/A
Mahoning County	Dam Failure	Develop a notification system that can be utilized to notify residents and businesses downstream of large dams of actions to take before a dam failure, if lead time exists. (i.e., similar to reverse 911 system). (Strategy 1.1.4)	11	Ongoing from previous plan	Education and Awareness Programs	HMGP, PDM, ODNR	$25,000 - $10,000 depending on the sophistication of the notification system.	3 years	ODNR, Dam owner	Notification system designer
Mahoning County	Tornado	Identify ideal location and build storm shelters for residents living in mobile home parks.	13	New	Structure and Infrastructure Projects	HMGP	Identification of locations would incur little to no additional costs	2 years	Goshen Twp	Mahoning County

MAHONING COUNTY MITIGATION PROJECTS										
Jurisdiction	*Hazard of concern*	*Project/Strategy*	*Priority*	*Status*	*Mitigation Type*	*Potential Funding Source*	*Cost Estimate*	*Timeline for Completion*	*Coordinating Agency*	*Support Agency(ies)*
Mahoning County	Dam Failure	Strategy 1.1.2: During all new dam construction, encourage the completion of a critical flood engineering analysis by a professional engineer licensed in the State of Ohio.	14	Ongoing from previous plan	Local Plans and Regulations	Local funding	$50,000 - $75,00 if a consultant is utilized.	During new dam construction	Dam owner	ODNR
Mahoning County	Terrorism	Establish a critical infrastructure protection program. (Strategy 10.1.5)	14	Ongoing from previous plan	Local Plans and Regulations	PDM, HMGP, Local funding	Up to $2,500	3 years	EMA & local law enforcement agencies.	N/A
Mahoning County	Dam Failure	Work with Class I dam owners to develop Emergency Action Plans, to include a detailed assessment of the vulnerability of structures and critical facilities near the hydrological shadow of the dams. (Strategy 1.1.5)	16	Ongoing from previous plan	Local Plans and Regulations	Local funding	Up to $45,000 for all dams	Update every 5 years	Dam owner	EMA
Mahoning County	Flood	Confirm status of repetitive loss structures and develop community specific plan to flood proof, relocate, or buyout to eliminate future risks. (Strategy 4.3.3)	16	Ongoing from previous plan	Local Plans and Regulations	No additional funding necessary.	Determine strategy to establish costs.	2 years	Cities of Youngstown, Poland, Boardman, Austintown, and Canfield.	EMA
Mahoning County	Severe wind and tornado	Coordinate with the County Building Inspector to annually assess County building codes to determine possible enhancements for reducing tornado risks that supplement Ohio building code requirements for commercial and apartments with four or more dwellings. (Strategy 7.2.1)	16	Ongoing from previous plan	Local Plans and Regulations	Local funding	Up to $4,000	Annually	County Building Inspector, Home Builders Association,	EMA
Mahoning County	Severe wind and tornado	Purchase mobile 35kw generators or (gen-sets) that can be transported to shelters throughout Mahoning County. (Strategy 7.2.3)	19	Ongoing from previous plan	Structure and Infrastructure Projects	PDM, HMGP, Local Funding	Up to $10,000 to $15,000 per generator.	2 years	Mahoning County Commission	EMA
Mahoning County	All hazards	Coordinate with those communities in the county that lack zoning, to determine if zoning or other approaches may be useful to reducing natural hazard risks unique to them. (Strategy 11.4.1)	20	Ongoing from previous plan	Local Plans and Regulations	Cost paid through in-kind services	N/A	3 years	County Planning Commission, County Engineer, & EMA	N/A
Mahoning County	Earthquake	Install sensory systems that immediately shut off the flow of gas throughout the county as soon as earth movements are felt. (Strategy 3.3.1)	21	Ongoing from previous plan	Structure and Infrastructure Projects	PDM, HMGP, Local funding	Up to $3,000 per sensor.	3 years	Utility providers	EMA
Mahoning County	Flooding	Remove brush and clean Garfield Ditch	22	New	Natural Systems Protection	Local funding	Cost would depend on the scope of the project.	3 years	Goshen Twp	Mahoning County
New Middletown	Drought	Purchase a new water storage tank to be utilized by the Village of New Middletown. Encourage water systems to develop system interconnects to increase water distribution capacities. (Strategy 1H.1.1)	1	Ongoing from previous plan	Structure and Infrastructure Projects	PDM, HMGP	Up to $110,000	3 years	Village Council, Water Distribution Systems	N/A
Poland	Flood	Encourage residents to control and secure debris yard items, or store objects (i.e., including oil, gasoline, and propane tanks, etc.) out of floodplains that may be swept away, damaged, or pose a hazard when flooding occurs. (Strategy 1I.1.1)	1	Ongoing from previous plan	Education and Awareness Programs	N/A	No additional funding necessary.	6 months	Residents, Village Council, Floodplain Coordinator	N/A
Sebring	All hazards	Work with the power company to clear trees and vegetation that are in powerline right of ways.	1	New	Structure and Infrastructure Projects	Utility Company	Partnering with private companies has no additional cost. The utility company should trim trees as part of their activities	1 year, ongoing	Utility providers	Village Council

