Mercer County 2023 Hazard Mitigation Plan

Prepared for:

Mercer County Department of Public Safety

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Prepared by:

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Certification of Annual Review Meetings

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED? *	SIGNATURE
2023			
2024			
2025			
2026			
2027			

**Confirm yes here annually and describe on record of change page.*

Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)

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Acronyms

AACT:	American Academy of Clinical Toxicology
ACHA:	American College Health Association
ACMT:	American College of Medical Toxicology
AHJ:	Authority Having Jurisdiction
AMD:	Acid Mine Drainage
ANSI:	American National Standards Institute
ASAM:	American Society of Addiction Medicine
ASHRAE:	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASIRT:	Association for Safe International Road Travel
BFE:	Base Flood Elevation
CBRNE:	Chemical, Biological, Radiological, Nuclear, or Explosive
CDC:	Centers for Disease Control and Prevention
CERT:	Community Emergency Response Team
CFR:	Code of Federal Regulations
CFS:	Commodity Flow Study
CHSN:	College Health Surveillance Network
CCIDRAP:	Center for Infectious Disease Research and Policy
CRS:	Community Rating System
DCNR:	Department of Conservation and Natural Resources
DDAP:	Department of Drug and Alcohol Programs
DEA:	Drug Enforcement Administration
DFIRM:	Digital Flood Insurance Rate Map
DMA:	Disaster Mitigation Act
DPS:	Department of Public Safety
EF:	Enhanced Fujita
EIA:	Energy Information Administration
EMA:	Emergency Management Agency
EMPG:	Emergency Management Performance Grant

EMS:	Emergency Medical Services
EOP:	Emergency Operations Plan
EPA:	Environmental Protection Agency
EPCRA:	Emergency Planning and Community Right-To-Know Act
EPZ:	Emergency Planning Zone
FBI:	Federal Bureau of Investigations
FEMA:	Federal Emergency Management Agency
FMA:	Flood Mitigation Assistance Grant Program
FRA:	Federal Railroad Association
GIS:	Geographic Information Systems
HAZUS:	Hazards U.S. Software
HMA:	Hazard Mitigation Assistance
HMEP:	Hazardous Material Emergency Planning Grant
HMGP:	Hazard Mitigation Grant Planning
HMP:	Hazard Mitigation Plan
HMRF:	Hazardous Material Response Fund
HSCA:	Hazardous Sites Cleanup Act
HSGP:	Homeland Security Grant Program
HVE:	Homegrown Violent Extremist
ICC:	International Code Council
IES:	Illuminating Engineering Society
LEPC:	Local Emergency Planning Committee
LGTBQ:	Lesbian, Gay, Bisexual, Trans & Queer
LPT:	Local Planning Team
MAT:	Medication-Assisted Treatment
MPC:	Municipalities Planning Code
NARM:	Notification and Resource Manual
NAS:	Neonatal Abstinence Syndrome
NCDC:	National Climatic Data Center
NCEI:	National Centers for Environmental Information

NFIP:	National Flood Insurance Program
NFPA:	National Fire Protection Association
NIH:	National Institute of Health
NLD:	National Levee Database
NOAA:	National Oceanic and Atmospheric Administration
NTP:	Narcotic Treatment Program
NWS:	National Weather Service
OIH:	Opioid-Induced Hyperalgesia
OUD:	Opioid Use Disorder
PA DCED:	Pennsylvania Department of Community and Economic Development
PA DEP:	Pennsylvania Department of Environmental Protection
PA DOA:	Pennsylvania Department of Agriculture
PA GWIS:	Pennsylvania Groundwater Information System
PA HART:	Pennsylvania Helicopter Aquatic Rescue Team
PAWNVCP:	Pennsylvania West Nile Virus Control Program
PDMP:	Prescription Drug Monitoring Program
PDSI:	Palmer Drought Severity Index
PEMA:	Pennsylvania Emergency Management Agency
PennDOT:	Pennsylvania Department of Transportation
PHMSA:	Pipeline and Hazardous Materials Safety Administration
PISC:	Pennsylvania Invasive Species Council
POD:	Points of Dispensing
PWSA:	Public Water Service Area
RF:	Risk Factor
SARA:	Superfund Amendments and Reauthorization Act
SFHA:	Special Flood Hazard Area
TRI:	Toxic Release Inventory
UCC:	Uniform Construction Code
US HHS:	United States Department of Health and Human Services

USACE:	Untied States Army Corp of Engineers
USDA:	United States Department of Agriculture
USDA FS:	United States Department of Agriculture Forest Service
USGS:	United States Geological Survey
WL:	Working Level
WMD:	Weapon of Mass Destruction
WUI:	Wildland Urban Interface

Executive Summary

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. Hazard mitigation focuses attention and resources on county and municipal policies and actions that will produce successive benefits over time. State and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural as well as human-caused hazards and develop long-term strategies for protecting people and property from future hazard events. Mitigation plans are key to breaking the cycle of disaster damage, reconstruction, and repeated damage. This plan represents the work of citizens, elected and appointed government officials, business leaders, and volunteer and nonprofit groups to protect community assets, preserve the economic viability of the community, and save lives.

In 2022, the Mercer County Department of Public Safety contracted the services of a consulting agency to revise and update the Mercer County Hazard Mitigation Plan. The plan was successfully updated in accordance with the requirements set forth by PEMA and FEMA. The updated Mercer County Hazard Mitigation Plan was adopted by the Mercer County Commissioners in 2023. All forty-eight municipalities adopted the 2018 Mercer County Hazard Mitigation Plan as the municipal hazard mitigation plan, and it is anticipated that all participating municipalities will adopt the 2023 Mercer County Hazard Mitigation Plan Update.

The Mercer County Commissioners secured a grant to complete the 2023 update to the Mercer County Hazard Mitigation Plan. MCM Consulting Group, Inc. was hired to assist the county with the update of the plan. The planning kick-off meeting was conducted on October 17, 2022.

The planning process for the 2023 Mercer County Hazard Mitigation Plan Update consisted of the following:

- Identification and prioritization of the hazards that may affect the county and its municipalities.
- Assessment of the county's and municipalities' vulnerability to these hazards.
- Identification of the mitigation actions and projects that can reduce that vulnerability.
- Development of a strategy for implementing the actions and projects, including identifying the agency(ies) responsible for that implementation.

Throughout the planning process, the general public was given the opportunity to comment on the existing HMP and provide suggestions for the updated version. Due to COVID-19, public meetings were conducted via an online survey to provide residents an opportunity to provide input on the HMP. Several meetings were held in person with a virtual option, and participants were invited to submit surveys and other documents via an online survey.

The following hazards were identified by the local planning team as presenting the highest risk to the county and its municipalities:

Natural hazards:

- Drought
- Earthquake
- Flooding, Flash Flooding, Ice Jam Flooding
- Hurricane and Tropical Storm
- Invasive Species
- Landslide
- Pandemic and Infectious Disease
- Radon Exposure
- Subsidence/Sinkhole
- Tornado/Windstorm
- Wildfire
- Winter Storm

Human-caused hazards:

- Civil Disturbance
- Dam Failure
- *Emergency Services
- Environmental Hazards / Hazardous Materials
- Levee Failure
- Nuclear Incident
- Opioid Epidemic
- Terrorism/Cyberterrorism Incidents
- Transportation Accidents
- Utility Interruption

A total of twenty-two hazards have been identified in the 2023 Mercer County Hazard Mitigation Plan. A total of sixteen identified hazards were listed in the previous 2018 plan update. The new hazards include Emergency Services, Opioid Epidemic, Radon Exposure, Terrorism and Cyberterrorism, Utility Interruptions, and Wildfire.

To mitigate against the effects of these hazards, the local planning team identified the following goals for hazard mitigation over the next five years:

- Reduce potential injury/death and damage to existing community assets due to floods, flash floods, and ice jams.
- Reduce potential injury/death and damage to community assets due to all hazards.
- Promote disaster-resistant future development.
- Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.
- Improve response and recovery capabilities.
- Protect critical infrastructure.

Mitigation actions are specific projects and activities that help achieve goals. A total of sixty-one actions were developed for this plan update as they pertain to hazards identified by the local planning team. The 2018 Mercer County Hazard Mitigation Plan consisted of forty-five total actions. The individual objectives and actions that will be implemented are shown in Section 6.4. Each municipality was provided the opportunity to submit new project opportunity forms for this update. A total of ninety-nine project opportunity forms were submitted during the 2018 HMP update. A total of thirty-eight project opportunities were submitted for this plan update.

The 2023 Mercer County Hazard Mitigation Plan is the cornerstone to reducing Mercer County's vulnerability to disasters. It is the commitment to reducing risks from hazards and serves as a guide for decision makers as they commit resources to reducing the effects of hazards. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

The 2023 Mercer County Hazard Mitigation Plan is a living document that reflects ongoing hazard mitigation activities and requires monitoring, evaluating, and updating to ensure the mitigation actions are implemented. To facilitate the hazard mitigation planning process and adhere to regulatory requirements, the plan will be reviewed annually, and any major revisions will be incorporated into the five-year update.

1. Introduction

1.1. Background

The Mercer County Board of Commissioners, in response to the Disaster Mitigation Act of 2000 (DMA 2000), organized a countywide hazard mitigation planning effort to prepare, adopt, and implement a multi-jurisdictional Hazard Mitigation Plan (HMP) for Mercer County and all of its forty-eight municipalities. The Mercer County Department of Public Safety charges by the County Board of Commissioners to prepare the 2023 plan. The 2018 HMP has been utilized and maintained during the five-year life cycle.

The Mercer County Commissioners were successful in securing hazard mitigation grant funding to update the county hazard mitigation plan. The pre-disaster mitigation grant funding was administered by the Pennsylvania Emergency Management Agency and provided to Mercer County as a sub-grantee. The Mercer County Commissioners assigned the Mercer County Department of Public Safety with the primary responsibility to update the hazard mitigation plan. MCM Consulting Group, Inc. was selected to complete the update of the HMP. A local hazard mitigation planning team was developed comprised of government leaders and citizens from Mercer County. This updated HMP will provide another solid foundation for the Mercer County Hazard Mitigation Program.

Hazard mitigation describes sustained actions taken to prevent or minimize long-term risks to life and property from hazards and to create successive benefits over time. Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to breaking the disaster cycles of damage, reconstruction, and repeated damage. With careful selection, successful mitigation actions are cost-effective means of reducing risk of loss over the long term.

Hazard mitigation planning has the potential to produce long-term and recurring benefits. A core assumption of mitigation is that current dollars invested in mitigation practices will significantly reduce the demand for future dollars by lessening the amount needed for recovery, repair, and reconstruction. These mitigation practices will also enable local residents, businesses, and industries to reestablish themselves in the wake of a disaster, getting the economy back on track sooner with less interruption.

1.2. Purpose

The purpose of this all-hazard mitigation plan (HMP) is:

- Protect life, safety, and property by reducing the potential for future damages and economic losses that result from hazards.

- Qualify for additional grant funding, in both the pre-disaster and the post-disaster environment.
- Speed recovery and redevelopment following future disaster events.
- Demonstrate a firm local commitment to hazard mitigation principles.
- Comply with both state and federal legislative requirements for local hazard mitigation plans.

1.3. Scope

This Mercer County Multi-Jurisdictional Hazard Mitigation Plan serves as a framework for saving lives, protecting assets, and preserving the economic viability of the forty-eight municipalities in Mercer County. The HMP outlines actions designed to address and reduce the impact of a full range of natural hazards facing Mercer County, including drought, earthquakes, flooding, tornadoes, hurricanes/tropical storms, invasive species, and severe winter weather. Human-caused hazards such as transportation accidents, emergency services shortage, hazardous materials spills, and fires are also addressed.

A multi-jurisdictional planning approach was utilized for the Mercer County HMP update, thereby eliminating the need for each municipality to develop its own approach to hazard mitigation projects, common mitigation goals and objectives, and an evaluation of a broad capabilities assessment examining policies and regulations throughout the county and its municipalities.

1.4. Authority and References

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended.
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq.

Authority for this plan originates from the following Commonwealth of Pennsylvania sources:

- Pennsylvania Emergency Management Services Code. Title 35, Pa C.S. Section 101
- Pennsylvania Municipalities Planning Code of 1968, Act 247 as reenacted and amended by Act 170 of 1988.
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No. 167

The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

- FEMA 386-1: Getting Started. September 2002
- FEMA 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001
- FEMA 386-3: Developing the Mitigation Plan. April 2003
- FEMA 386-4: Bringing the Plan to Life. August 2003
- FEMA 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007
- FEMA 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005
- FEMA 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003
- FEMA 386-8: Multijurisdictional Mitigation Planning. August 2006
- FEMA 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008
- FEMA Local Multi-Hazard Mitigation Planning Guidance. July 1, 2008
- FEMA National Fire Incident Reporting System 5.0: Complete Reference Guide. January 2008
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. January 2013
- FEMA Rehabilitation of High Hazard Potential Dams: Grant Program Guidance, June 2020

The following Pennsylvania Emergency Management Agency (PEMA) guides and reference documents were used to prepare this document:

- PEMA: Hazard Mitigation Planning Made Easy!
- PEMA Mitigation Ideas: Potential Mitigation Measures by Hazard Type: A Mitigation Planning Tool for Communities. March 6, 2009
- PEMA: All-Hazard Mitigation Planning Standard Operating Guide, 2020.

The following document produced by the National Fire Protection Association (NFPA) provided additional guidance for updating this plan:

NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs. 2011

2. Community Profile

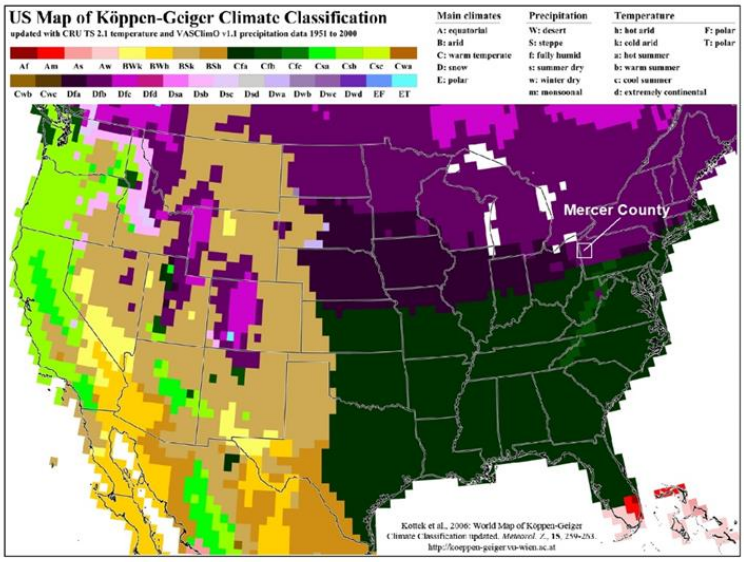
2.1. Geography and the Environment

Mercer County covers approximately 683 square miles and is situated in north-western Pennsylvania. The county is bordered by Crawford County to the north, Venango County to the north-east and east, Butler County to the south-east, Lawrence County to the South, and Ohio (Trumbull County) to the west. Mercer County lies entirely within the Appalachian Plateaus physiographic province. The county is the 30th ranked county in terms of population within the Commonwealth of Pennsylvania. There is a total of 673 square miles of land and 10 square miles of water.

Mercer County presents a wide range of topographic features. The surface ranges from almost level on plateaus and in valleys, to rolling and hilly in other areas. Elevations in the county range from a high of 1,620 feet southeast of Sandy Lake Borough in Sandy Lake Township to a low of 810 feet where the Shenango River flows out of the county in Shenango Township.

The Köppen-Geiger Climate Areas map classifies Mercer County and the rest of Pennsylvania as Humid Continental, which can be seen in *Figure 1 – Köppen-Geiger Climate Map*. While the counties of Pennsylvania share many weather similarities, there are also a few unique characteristics to the area.

Figure 1 - Köppen-Geiger Climate Map



According to current data, the climate in Mercer County is temperate, being characterized by moderately hot summers and moderately severe winters. In winter, the average temperature is

32.46˚F and the average daily minimum temperature is 6.33˚F. In summer, the average temperature is 71.7˚F and the average daily maximum temperature is 90.5˚F. The average amount of snowfall each winter is 44.7 inches.

River and stream valleys dominate the landscape of Mercer County as well as ridge lines and rolling hills. The major water features are: Crooked Creek, Little Shenango River, Big Run, Otter Creek, Cool Spring Creek, French Creek, Little Neshannock Creek, Little Neshannock Creek (west branch), Wolf Creek, and Sandy Creek.

Mercer County is comprised of eight watersheds:

- Conneaut outlet
- French Creek
- Little Neshannock Creek
- Little Shenango River
- Neshannock Creek
- Sandy Creek
- Shenango River
- Slippery Rock
- Wolf Creek

2.2. Community Facts

On March 12th, 1800 Mercer County was established from portions of Allegheny County and named after Hugh Mercer, a general in the American Revolution. It was attached to Crawford County until February 1804 when it was formally organized. Mercer Borough, the county seat, was laid out in 1803 and incorporated as a borough on March 28, 1814. The most populous communities in Mercer County are Hermitage, Sharon, Farrell, Grove City, Greenville, and Sharpsville.

The following cities, boroughs and townships are located in Mercer County:

- Cities: Farrell, Hermitage, Sharon
- Boroughs: Clark, Fredonia, Greenville, Grove City, Jackson Center, Jamestown, Mercer, New Lebanon, Sandy Lake, Sharpsville, Sheakleyville, Stoneboro, West Middlesex, Wheatland
- Townships: Coolspring, Deer Creek, Delaware, East Lackawannock, Fairview, Findley, French Creek, Greene, Hempfield, Jackson, Jefferson, Lackawannock, Lake, Liberty, Mill Creek, New Vernon, Otter Creek, Perry, Pine, Pymatuning, Salem, Sandy Creek,

Sandy Lake, Shenango, South Pymatuning, Springfield, Sugar Grove, West Salem, Wilmington, Wolf Creek, Worth

Mercer County has a moderate number of cultural resources, including locations that are registered with the National Registry of Historic Places. Below is a list of the registered historic places by the National Park Service in Mercer County, Pennsylvania. These locations can also be seen in *Figure 4 – National Register of Historic Places in Mercer County*.

The following are the registered places in Mercer County, Pennsylvania:

1. The Alexander P. and James S. Waugh House
2. The Christiana Lindsey House
3. The First Universalist Church of Sharpsville
4. The Frank L. Buhl Mansion
5. The Gibson House
6. The Jonas J. Pierce House
7. The Mercer County Courthouse
8. The Wendell August Forge

The Mercer County Courthouse is a Beaux-Art style building made of red brick and sandstone located in the middle of the county seat in Mercer, Pennsylvania. The courthouse is a three-story building that contains a large portion of the county government. The courthouse also features an illuminated bell and clock tower and a marble lobby.

There is also one cultural district located in Mercer County that is listed on the National Register of Historic Places from the National Park Service, and this is the Greenville Commercial Historic District. This district is a large collection of classically designed buildings and accounts for approximately forty-eight contributing locations. Some of the buildings include the United States Post Office in Sharpsville, the Bessemer Depot, and the Packard Commercial Building. This locations is also noted on *Figure 4 – National Register of Historic Places in Mercer County*.

2.3. Population and Demographics

The total population for Mercer County is 110,652 based on 2020 United States Census Bureau. The total change in population for Mercer County from 2010 to 2020 was a decrease of 5,986 and a change of -5.14%. The most populous municipality is the City of Hermitage. The municipalities in the county that had the largest percentage of decrease from 2010 to 2020 were the City of Farrell (-16.69%), Jackson Center Borough (-14.29%), Wolf Creek Township (-13.94%) and Fredonia Borough (-13.35%). The municipalities that had the highest percentage of increase for the period from 2010 to 2020 were Mill Creek Township (7.63%), Sheakleyville Borough (5.63%), Jefferson Township (2.13%) and Sandy Creek Township (0.63%). *Table 1 –*

Population Change in Mercer County illustrates the trends and data from United States Census Bureau. These figures are based off data from the United States Census Bureau in 2020. *Figure 6 – Mercer County Population Density* illustrates the average population density values per census track in the various municipalities of Mercer County.

Table 1 - Population Change in Mercer County

Population Change in Mercer County 2010-2020				
Municipality	**2010 Census**	**2020 Census**	**Change**	**Percent of Change 2010-2020**
City of Farrell	5,111	4,258	-853	-16.69
City of Hermitage	16,220	16,144	-76	-0.47
City of Sharon	14,038	13,147	-891	-6.35
Clark Borough	640	576	-64	-10.00
Coolspring Township	2,278	2,112	-166	-7.29
Deer Creek Township	502	456	-46	-9.16
Delaware Township	2,291	2,088	-203	-8.86
East Lackawannock Township	1,682	1,666	-16	-0.95
Fairview Township	1,085	950	-135	-12.44
Findley Township	2,910	2,868	-42	-1.44
Fredonia Borough	502	435	-67	-13.35
French Creek Township	771	710	-61	-7.91
Greene Township	1,091	1,051	-40	-3.67
Greenville Borough	5,919	5,541	-378	-6.39
Grove City Borough	8,322	7,894	-428	-5.14
Hempfield Township	3,741	3,734	-7	-0.19
Jackson Township	1,273	1,181	-92	-7.23
Jackson Center Borough	224	192	-32	-14.29
Jamestown Borough	617	580	-37	-6.00
Jefferson Township	1,880	1,920	+40	+2.13
Lackawannock Township	2,662	2,469	-193	-7.25
Lake Township	780	702	-78	-10.00
Liberty Township	1,414	1,397	-17	-1.20
Mercer Borough	2,002	1,982	-20	-1.00