MAHONING COUNTY MITIGATION PROJECTS										
Jurisdiction	*Hazard of concern*	*Project/Strategy*	*Priority*	*Status*	*Mitigation Type*	*Potential Funding Source*	*Cost Estimate*	*Timeline for Completion*	*Coordinating Agency*	*Support Agency(ies)*
Sebring	Earthquake	Retrofit existing critical infrastructure systems to "harden" them to meet seismic design standards for "lifelines". (Strategy 1J.1.1)	2	Ongoing from previous plan	Structure and Infrastructure Projects	PDM, HMGP	Up to $550,000 to $750,000	5 years	Village Council	N/A
Struthers	Severe wind	Identify locations of and remove trees and limbs from areas where vegetation hinders utility lines and poles.	1	New	Structure and Infrastructure Projects, Natural Systems Protection	Utility Company	The utility company should trim trees as part of their activities	Ongoing	Utility providers	Homeowners
Struthers	Flood	Offer eligible residential homeowners subsidies to install backflow prevention devices to aid in the prevention of sewer backup into basements. (Strategy 1C.1.1)	2	Ongoing from previous plan	Structure and Infrastructure Projects	Local funding	Assistance to homeowners will come in the form of grants from the City of Struthers for up to 100% of the cost for the installation of a backflow valve and other associated costs	Ongoing	City of Struthers	N/A
Struthers	Dam Failure	Conduct regular dam inspections at Lake Hamilton Dam.	3	New	Structure and Infrastructure Projects	ODNR	ODNR inspects dams as part of regular activities	Ongoing	ODNR	Dam owners
Struthers	Severe wind and tornado	Require new construction and retrofits to adhere to current building code standards to withstand severe winds.	4	New	Local Plans and Regulations	N/A	No additional funding necessary.	Ongoing	City Council	Homeowners
Struthers	Flood	Clear trees and build boat ramp to access the Mahoning River; purchase rescue boat.	5	New	Structure and Infrastructure Projects, Natural Systems Protection	Local funding	Up to $16,000 for inflatable boat. Cost will depend on type of equipment	5 years	Department of Public Safety	City Council
Youngstown	Severe thunderstorm and hail	Work with the power company to clear trees and vegetation that are in powerline right of ways.	1	New	Structure and Infrastructure Projects, Natural Systems Protection	Utility Company	Partnering with private companies has no additional cost. The utility company should trim trees as part of their activities	1 year, ongoing	Public Works	Utility Companies, homeowners
Youngstown	Flood	Conduct a study of stormwater systems to identify possible solutions for runoff including enlarging system diameters	2	New	Local Plans and Regulations, Structure and Infrastructure Projects	USEPA	Up to $10-15,000 and up for a study by a contractor	3 years	City Council City Engineer	Private contractors
Youngstown	Flood	Decrease the amount of impermeable ground coverage in drainage areas. Initiate zoning and open space requirements suited to the capacity of soils and drainage system to absorb rainwater runoff, and conduct appropriate land use and capital improvements planning. (Strategy 1D.1.1)	3	Ongoing from previous plan	Local Plans and Regulations	PDM, HMGP	Up to $100,000 to $500,000	5 years	County Engineer and Zoning Office	N/A

4.0 PLAN MAINTENANCE

The plan maintenance section of the hazard mitigation plan includes methods of how the committee and the jurisdictions will monitor, evaluate, and update the plan, how they will integrate existing plans with hazard mitigation, and how they will continue to involve the public in the five-year cycle of this plan.

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4.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

§ 201.6(c)(4)(i)	A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

The committee understands that "the mitigation plan is a living document that guides action over time. As conditions change, new information becomes available, or actions progress over the life of the plan, plan adjustments may be necessary to maintain its relevance" (FEMA, 2013). To that end, the committee discussed the strategy to maintain the plan in the next five years after the official adoption and before the next update. They determined the following.