Population Change in Mercer County 2010-2020				
Municipality	**2010 Census**	**2020 Census**	**Change**	**Percent of Change 2010-2020**
Mill Creek Township	721	776	+55	+7.63
New Lebanon Borough	188	186	-2	-1.06
New Vernon Township	504	492	-12	-2.38
Otter Creek Township	589	525	-64	-10.87
Perry Township	1,453	1,332	-121	-8.33
Pine Township	5,150	4,808	-342	-6.64
Pymatuning Township	3,281	3,114	-167	-5.09
Salem Township	754	752	-2	-0.27
Sandy Creek Township	795	800	+5	+0.63
Sandy Lake Borough	659	649	-10	-1.52
Sandy Lake Township	1,226	1,197	-29	-2.37
Sharpsville Borough	4,415	4,253	-162	-3.67
Sheakleyville Borough	142	150	+8	+5.63
Shenango Township	3,929	3,519	-410	-10.44
South Pymatuning Township	2,695	2,650	-45	-1.67
Springfield Township	1,981	1,855	-126	-6.36
Stoneboro Borough	1,051	946	-105	-9.99
Sugar Grove Township	971	950	-21	-2.16
West Middlesex Borough	863	815	-48	-5.56
West Salem Township	3,538	3,220	-318	-8.99
Wheatland Borough	632	583	-49	-7.75
Wilmington Township	1,415	1,416	-1	-0.07
Wolf Creek Township	832	716	-116	-13.94
Worth Township	899	824	-75	-8.34
TOTAL	**116,638**	**110,652**	**-5,986**	**-5.14**

There are approximately 50,828 housing units in Mercer County, Pennsylvania. Of these housing units, there are an estimated 45,478 that are occupied, with an average family size of 2.74 persons. Married couples make up a plurality of households in the county (46.7%). The estimated homeownership rate in Mercer County is 71.7%. Approximately 23.0% of housing in

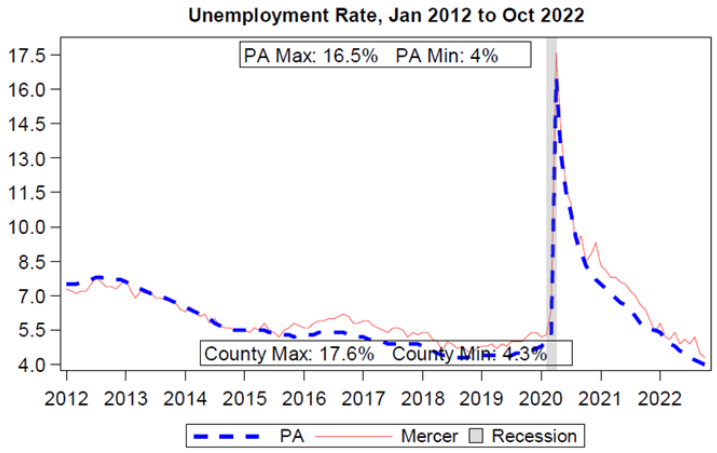
Mercer County is valued between $50,000.00 to $99,999.99. 13.1% of the housing in Mercer County is valued below $50,000.00 while the remaining 63.9% of housing in Mercer County is valued above $100,000.00.

The racial composition of the county is 90.9% White, 6.0% Black or African American, 1.7% Hispanic or Latino, 0.3% American Indian and Alaska Native, 0.7% Asian, <0.1% native Hawaiian and other Pacific Islander, and 2.0% two or more races. The median age of Mercer County is 44.8 years of age, which is higher than the median age of Pennsylvania at 40.9 and the national median of 38.8 years of age. The percentage of Mercer County under the age of 5 years old is 4.8%, under the age of 18 is 19.2%, between the ages of 18 and 64 years old is 53.4%, and aged 65 years old and older is 22.6%.

The median household income for households in Mercer County is $54,067.00 and the poverty rate of Mercer County is 12.4% of the total population. The poverty rate for the Commonwealth of Pennsylvania as a whole is 12.1%. There are approximately 8,480 veterans in Mercer County. The median veteran income in Mercer County as of 2021 was $32,522.00, with 6% of Mercer County veterans living below the poverty level. The veteran unemployment rate in the county was approximately 1.1%.

The Covid-19 Pandemic created an increase in unemployment and interruptions in employment throughout the United States, to include Pennsylvania and Mercer County. According to Pennsylvania Department of Labor and Industry data, there was a large spike in unemployment both across the Commonwealth and Mercer County. At the height of the Covid-19 Pandemic in the spring of 2020, the unemployment rate for Mercer County hit 17.6% of the working population of the county. That is higher than the peak unemployment percentage for Pennsylvania, which peaked at 16.5% of the working population of the entire state. *Figure 2 – Unemployment Rate Jan. 2012 to Oct. 2022* illustrates the trend and large spike in unemployment. The unemployment rate for Mercer County in October 2022 was 4.3%, which roughly accounted for 2,000 working age adults (ages 16 to 65). The total estimated workforce for Mercer County was 47,100 working age adults (ages 16 to 65) in October of 2022.

Figure 2 - Unemployment Rate Jan. 2012 to Oct. 2022



Source: Pennsylvania Department of Labor & Industry, Center for Workforce Information & Analysis (2022)

Mercer County's leading industries are healthcare, social services, retail trade, construction, and manufacturing. The primary employment providers within Mercer County are displayed below in *Table 2 – Mercer County Top Employers.*

Table 2 - Mercer County Top Employers

Mercer County Top Employers	
Ranking	**Company**
1	State Government
2	Wabtec US Rail Inc.
3	Wal-Mart Associates Inc.
4	Steward Sharon Regional Health System
5	Joy Cone Company
6	UPMC Horizon
7	First National Bank of Pennsylvania
8	NLMK Pennsylvania Corp
9	John Maneely Co.
10	Grove City College
Source: Pennsylvania Department of Labor & Industry, Center for Workforce Information & Analysis (2022)	

The top employers' data was obtained through the Pennsylvania Department of Labor and Industry, Center for Workforce Information and Analysis. This data only provided a list of

employers, their ranking, and North American Industry Classification System (NAICS) descriptions. *Table 3 – Quarterly Census of Employment and Wages, 2021 Annual Averages in Mercer County* only calls out how many locations per NAICS description and total number of employees.

Table 3 - Quarterly Census of Employment and Wages, 2021 Annual Averages in Mercer County

Quarterly Census of Employment and Wages, 2021 Annual Averages in Mercer County (PA DLI)					
NAICS	**Description**	**Number of Locations**	**Number of Employees**	**Employment Percentage**	**Average Wages**
11	Agriculture, Forestry, Fishing, and Hunting	28	217	.5%	$38,405.00
21	Mining, Quarrying, and Oil & Gas	16	174	.4%	$140,719.00
22	Utilities	13	196	.5%	$89,939.00
23	Construction	226	1,588	3.8%	$53,567.00
31-33	Manufacturing	195	7,601	18%	$61,980.00
42	Wholesale Trade	95	1,066	2.5%	$58,939.00
44-45	Retail Trade	419	5,880	13.9%	$30,101.00
48-49	Transportation and Warehousing	103	1,710	4%	$55,897.00
51	Information	21	279	.7%	$50,096.00
52	Finance and Insurance	133	1,457	3.4%	$84,100.00
53	Real Estate, Rental, and Leasing	73	279	.7%	$41,684.00
54	Professional and Technical Services	178	959	2.3%	$56,691.00
55	Management of Companies and Enterprises	29	585	1.4%	$96,067.00
56	Administrative and Waste Services	98	731	1.7%	$39,286.00
61	Educational Services	68	3,398	8%	$52,665.00
62	Healthcare and Social Assistance	552	8,847	20.9%	$47,781.00

Quarterly Census of Employment and Wages, 2021 Annual Averages in Mercer County (PA DLI)					
NAICS	**Description**	**Number of Locations**	**Number of Employees**	**Employment Percentage**	**Average Wages**
71	Arts, Entertainment, and Recreation	35	502	1.2%	$16,065.00
72	Accommodation and Food Services	260	3,761	8.9%	$17,184.00
81	Other Services (Except Public Administration)	276	1,406	3.3%	$24,392.00
92	Public Administration	70	1,703	4%	$55,366.00
-	**Total, All Industries**	**2,888**	**43,339**	**100%**	**$55,546.00**
Source: NAICS (North American Industry Classification System) (2022).					

2.4. Land Use and Development

Mercer County is composed of forty-eight municipalities, which include:

- Thirty-one townships
- Fourteen boroughs
- Three cities

The majority of acreage in Mercer County is forested, while approximately 36.31% (or 156,397 acres) of the acreage is agriculture. The land use in the county consists of forestland and provides recreational opportunity and wildlife habitat along the many lakes, ponds, and streams. A large portion of the land in Mercer County is also used for pasture of cropland.

Mercer County has approximately 430,720 acres of total land area, and 6,400 acres of water area, with a population per square mile of 162 persons based on 2020 data estimates. Mercer County is largely rural in character with a large portion of undeveloped landscape in the county. The amount of undeveloped land in the county has decreased over the past fifty years due to an increase in active agriculture and land disturbance. Both of these practices are considered development from a land use classification perspective. Forested areas makes up 37% of the county, while agriculture makes up approximately 50% of the total land area in Mercer County, and high density urban, low density urban, water, transitional, resource extraction, quarries, and wetlands each account for 10% of the land area. Only a small portion of land in Mercer County is designated as residential, as visualized in *Figure 7 – Mercer County Land Use*.

Future development for land use and land cover was examined to determine where future expansion may occur in the county. Consideration was given to the location of existing infrastructure, as well as possible future infrastructure expansion in urban and densely populated areas. The following municipalities were identified as the most prominent locations of future development within the county:

- City of Farrell
- City of Hermitage
- City of Sharon
- Mercer Borough
- Grove City Borough
- Greenville Borough

2.5. Data Sources

The following data sources were used during the update process:

- United States Census Bureau.
- National Climatic Data Center (NCDC).
- National Oceanic and Atmospheric Administration (NOAA).
- Pennsylvania Department of Conservation and Natural Resources (PA DCNR).
- Pennsylvania Department of Environmental Protection (PA DEP).
- Pennsylvania Department of Labor and Industry (PA DLI).
- Pennsylvania Groundwater Information System (PaGWIS).
- Pennsylvania Emergency Management Agency (PEMA).
- Mercer County Comprehensive Plan 2006.

The countywide Digital Flood Insurance Rate Maps (DFIRM) were used for all flood risk analysis and estimation of loss. The Mercer County DFIRMs were approved and effective in 2014 and 2017. The DFIRM database provides flood frequency and elevation information used in the flood hazard risk assessment. Other Mercer County GIS datasets including road centerlines, structures, and municipalities were utilized in conjunction with the DFIRM data.

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging weather events was compiled. A large number of natural-hazard events were gathered from the National Climatic Data Center (NCDC) database. The NCDC is a division of the United States Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by the NCDC from data gathered by the National Weather Service (NWS), another division of NOAA. The data is then presented by the NCDC as tabular data that can be queried in the United States Storm Events

database, which "documents the occurrences of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce" (NOAA, 2006). The classification of storm events in the database is based off of data collected from around the United States and the Commonwealth of Pennsylvania, so the data may not be filed under the correct storm category due to user input error. The reason for this data issue results from some storm events falling under multiple categories, including but not limited to winter storm, ice storm, tornado, hurricane / tropical storm, flooding, and flash flooding. Many of the events listed in the United States Storm Events database can fall under multiple of these categories. In an effort to include a comprehensive list of prior storm events for Mercer County, search queries with multiple storm classifications were conducted for each hazard.

Throughout the risk and vulnerability assessment included in Section 4 of this Hazard Mitigation Plan, descriptions of limited data indicate some areas in which the county and the municipalities can improve their ability to identify vulnerable structures and improve loss estimates. As the county and municipal governments work to increase their overall technical capacity and implement comprehensive planning goals, they will also attempt to improve the ability to identify areas of increased vulnerability.

This hazard mitigation plan evaluates the vulnerability of the county's community lifelines. For the purposes of this plan, community lifeline facilities are those entities that are essential to the health, welfare, and safety of the community. This includes but is not limited to airports, emergency medical service (EMS) stations, communication facilities and towers, day care centers and preschools, fire departments, hospitals and medical facilities, police departments, schools, and senior living facilities. The locations of these facilities were provided by the Mercer County GIS Department.

Community lifelines are broken down into seven categories (FEMA):

- **Safety and Security:** Law Enforcement/Security, Fire Service, Search and Resuce, Government Service, Community Safety
- **Food, Water, Shelter:** Food, Water, Shelter, Agriculture
- **Health and Medical:** Medical Care, Public Health, Patient Movement, Medical Supply Chain, Facility Management
- **Energy:** Power Grid, Fuel
- **Communications:** Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch
- **Transportation:** Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Marine
- **Hazardous Materials:** Facilities, HAZMAT, Pollutants, Contaminants

Geographic Information Systems (GIS) Data

GIS data was utilized in risk assessment, estimation of loss and the development of map products for the hazard mitigation plan update. A foundation of data was available from the Mercer County GIS Department. Some of the utilized data was downloaded from the Pennsylvania Spatial Data Access (PASDA). A large portion of the plan utilizes census data from the United States Census Bureau, but the 2020 census data collection and dissemination was disrupted due to the Covid-19 Pandemic in 2020 and 2021. The 2020 census data was distributed in late 2021 and is included in the HMP.

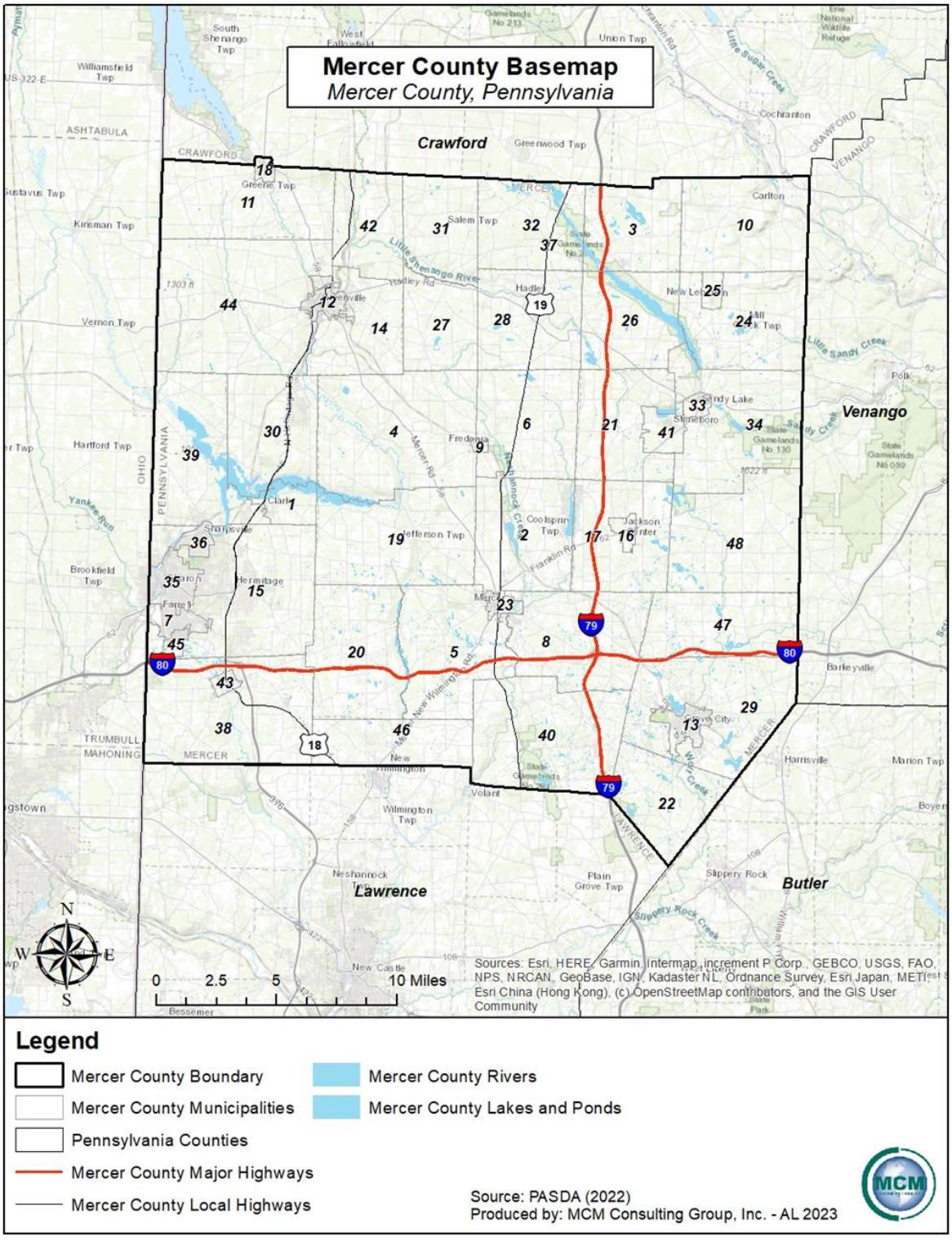
The Mercer County GIS Department provided the following layers for use in the development of hazard profiles and hazard profile mapping for the 2023 Hazard Mitigation Plan Update:

- County Address Points
- Road Centerlines

The following GIS Data layers were developed for use in the 2023 Hazard Mitigation Plan Update:

- Mercer County Fire Stations
- Mercer County EMS Locations
- Mercer County Hospitals
- Earthquake Vulnerability Areas
- Mobile Home Vulnerability Data
- Tornado Paths within Mercer County
- Mercer County Unconventional Oil and Gas Wells
- Mercer County Conventional Oil and Gas Wells
- Mercer County Levee Centerlines and Levee Protection Areas
- Mercer County Public Water Supply Areas

Figure 3 - Mercer County Basemap



Mercer County Basemap

Mercer County, Pennsylvania

Legend

- Mercer County Boundary
- Mercer County Municipalities
- Pennsylvania Counties
- Mercer County Major Highways
- Mercer County Local Highways
- Mercer County Rivers
- Mercer County Lakes and Ponds

Municipalities:
1. Clark Borough
2. Coolspring Township
3. Deer Creek Township
4. Delaware Township
5. East Lackawannock Township
6. Fairview Township
7. Farrell City
8. Findley Township
9. Fredonia Borough
10. French Creek Township
11. Greene Township
12. Greenville Borough
13. Grove City Borough
14. Hempfield Township
15. Hermitage City
16. Jackson Center Borough
17. Jackson Township
18. Jamestown Borough
19. Jefferson Township
20. Lackawannock Township
21. Lake Township
22. Liberty Township
23. Mercer Borough
24. Mill Creek Township

Municipalities:
25. New Lebanon Borough
26. New Vernon Township
27. Otter Creek Township
28. Perry Township
29. Pine Township
30. Pymatuning Township
31. Salem Township
32. Sandy Creek Township
33. Sandy Lake Borough
34. Sandy Lake Township
35. Sharon City
36. Sharpsville Borough
37. Sheakleyville Borough
38. Shenango Township
39. South Pymatuning Township
40. Springfield Township
41. Stoneboro Borough
42. Sugar Grove Township
43. West Middlesex Borough
44. West Salem Township
45. Wheatland Borough
46. Wilmington Township
47. Wolf Creek Township
48. Worth Township