- The steering committee will meet every year, in person or on the phone.
- A representative from the steering committee will attend one local emergency planning committee (LEPC) meeting, one township meeting, and one general policy board meeting; they will attempt to get on the agenda for one of those meetings at least once a year and reach every meeting within the five-year timeframe.
- In order to streamline the update process for the next cycle, the committee will keep records of:
  - events and incidents that occur in the county or surrounding counties that impact the Mahoning County,
  - emergency disaster declarations,
  - changes in the county (e.g., population, economy, development, transportation, infrastructure, etc.),
  - progress on mitigation projects outlined in this plan, and
  - any other relevant information.

- Mahoning County EMA, as the entity in charge of this plan, will ensure this plan is updated in five years according to the most recent standards and will include any updates from the previous five years.

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4.2 PLAN INTEGRATION

§ 201.6(c)(4)(ii)	A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

There is a variety of plans that the county and individual jurisdictions have that can organically integrate hazard mitigation projects in them; some already have. All plans identify certain problems and propose solutions within a community. If these plans reference each other and work together to make a community safer, more attractive to residents, commerce, and industries, and healthier overall, then they will work together to create a more resilient community. This is where hazard mitigation actions can aide in making communities safer by lessening the impacts of a variety of hazards.

The different plans are described below in more detail. In general, each section describes who each plan relates to hazard mitigation; when appropriate, the sections identify specific mitigation actions within the existing plans.

Comprehensive Plans

As mentioned in Section 1.3 Capabilities, comprehensive plans guide the location, type, and extent of future development. In them, they describe a variety of projects that can relate to mitigation. The following table outlines the general elements that comprehensive plans incorporate and how they relate directly to hazard mitigation.

COMPREHENSIVE PLAN CONCEPT INTEGRATION	
Plan Element	*Relevance to Hazard Mitigation*
Goals & Objectives	Definition*: *This section establishes goals and objectives that serve as a guide for the development and economic and social well-being of the local jurisdictions. The goals and objectives tell the world how the community wants to function and look in the future.* This section provides an opportunity for local officials to acknowledge the reciprocal benefits of hazard mitigation to community-level comprehensive planning. This section also serves as a statement of the community's stance on resilience at it moves forward.
Land Use	Definition: *The land use element outlines the most appropriate and desirable patterns of growth and development.* This section can include risk areas as key points of information for consideration as to these appropriate and desirable patterns. Incorporating mitigation in this section does not automatically imply banning development from all high hazard areas; rather, it can identify those areas where certain types of resilient construction techniques would be beneficial.

COMPREHENSIVE PLAN CONCEPT INTEGRATION	
Plan Element	*Relevance to Hazard Mitigation*
Transportation	Definition: *The transportation element describes and presents transportation patterns and includes the entire spectrum of transportation facilities (transit, roads, bicycle and pedestrian amenities, and transit-oriented development) applicable to the jurisdiction.* This section can recognize the importance of the transportation infrastructure to overall emergency and disaster preparedness. Within such a discussion, maintaining critical arterial routes can be prioritized as a mitigative measure.
Community Facilities	Definition: *The community facilities element identifies the location, character and extent of public and semi-public buildings, lands, and facilities.* This section provides another perspective from which to consider high-risk areas.
Development Regulations	Definition: *The development regulations section identifies development tools that are the best available mechanisms to implement the plan, including streamlined review for development in designated growth areas.* This section can discuss how local ordinances and regulations can be amended to account for hazard risks. As with the land use element, these regulations may recommend or require certain types of resilient construction.
Sensitive Areas	Definition: *The sensitive areas element sets goals, objectives, principles, policies, and standards to protect sensitive areas from the adverse effects of development. The Land Use Article requires jurisdictions to protect streams and their buffers; the 100-year floodplain; habitats of threatened and endangered species; and steep slopes, wetlands, and agricultural and forest lands intended for resource protection or conservation.* This section gives communities the option of designating high risk areas as sensitive areas.
Implementation	Definition: *Recognizing the importance of designing land development regulations that implement the plan, this section is supposed to address recommendations for land development regulations.* This section can include a series of actions that may be duplicated in the hazard mitigation plan (and vice versa). It allows communities to acknowledge those initiatives that overlap both community development and hazard mitigation goals.
Development Capacity Analysis	Definition: *This section is an estimate of the total amount of development that may be built in an area under a certain set of assumptions, including land use laws and policies (e.g., zoning), environmental constraints, etc.* This section can include high risk areas as a type of environmental constraint.
Municipal Growth	Definition: *This element requires municipalities to identify areas for future growth consistent with their long-range visions.* This section supports the multi-jurisdictional approach of this hazard mitigation plan by integrating discussions of high risk areas and their relation to areas targeted for future growth. It also provides space to consider such measures as resilient construction in municipal areas.
Water Resources	Definition: *This element identifies drinking water supplies needed by projected populations.* This section supports the continued operation of critical infrastructure, particularly water systems. By identifying drinking water supply needs and potential upgrades necessary to meet those needs, this section gives local officials the opportunities to discuss upgrades and other means of ensuring reliability of water during emergencies.