0 2.5 5 10 Miles

Source: PASDA (2022)
Produced by: MCM Consulting Group, Inc. - AL 2023

Figure 4 - National Register of Historic Places in Mercer County

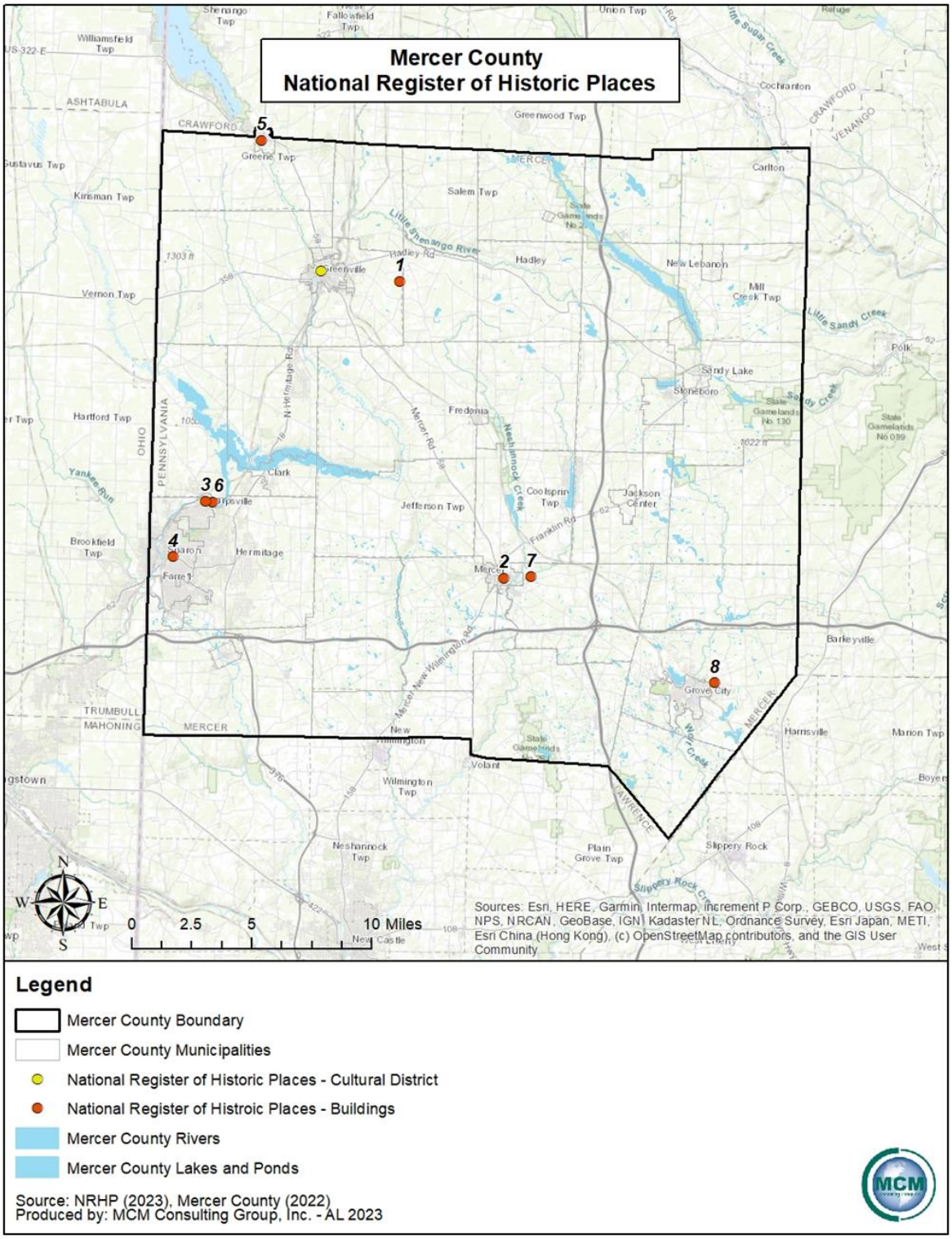


Figure 5 - Mercer County Watersheds

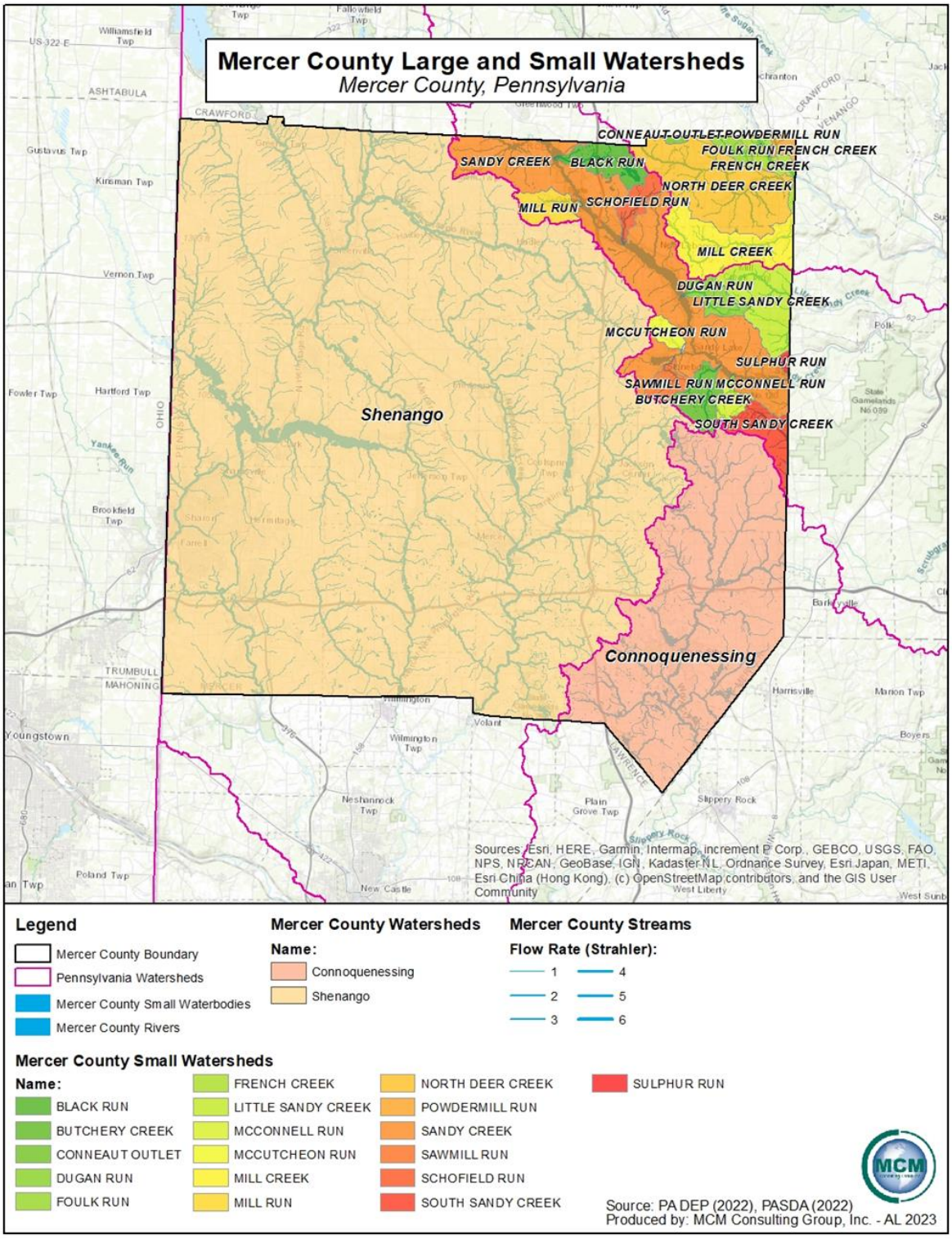


Figure 6 - Mercer County Population Density

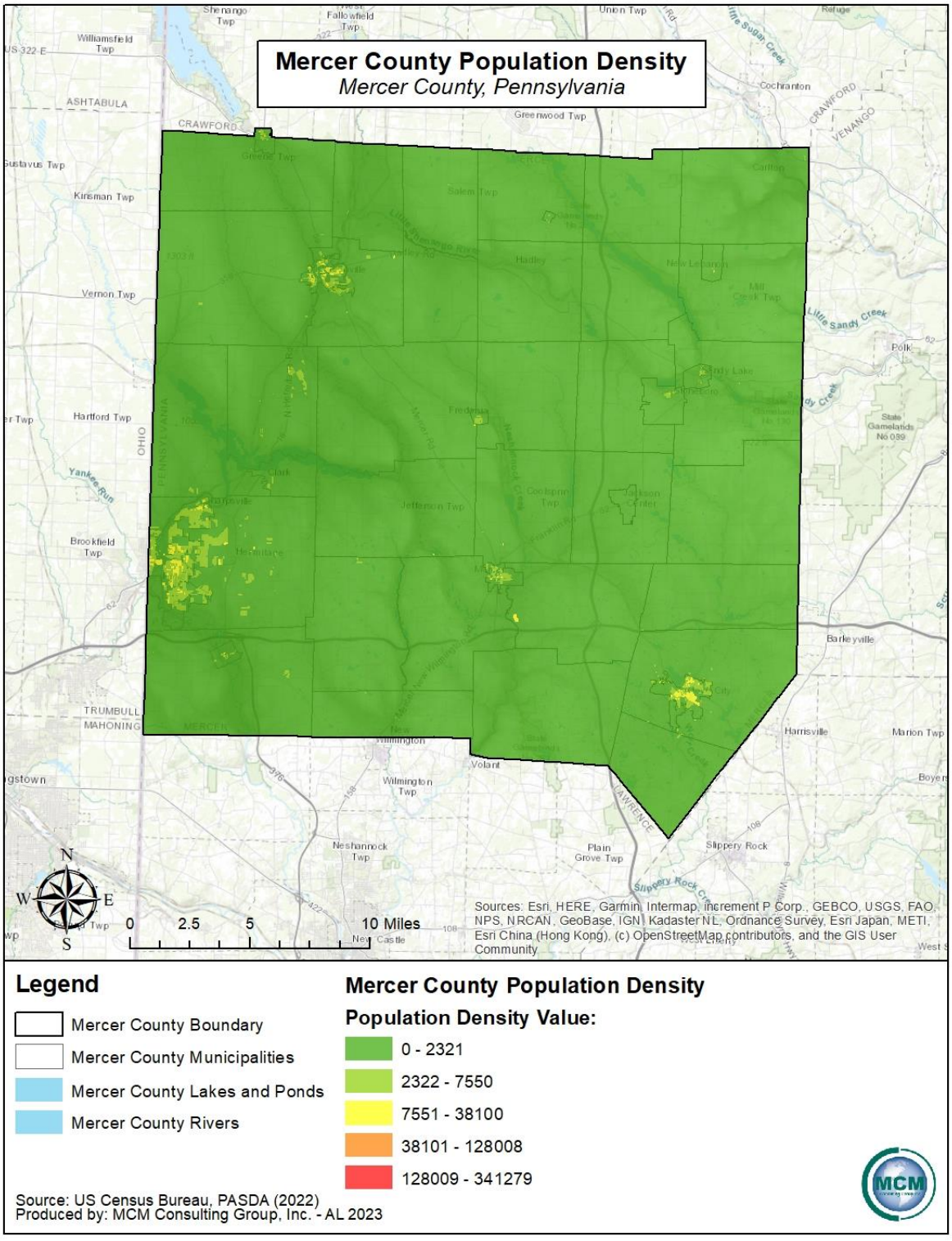
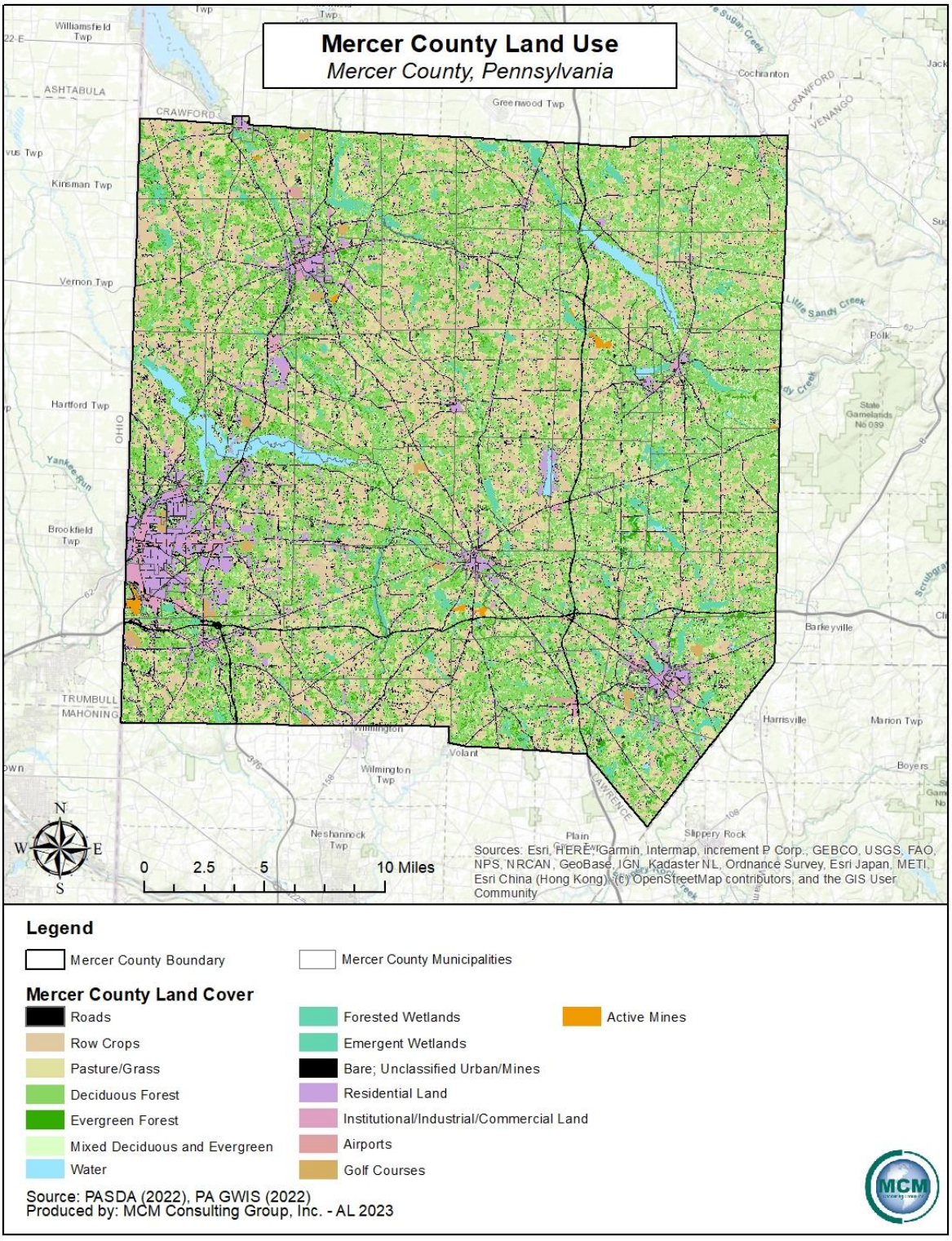


Figure 7 - Mercer County Land Use



3. Planning Process

3.1. Update Process and Participation Summary

The Mercer County Hazard Mitigation Plan update began October 5th, 2022. The Mercer County Commissioners were able to secure a hazard mitigation grant to start the process. The Mercer County Department of Public Safety was identified as the lead agency for the Mercer County Hazard Mitigation Plan update. The planning process involved a variety of key decision makers and stakeholders within Mercer County. Mercer County immediately determined that the utilization of a contracted consulting agency would be necessary to assist with the plan update process. MCM Consulting Group, Inc. was selected as the contracted consulting agency to complete the update of the hazard mitigation plan. The core hazard mitigation team, which was referred to as the steering committee, included officials from the Mercer County Department of Public Safety and MCM Consulting Group, Inc. (MCM).

The process was developed around the requirements laid out in the Federal Emergency Management Agency (FEMA) Local Hazard Mitigation Crosswalk, referenced throughout this plan, as well as numerous other guidance documents including, but not limited to, Pennsylvania's All-Hazard Mitigation Standard Operating Guide, FEMA's State and Local Mitigation Planning How-to Guide series of documents (FEMA 386-series), and the National Fire Protection Association (NFPA) 1600 Standard on Disaster/Emergency Management and Business Continuity Programs.

MCM Consulting Group, Inc. assisted Mercer County Department of Public Safety in coordinating and leading public involvement meetings, local planning team meetings, analysis, and the writing of the updated HMP. The Mercer County Local Planning Team (LPT) worked closely with MCM in the writing and review of the HMP. MCM conducted project meetings and local planning team meetings throughout the update process. Due to COVID-19, meetings were held with the option to attend virtually. Meeting agendas, meeting minutes and sign-in sheets were developed and maintained for each meeting conducted by MCM. These documents are detailed in Appendix C of this plan.

Public meetings with local elected officials were held, as well as work sessions and in-progress review meetings with the Mercer County Local Planning Team and staff. At each of the public meetings, respecting the importance of local knowledge, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability's assessment and review, and eventually adopt the county hazard mitigation plan. Mercer County will continue to work with all local municipalities to collect local hazard mitigation project opportunities.

The HMP planning process consisted of:

- Applying for and receiving a hazard mitigation planning grant (HMPG) to fund the planning project.
- Announcing the initiative via press releases and postings on the county website.
- Involving elected and appointed county and municipal officials in a series of meetings, training sessions, and workshops.
- Identifying capabilities and reviewed the information with the municipalities.
- Identifying hazards.
- Assessment of risk and analyzing vulnerabilities.
- Identifying mitigation strategies, goals, and objectives.
- Developing an implementation plan.
- Announcing completion via press releases and postings on the county website.
- Plan adoption at a public meeting of the Mercer County Board of Commissioners.
- Plan submission to FEMA and PEMA.

The 2023 Mercer County HMP was completed March 1, 2023. The 2023 plan follows an outline developed by PEMA which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. The 2023 HMP format is consistent with the PEMA recommended format. The 2023 Mercer County HMP combined dam failure and levee failure profiles; and has added additional hazard profiles to the HMP, and these additional profiles increased the subsections in section 4.3 of the HMP.

3.2. The Planning Team

The 2023 Mercer County Hazard Mitigation Plan update was led by the Mercer County Steering Committee. The Mercer County Steering Committee provided guidance and leadership for the overall project. The steering committee assisted MCM Consulting Group, Inc. with dissemination of information and administrative tasks. *Table 4 – Steering Committee* outlines the individuals that comprised this team.

Table 4 - Steering Committee

Mercer County Hazard Mitigation Plan Update Steering Committee		
Name	**Organization**	**Position**
Frank Jannetti	Mercer County Department of Public Safety	Director
John Nicklin	Mercer County Department of Public Safety	Deputy Director

Mercer County Hazard Mitigation Plan Update Steering Committee		
Name	**Organization**	**Position**
Debbie Hartley	Mercer County Department of Public Safety	Administrative Assistant
Michael Rearick	MCM Consulting Group, Inc.	Director of Operations
Adam Leister	MCM Consulting Group, Inc.	Senior GIS Consultant
Valerie Zents	MCM Consulting Group, Inc.	Senior Consultant
Daniel Becker	MCM Consulting Group, Inc.	Consultant

In order to represent the county, the Mercer County Steering Committee developed a diversified list of potential local planning team (LPT) members. Members that participated in the 2018 hazard mitigation plan were highly encouraged to join the 2023 team. The steering committee then provided invitations to the prospective members and provided a description of duties to serve on the LPT. The invitations for members of the LPT were disseminated by the Mercer County Department of Public Safety utilizing letters, email, and telephone calls. The LPT worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The Steering Committee looked at a comprehensive list of individuals to invite to the Local Planning Team including the following individuals from the Commonwealth of Pennsylvania and the Federal Government:

Commonwealth of Pennsylvania:

- PA Department of Environmental Protection (Dam Safety Officer)
- PA Game Commission
- PA DCNR Department of Forestry
- PA DCNR Bureau of Parks
- PA Department of Agriculture
- PA Department of Health
- PASSHE
- PennDOT
- Penn State Cooperative Extension Services
- PEMA (area hazard mitigation officer)

Federal Government:

- USACE Dam Safety Officer
- FEMA Region III
- US Forestry Service

An initial email request from the Mercer County Department of Public Safety was sent to all local, state, and federal stakeholders identified to participate in the Local Planning Team Kickoff on September 23rd, 2022, and the kickoff meeting was held on October 17th, 2022.

The stakeholders listed in *Table 5 – Local Planning Team* served on the 2023 Mercer County Hazard Mitigation Local Planning Team, actively participated in the planning process by attending meetings, completing assessments, surveys, and worksheets and/or submitting comments.

Table 5 - Local Planning Team

Mercer County Hazard Mitigation Plan Local Planning Team		
Name	**Organization**	**Position**
Frank Jannetti	Mercer County Department of Public Safety	Director
John Nicklin	Mercer County Department of Public Safety	Deputy Director
Debbie Hartley	Mercer County Department of Public Safety	Administrative Assistant
Matt McConnell	Mercer County Commissioners	Commissioner
Jay Russell	Mercer County Conservation District	Manager
Sean McLaughlin	Mercer County GIS Department	GIS Coordinator
Will Chittester	Mercer County GIS Department	GIS Technician
Katie Tomanek	Mercer County Bridge Department	Administrator
Daniel Gracenin	Mercer County Planning Commission	Executive Director
Darrell Chapman	Mercer County PennDOT	Senior Highway Maintenance Manager
Zach Miles	Mercer County PennDOT	Assistant Co-Manager
Elissa Wright	Mercer County PennDOT	Maintenance Coordinator
Charlie Hughes	PEMA – Western Area	Emergency Management Specialist
Jeff Giardina	Pennsylvania Fish and Boat Commission	Waterway Conservation Officer
Wendy Westberg	Maurice Goddard State Park	
Bill Spring	USACE Shenango River Lake	Resource Manager
Aaron Haflich	USACE Shenango River Lake	Natural Resource Specialist
Beth Black	Grove City Area Chamber of Commerce	Executive Director
Janice Schwanbeck	Greenville Chamber of Commerce	Executive Director
Seth Van Til	Grove City Police Department	

Mercer County Hazard Mitigation Plan Local Planning Team		
Name	**Organization**	**Position**
Sherwood Raymer	Thiel College Police Department	Captain
Kent McFadden	Grove City College	Assistant Director of Campus Security
Craig Conforti	Penn State Extension	Client Relationship Manager

3.3. Meetings and Documentation

Meetings with local elected officials and the local planning team were held as needed. At each of the meetings, municipal officials were strongly encouraged to submit hazard mitigation project opportunity forms, complete their respective portions of the capability assessment, review and eventually adopt the multi-jurisdictional HMP. *Table 6 – HMP Process Timeline* lists the meetings held during the HMP planning process, which organizations and municipalities attended and the topic that was discussed at each meeting. All meeting agendas, sign-in sheets, presentation slides, and other documentation is in Appendix C.

The draft plan was made available for public review on February 1, 2023. The draft was advertised on Mercer County's social media page and was made available digitally on the Mercer County website at:

https://www.mercercountypa.gov/hazard.mitigation/default.htm

The public comment period remained open until March 1, 2023. All public comments were submitted via an online survey or in writing to Debbie Hartley at the Mercer County Department of Public Safety. Public commenting was available during the public comment period via a Survey Monkey link that was advertised on the county website and social media pages. No public comments were received for this planning period, so no comments are included in Appendix C of this hazard mitigation plan update.

Table 6 - HMP Process Timeline

Mercer County HMP Process Timeline		
Date	**Meeting**	**Description**
10/05/2022	Mercer County Hazard Mitigation Plan Steering Committee Kickoff Meeting	Meeting was used to determine people to invite to the local planning team and to review the project schedule.

Mercer County HMP Process Timeline		
Date	**Meeting**	**Description**
10/17/2022	Mercer County HMP Local Planning Team Kickoff Meeting	Meeting was used to review the project schedule and discuss roles and responsibilities for the hazard mitigation plan. Stakeholders were also identified, and the initial worksheets were introduced and reviewed (Hazard ID, Capability Assessment, and NFIP Survey).
10/17/2022	Municipality Kickoff Meetings	Meeting was used to review the roles and responsibilities of municipality members in the process. Introduction of worksheets for municipality completion. Discussion was also held for the 2018 Hazard Mitigation Plan.
11/17/2022	Local Planning Team Risk Assessment Meeting	Meeting was used to review the results of the initial documentation. Selection of hazards for the 2023 hazard mitigation plan was conducted. Risk factor scores were also updated based on changing situation since 2018.
11/17/2022	Local Planning Team Mitigation Strategy Meeting	Meetings was used to discuss the initial 2018 goals, objectives, and actions review for the hazard mitigation plan. Meeting was also used to discuss mitigation project opportunities.
12/13/2022	Local Planning Team Mitigation Strategy Meeting	Meeting was used to review finalized 2023 mitigation goals and objectives. The review of the 2018 mitigation actions from Mercer County was also reviewed.
12/13/2022	Public Meeting Risk Assessment	Meeting was used to offer the public an opportunity to review the risk assessment section of the 2023 hazard mitigation plan.
12/13/2022	Municipality Mitigation Strategy Meeting	In person meetings to educate county and elected officials on mitigation strategy including new mitigation project opportunities. Also conducted during this meeting was the municipal risk factor comparison for all municipalities in attendance.