Source: Maryland Department of Planning

Currently, the City of Youngstown is the only jurisdiction within Mahoning County that has a current comprehensive plan; the city has considered updating it. According to the steering committee, Lowellville has already hired a contractor to develop their comprehensive plan and Canfield has considered developing their plan as well. The comprehensive plans should strongly consider actions that will reduce the loss of life and property from hazards and increase the overall resiliency of the jurisdiction.

HAZARD MITIGATION AND COMPREHENSIVE PLAN INTEGRATION	
Concept	*Example Projects*
Cleaner	• Convert surplus school building sites to green space • Seek Clean Ohio funding for Brownfields remediation • Study/Implement code enforcement
Greener	• Create and maintain high quality city parks • Adopt citywide/regional greenway network • Support the Mahoning River restoration project • Encourage preservation of open space
Better Planned and Organized	• Establish industrial green districts • Support planned development with City Commission approval • Adopt new zoning code with new development design standards

Source: Youngstown 2010 Citywide Plan

Land Use Plan

Land use plans ensure adherence to the jurisdictions' floodplain, zoning, building, subdivision, and other relevant ordinances and consider the implementation of storm water management projects. Land use plans can also incorporate or consider the implementation of green infrastructure/low-impact development into site-specific projects (e.g., use of porous pavement, tree planting initiatives, planter boxes, bio swales, etc.).

In 2016 Mahoning County Land Use Plan, almost every township in the county has goals and objectives that relate to land use and future development.

HAZARD MITIGATION AND LAND USE PLAN INTEGRATION	
Township	*Objectives*
Austintown Township	• Preserving floodplains, wetlands and riparian areas • Effectively manage storm water retention/detention
Beaver Township	• Manage the uses and development of land in the township to protect surface water resources from pollution, sedimentation, and increased storm water runoff
Berlin Township	• N/A
Boardman Township	• Advocate adoption of local measure that prevent increases in storm water runoff • Recognize the importance and encourage the preservation of green space, parklands, sensitive lands, and farmlands
Canfield Township	• Advocate adoption of local measures that prevent increases in storm water runoff

HAZARD MITIGATION AND LAND USE PLAN INTEGRATION	
Township	*Objectives*
	• Recognize the importance and encourage the preservation of green space, parklands, sensitive lands, and farmlands • Preserve the natural resources, scenic quality and recreational opportunities of the township through the strict enforcement of regulations to reduce pollution of land and water
Coitsville Township	• Preserve the natural resources, scenic quality and recreational opportunities of the township through the strict enforcement of regulations to reduce pollution of land and water
Ellsworth Township	• Stress environmental protection/riparian corridors/recreational areas
Goshen Township	• N/A
Green Township	• Preserve the natural resources, scenic quality and recreational opportunities of the township through the strict enforcement of regulations to reduce pollution of land and water • Advocate adoption of local measures that prevent increases in storm water runoff
Jackson Township	• Advocate adoption of local measures that prevent increases in storm water runoff
Milton Township	• Preserve the natural resources, scenic quality and recreational opportunities of the township through the strict enforcement of regulations to reduce pollution of land and water • Advocate adoption of local measures that prevent increases in storm water runoff • Recognize the importance and encourage the preservation of green space, parklands, sensitive lands, and farmlands
Poland Township	• Preserve the natural resources, scenic quality and recreational opportunities of the township through the strict enforcement of regulations to reduce pollution of land and water • Advocate adoption of local measures that prevent increases in storm water runoff
Smith Township	• Advocate adoption of local measures that prevent increases in storm water runoff
Springfield Township	• N/A

Source: 2016 Land Use Plan (Mahoning County)

Emergency Operations Plan

Emergency operations plans (EOPs) ensure consistency between updated hazard analyses and the risk assessment portion of the plan. They also consider mitigation projects as part of the overall cycle of emergency management. EOPs establish and maintain effective response programs, support continuity of critical infrastructure and key resources, and identify specific risk areas for certain hazards.