Mercer County HMP Process Timeline		
Date	**Meeting**	**Description**
01/31/2023	Public Meeting – Entire HMP	Meeting was used to offer the public an opportunity to review the completed HMP.

3.4. Public and Stakeholder Participation

Mercer County engaged numerous stakeholders and encouraged public participation during the HMP update process. Advertisements for public meetings were completed utilizing the local newspaper and the Mercer County website. Copies of those advertisements are in Appendix C. Municipalities and other county entities were invited to participate in various meetings and encouraged to review and update various worksheets and surveys. Copies of all meeting agendas, meeting minutes and sign-in sheets are located in Appendix C. Worksheets and surveys completed by the municipalities and other stakeholders are located in appendices of this plan update as well. Municipalities were also encouraged to review hazard mitigation related items with other constituents located in the municipality like businesses, academia, private and nonprofit interests.

The tools listed below were distributed with meeting invitations, provided directly to municipalities for completion and return to the Mercer County Department of Public Safety or at meetings to solicit information, data, and comments from both local municipalities and other key stakeholders. Responses to these worksheets and surveys are available for review at the Mercer County Department of Public Safety.

1. **Risk Assessment Hazard Identification and Risk Evaluation Worksheet**: Capitalizes on local knowledge to evaluate the change in the frequency of occurrence, magnitude, or impact and/or geographic extent of existing hazards and allows communities to evaluate hazards not previously profiled using the Pennsylvania Standard List of Hazards.
2. **Capability Assessment Survey**: Collects information on local planning, regulatory, administrative, technical, fiscal, and political capabilities that can be included in the countywide mitigation strategy.
3. **Municipal Project Opportunity Forms and Mitigation Actions**: Copies of the 2018 mitigation opportunity forms that were included in the current HMP were provided to the municipalities for review and amendment. These opportunities are located in Appendix G. The previous mitigation actions were provided and reviewed at update meetings. New 2023 municipal project opportunity forms are included as well, located in Appendix G.

In an effort to capture public input, the Mercer County LPT held in person meetings and offered on-line surveys. Members of the public were also encouraged to contact Mercer County Department of Public Safety or MCM Consulting Group, Inc. with any comments or questions

regarding this update. Any public comment that was received during public meetings or during the draft review of the plan were documented and included in the plan. Copies of newspaper public meeting notices, website posted public notices, and other correspondence are included in Appendix C of this plan.

Mercer County invited all contiguous counties to be a part of the local planning team. A letter was sent to the emergency management coordinators in Butler, Crawford, Lawrence, and Venango counties in Pennsylvania, on September 23, 2022. Each contiguous county was also offered a chance to review the 2023 draft hazard mitigation plan during the public comment period.

3.5. Multi-Jurisdictional Planning

Mercer County used an open, public process to prepare this HMP. Meetings and letters to municipal officials were conducted to inform and educate them about hazard mitigation planning and its local requirements. Municipal officials provided information related to existing codes and ordinances, the risk and impacts of known hazards on local infrastructure and critical facilities and recommendations for related mitigation opportunities. The pinnacle to the municipal involvement process was the adoption of the final plan. *Table 7 – Municipality Worksheets, Surveys, and Forms Participation* reflects the municipalities participation by completing worksheets, surveys, and forms.

Table 7 - Municipality Worksheets, Surveys, and Forms Participants

Mercer County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP**	**Hazard Mitigation Opportunity Form Review and Updates**
Clark Borough	**X**	**X**	**X**	**X**
Coolspring Township	**X**	**X**	**X**	**X**
Deer Creek Township	**X**	**X**	**X**	**X**
Delaware Township	**X**	**X**	**X**	**X**
East Lackawannock Township	**X**	**X**	**X**	**X**
Fairview Township	**X**	**X**	**X**	**X**
Farrell City	**X**	**X**	**X**	
Findley Township	**X**	**X**	**X**	**X**
Fredonia Borough		**X**	**X**	
French Creek Township	**X**	**X**	**X**	**X**

Mercer County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP**	**Hazard Mitigation Opportunity Form Review and Updates**
Greene Township	X	X	X	X
Greenville Borough	X	X	X	X
Grove City Borough	X	X	X	X
Hempfield Township	X	X	X	
Hermitage City	X	X	X	
Jackson Township	X	X	X	X
Jackson Center Borough	X	X	X	X
Jamestown Borough	X	X	X	X
Jefferson Township		X		X
Lackawannock Township			X	
Lake Township	X	X	X	
Liberty Township	X	X	X	
Mercer Borough	X	X	X	
Mill Creek Township	X	X	X	
New Lebanon Borough	X	X	X	X
New Vernon Township	X	X		
Otter Creek Township	X	X	X	
Perry Township	X	X	X	X
Pine Township	X	X	X	X
Pymatuning Township	X	X	X	
Salem Township	X	X	X	
Sandy Creek Township	X	X	X	X
Sandy Lake Borough	X	X	X	X
Sandy Lake Township		X		X
Sharon City	X	X	X	
Sharpsville Borough	X	X	X	
Sheakleyville Borough		X		
Shenango Township	X	X	X	
South Pymatuning Township		X		
Springfield Township	X	X		
Stoneboro Borough		X		
Sugar Grove Township	X	X		X
West Middlesex Borough		X		

Mercer County HMP Worksheets, Surveys, and Forms Participation				
Municipality	**Capability Assessment Survey**	**Risk Assessment Hazard Identification and Risk Evaluation Worksheet**	**NFIP**	**Hazard Mitigation Opportunity Form Review and Updates**
West Salem Township	**X**	**X**	**X**	
Wheatland Borough	**X**	**X**	**X**	
Wilmington Township	**X**	**X**	**X**	**X**
Wolf Creek Township	**X**	**X**	**X**	
Worth Township	**X**	**X**	**X**	**X**

The majority of the forty-eight municipalities within Mercer County adopted the 2018 Mercer County Hazard Mitigation Plan as the municipal hazard mitigation plan. The goal of the Mercer County Local Planning Team is to have 100% participation by municipalities in adopting the 2023 Mercer County Hazard Mitigation.

The table above was completed with the most accurate information available at the time of the writing of this Hazard Mitigation Plan Update. Since the writing of this plan, some of the municipalities listed above have provided information to Mercer County which updates their participation status. With forty-eight municipalities participating in the planning process, and submitting paperwork, the participation percentage for this hazard mitigation plan is 100%.

4. Risk Assessment

4.1. Update Process Summary

A key component to reducing future loss is to first have a clear understanding of what the current risks are and what steps may be taken to lessen their threat. The development of the risk assessment is a critical first step in the entire mitigation process, as it is an organized and coordinated way of assessing potential hazards and risks. The risk assessment identifies the effects of both natural and human-caused hazards and describes each hazard in terms of its frequency, severity, and county impact. Numerous hazards were identified as part of the process.

A risk assessment evaluates threats associated with a specific hazard and is defined by probability and frequency of occurrence, magnitude, severity, exposure, and consequences. The Mercer County risk assessment provides in-depth knowledge of the hazards and vulnerabilities that affect Mercer County and its municipalities. This document uses an all-hazards approach when evaluating the hazards that affect the county and the associated risks and impacts each hazard presents.

This risk assessment provides the basic information necessary to develop effective hazard mitigation/prevention strategies. Moreover, this document provides the foundation for the Mercer County Emergency Operations Plan (EOP), local EOPs and other public and private emergency management plans.

The Mercer County risk assessment is not a static document, but rather, is a biennial review requiring periodic updates. Potential future hazards include changing technology, new facilities and infrastructure, dynamic development patterns and demographic and socioeconomic changes into or out of hazard areas. By contrast, old hazards, such as brownfields and landfills, may pose new threats as county conditions evolve.

Using the best information available and geographic information systems (GIS) technologies, the county can objectively analyze its hazards and vulnerabilities. Assessing past events is limited by the number of occurrences, scope and changing circumstances. For example, ever-changing development patterns in Pennsylvania have a dynamic impact on traffic patterns, population density and distribution, storm water runoff and other related factors. Therefore, limiting the risk assessment to past events is myopic and inadequate.

The Mercer County Local Planning Team (LPT) reviewed and assessed the change in risk for all natural and human-caused hazards identified in the 2018 hazard mitigation plan. The mitigation planning team then identified hazards that were outlined within the Pennsylvania Hazard Mitigation Plan but not included in the 2018 Mercer County Hazard Mitigation Plan that could

impact Mercer County. The team utilized the hazard identification and risk evaluation worksheet that was provided by the Pennsylvania Emergency Management Agency.

The Mercer County Steering Committee met with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheet. All municipalities in Mercer County returned a completed worksheet. This information was combined with the county information to develop an overall list of hazards that would need to be profiled.

Once the natural and human-caused hazards were identified and profiled, the local planning team then completed a vulnerability assessment for each hazard. An inventory of vulnerable assets was completed utilizing GIS data and local planning team knowledge. The team used the most recent Mercer County assessment data to estimate loss to particular hazards. Risk factor was then assessed to each of the twenty-seven hazard aspects utilizing the hazard prioritization matrix. This assessment allows the county and its municipalities to focus on and prioritize local mitigation efforts on areas that are most likely to be damaged or require early response to a hazard event.

4.2. Hazard Identification

4.2.1. Presidential and Gubernatorial Disaster Declarations

Table 8 – Presidential & Gubernatorial Disaster Declarations contains a list of all Presidential and Gubernatorial disaster declarations that have affected Mercer County and its municipalities from 1955 through 2022, according to the Pennsylvania Emergency Management Agency.