The Mahoning County Emergency Management Agency maintains the county's EOP; in it, specific annexes relate to hazard mitigation. The following table describes the annexes and how they can integrate hazard mitigation.

HAZARD MITIGATION AND EMERGENCY OPERATIONS PLAN INTEGRATION	
Section	*Hazard Mitigation Integration*
Annex J: Evacuation (2007)	• Identifies areas that may require evacuations. • Discourages development, particularly residential, in flood plains and other hazardous areas • Develops emergency public information messages for areas where the risk population and the evacuation routes can be predetermined • Includes guides for evacuation assistance in mutual-aid agreements.
Annex M: WMD (2012)	• Establishes a radiological program • Designates a radiological officer

	• Develops a radiological training program • Develops a radiological reporting network
Annex O: Hazardous Materials (2015)	• Identifies potential hazards • Establishes warning procedures • Educates the public and trains emergency personnel • Develops and exercises emergency response operations
Annex T: Critical Care Facilities (2007)	• Determines hazard vulnerabilities that affect the critical care facility

Source: Mahoning County EOP, 2010

Transportation Planning

Transportation plans can ensure hazards are acknowledged in long-range transportation planning and consider response elements to the hazards identified in the mitigation plan, as appropriate, with respect to transportation (e.g., evacuation). These plans also ensure that planned transportation projects do not add to vulnerabilities (e.g., ensure projects utilize proper drainage, are properly elevated, etc.) and can consider the incorporation of green infrastructure/low-impact development as transportation projects are undertaken (e.g., permeable pavements, green streets and alleys, etc.).

In Mahoning County, the Eastgate Regional Council of Governments has developed the 2040 Metropolitan Transportation Plan which includes Mahoning and Trumbull Counties. Refer to Section 1.4.4 Transportation for information on specific actions this plan outlines.

Floodplain Ordinances

The entire purpose of floodplain ordinances is to mitigate the effect of floods in an area where flooding is prone to occur and therefore relate closely to hazard mitigation activities. Floodplain ordinances support resiliency by ensuring new development and redevelopment stays clear of known hazard areas or is built in such a way as to withstand the effects of known hazards. Ordinances protect green spaces in special flood hazard areas (SFHAs). For specific information on floodplain ordinances and National Flood Insurance Program (NFIP) participation refer to sections 1.3 Capabilities and 2.4.6 Flood.

Watershed Plans

Watershed plans identify site-specific flooding concerns and other water quality issues and provide a means for consideration of low-impact development options for flood mitigation.

In Mahoning County, the Eastgate Regional Council of Governments has developed the Yellow Creek Watershed Action Plan (2015) in which they include a variety of information about the watershed. The plan:

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- provides information on previous and current water quality efforts,
- contains physical attributes that support water quality such as floodplains, riparian buffers, dams, channelization, and eroding banks, among others,
- identifies causes and sources of water pollution including permitted discharges, spills, surface mines, animal feeding operations, etc., and
- identifies actions to be completed, the timeframe, and estimated cost including reduction of nitrogen, phosphorus, sediment, and bacteria loading, protecting surface drinking water sources, determining the impact of acid mine drainage on the watershed, and educating stakeholders and watershed residents.

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4.3 CONTINUED PUBLIC INVOLVEMENT

§ 201.6(c)(4)(iii)	Discussion on how the community will continue public participation in the plan maintenance process.

The committee recognizes the need to continually involve the public in the maintenance of this plan. To that end, the committee has decided to organize or participate in a variety of activities where they can reach the public and include them in the status of mitigation activities and the plan itself. Public outreach activities will include the following.

- Provide information on mitigation activities that families and individuals can implement in their homes and places of business at a booth at the annual Canfield Fair
- Make this plan available on the Mahoning County Emergency Management Agency and Eastgate Regional Council of Governments websites and provide a way for the public to comment on the plan.
- Participate in the local emergency planning committee (LEPC) meetings, which are open to the public; in these meetings, the committee will provide the attendees with the general status of the plan, mitigation activities and other outreach conducted.
- Provide an annual update of the plan and mitigation activities to the Mahoning County Commission, a meeting that is open to the public.

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5.0 APPENDICES

This section contains supporting documentation for the hazard mitigation plan. In it, the following appendices are included.

Appendix 1: Planning Documentation

Appendix 2: Public Survey Data

Appendix 3: Inactive Projects

Appendix 4: Project Prioritization

Appendix 5: Citations

Appendix 6: Plan Adoption

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