Table 8 - Presidential & Gubernatorial Disaster Declarations

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
June, 1972	Flood (Agnes)	Presidential Disaster Declaration
January, 1977	Snowstorm	Presidential Declaration
June, 1981	Severe Storms & Flooding	Presidential Declaration
June, 1985	Severe Storm & High Winds	Presidential Declaration
1991	Drought	Gubernatorial Disaster Declaration
March, 1993	Blizzard	Presidential Emergency Declaration
January, 1996	Flooding	Presidential Disaster Declaration
July, 1999	Drought	Gubernatorial Declaration
August, 2003	High Winds & Heavy Rain	Presidential Declaration
September, 2005	Hurricane Katrina – Mutual Aid	Presidential Emergency Declaration

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
September, 2005	Hurricane Katrina	Gubernatorial Proclamation of Emergency – All Counties
September, 2006	Tropical Depression Ernesto	Gubernatorial Proclamation of Emergency – All Counties
February, 2007	Severe Winter Storms	Gubernatorial Proclamation of Emergency – All Counties
April, 2007	Severe Storm	Gubernatorial Proclamation of Emergency – All Counties
January, 2011	Severe Winter Storms	Gubernatorial Proclamation of Emergency – All Counties
August, 2011	Tropical Storm Irene/Lee	Gubernatorial Proclamation of Emergency – All Counties
April, 2012	Spring Winter Storms	Gubernatorial Proclamation of Emergency – All Counties
October, 2012	Hurricane Sandy	Presidential Emergency Declaration
October, 2012	Hurricane Sandy	Gubernatorial Proclamation of Emergency
June, 2013	High Winds, Thunderstorms, Heavy Rain, Tornado and Flooding	Gubernatorial Proclamation of Emergency – All Counties
June, 2018	Severe Weather Event	Gubernatorial Proclamation of Emergency – All Counties
January, 2019	Severe Weather Event	Gubernatorial Proclamation of Emergency – All Counties
January, 2020	COVID-19 Pandemic	Presidential Disaster Declaration
March, 2020	Coronavirus (COVID-19)	Gubernatorial Proclamation of Emergency – All Counties
May, 2020	Civil Disturbance	Gubernatorial Proclamation of Emergency – All Counties
October, 2020	Civil Disturbance	Gubernatorial Proclamation of Emergency – All Counties
December, 2020	Winter Weather	Gubernatorial Proclamation of Emergency – All Counties

Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations		
Date	**Hazard Event**	**Action**
February, 2021	Winter Weather	Gubernatorial Proclamation of Emergency – All Counties
April, 2021	Civil Disturbance	Gubernatorial Proclamation of Emergency – All Counties
Source: Pennsylvania Emergency Management Agency and Federal Emergency Management Agency		

4.2.2. Summary of Hazards

The Mercer County LPT was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2023 HMP Update. Following a review of the hazards considered in the 2018 HMP and the standard list of hazards, the local planning team decided that the 2023 plan should identify, profile, and analyze twenty-one hazards. These twenty-one hazards include all of the hazards profiled in the 2018 plan and the new profiles determined by the Local Planning Team. The list below contains the hazards that have the potential to impact Mercer County as identified through previous risk assessments, the Mercer County Hazard Vulnerability Analysis and input from those who participated in the 2023 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

Identified Natural Hazards

Drought
Drought is defined as a deficiency of precipitation experienced over an extended period of time, usually a season or more. Droughts increase the risk of other hazards, like wildfires, flash floods, and landslides or debris flows. This hazard is of particular concern in Pennsylvania due to the prevalence of farming and other water-dependent industries, water dependent recreation uses, and residents who depend on wells for drinking water.

Earthquake
An earthquake is the motion or trembling of the ground produced by the sudden displacement of rock usually within the upper ten to twenty miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons and disrupt the social and economic functioning of the affected area. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking, which is dependent upon the amplitude and duration of the earthquake.

Flooding, Flash Flooding, and Ice Jam Flooding

Flooding is the temporary condition of partial or complete inundation of normally dry land, and it is the most frequent and costly of all-natural hazards in Pennsylvania. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams.

Hurricane/Tropical Storm

Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. Potential threats from hurricanes include powerful winds, heavy rainfall, storm surges, coastal and inland flooding, rip currents, tornadoes, and landslides. The Atlantic hurricane season runs from June 1 to November 30.

Invasive Species

An invasive species is a species that is not indigenous to the ecosystem under consideration and whose introduction causes or is likely to cause economic, environmental, or human harm. These species can be any type of organism: plant, fish, invertebrate, mammal, bird, disease, or pathogen.

Landslide

In a landslide, masses of rock, earth or debris move down a slope. Landslides can be caused by a variety of factors, including earthquakes, storms, fire, and human modification of land. Areas that are prone to landslide hazards include previous landslide areas, areas on or at the base of slopes, areas in or at the base of drainage hollows, developed hillsides with leach field septic systems, and areas recently burned by forest or brush fires.

Pandemic and Infectious Disease

A pandemic is a global outbreak of disease that occurs when a new virus emerges in the human population, spreading easily in a sustained manner, and causing serious illness. An epidemic describes a smaller scale infectious outbreak, within a region or population, that emerges at a

disproportionate rate. Infectious disease outbreaks may be widely dispersed geographically, impact large numbers of the population, and could arrive in waves lasting several months at a time.

Radon Exposure

Radon is a radioactive gas produced by the breakdown of uranium in soil and rock that can lead to lung cancer in people exposed over a long period of time. Most exposure comes from breathing in radon gas that enters homes and buildings through foundation cracks and other openings. According to the DEP, approximately 40% of Pennsylvania homes have elevated radon levels.

Subsidence/Sinkhole

Land subsidence is a gradual settling or sudden sinking of the ground surface due to the movement of subsurface materials. A sinkhole is a subsidence feature resulting from the sinking of surficial material into a pre-existing subsurface void. Subsidence and sinkholes are geologic hazards that can impact roadways and buildings and disrupt utility services. Subsidence and sinkholes are most common in areas underlain by limestone and can be exacerbated by human activities such as water, natural gas, and oil extraction.

Tornadoes/Windstorm

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. About 1,250 tornadoes hit the U.S. each year, with about sixteen hitting Pennsylvania. Damaging winds exceeding 50-60 miles per hour can occur during tornadoes, severe thunderstorms, winter storms, or coastal storms. These winds can have severe impacts on buildings, pulling off the roof covering, roof deck, or wall siding and pushing or pulling off the windows.

Wildfire

A wildfire is an unplanned fire that burnt in a natural area. Wildfires can cause injuries or death and can ruin homes in their path. Wildfires can be caused by humans or lightning, and can happen anytime, though the risk increases in period of little rain. In Pennsylvania, 98% of wildfires are caused by people.

Winter Storm

A winter storm is a storm in which the main types of precipitation are snow, sleet, or freezing rain. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Most deaths from

winter storms are not directly related to the storm itself, but result from traffic accidents on icy roads, medical emergencies while shoveling snow, or hypothermia from prolonged exposure to cold.

Identified Human-Caused Hazard

Civil Disturbance
A civil disturbance is defined by FEMA as a civil unrest activity (such as a demonstration, riot, or strike) that disrupts a community and requires intervention to maintain public safety.

Dam Failure
Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides. The consequences of dam failures can include property and environmental damage and loss of life.

Emergency Services
Emergency medical services (EMS) and fire department services play a crucial role in the emergency response system, and the functionality of these emergency services directly impacts many of the other hazard profiles in this report. Both EMS and fire services face challenges from lack of funding and lower rates of volunteerism.

Environmental Hazards/Hazardous Materials
Environmental hazards are hazards that pose threats to the natural environment, the built environment and public safety through the diffusion of harmful substances, materials, or products. Environmental hazards include the following:

- Hazardous material releases: at fixed facilities or as such materials are in transit and including toxic chemicals, infectious substances, biohazardous waste and any materials that are explosive, corrosive, flammable, or radioactive (PL 1990-165, § 207(e)).
- Air or Water Pollution; the release of harmful chemical and waste materials into water bodies or the atmosphere, for example (National Institute of Health Sciences, July 2009; Environmental Protection Agency, Natural Disaster PSAs, 2009).
- Superfund Facilities: hazards originating from abandoned hazardous waste sites listed on the National Priorities List (Environmental Protection Agency, National Priorities List, 2009).
- Manure Spills: involving the release of stored or transported agricultural waste, for example (Environmental Protection Agency, Environmental Impacts of…, 1998).

- Product Defect or Contamination; highly flammable or otherwise unsafe consumer products and dangerous foods (Consumer Product Safety Commission, 2003).
- Hazardous material releases can contaminate air, water, and soils and have the potential to cause injury or death. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events.

Levee Failure

A levee is a human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide protection from temporary flooding (FEMA, 2016). A levee failure or breach occurs when a levee fails to prevent flooding on the landside of the levee. The consequences of a sudden levee failure can be catastrophic, with the resulting flooding causing loss of life, emergency evacuations, and significant property damage.

Nuclear Incident

Nuclear explosions can cause significant damage and casualties from blast, heat, and radiation. The primary concern following a nuclear accident or nuclear attack is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects.

Opioid Epidemic

An opioid epidemic is the rapid increase in the use of prescription and non-prescription opioid drugs in the United States beginning in the late 1990s and continuing throughout the first two decades of the 2000s. Opioids are a diverse class of moderately strong painkillers, including oxycodone, hydrocodone, and a very strong painkiller, fentanyl, which is synthesized to resemble other opiates such as opium-derived morphine and heroin. The potency and availability of these substances, despite their high risk of addiction and overdose, have made them popular both as formal medical treatments and as recreational drugs. Due to their sedative effects on the part of the brain which regulates breathing, opioids in high doses present the potential for respiratory depression and may cause respiratory failure and death.

The Commonwealth of Pennsylvania, along with other states in the nation has enacted legislation to curb the prescription and distribution of these drugs to try to prevent addiction rising from abuse as a painkiller. This includes but is not limited to restrictions to prescribing to minors,

quantity limits, a prescription database with entry requirements and other limits to its availability.

Terrorism/Cyberterrorism Incidents

Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear, and radiological weapons. Cyber-attacks have become an increasingly pressing concern. Cyberterrorism refers to acts of terrorism committed using computers, networks, and the internet. The most widely cited definition comes from Denning's Testimony before the Special Oversight Panel on Terrorism: "Cyberterrorism…is generally understood to mean unlawful attacks and threats of attack against computers, networks, and the information stored therein when done to intimidate or coerce a government or its people in furtherance of political or social objectives. Further, to qualify as cyberterrorism, an attack should result in violence against persons or property, or at least cause enough harm to generate fear".

Transportation Accidents

Transportation accidents are technological hazards involving the nation's system of land, sea, and air transportation infrastructure. A flaw or breakdown in any component of this system can and often does result in a major disaster involving loss of life, injuries, property and environmental damage, and economic consequences.

Utility Interruption

Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications and public works and information network sectors. Utility interruption hazards include the following:

- Geomagnetic Storms; including temporary disturbances of the Earth's magnetic field resulting in disruptions of communication, navigation, and satellite systems (National Research Council et al., 1986).
- Fuel or Resource Shortage; resulting from supply chain breaks or secondary to other hazard events, for example (McGrady County, PA, 2005).
- Electromagnetic Pulse; originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996).
- Information Technology Failure; due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991).

- Ancillary Support Equipment; electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst & Kirby, 1996).
- Public Works Failure; damage to or failure of highways, flood control systems, deep-water ports and harbors, public buildings, bridges, dams, for example (Unit-ed States Senate Committee on Environment and Public Works, 2009).
- Telecommunications System Failure; Damage to data transfer, communications, and processing equipment, for example (FEMA, 1997)
- Transmission Facility or Linear Utility Accident; liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005)
- Major Energy, Power, Utility Failure; interruptions of generation and distribution, power outages, for example (United States Department of Energy, 2000).

4.2.3. Climate Change

Impacts of Climate Change on Identified Hazards

Humans have become the dominant species on Earth and our society and influence is globalized. Human activity such as the large-scale consumption of fossil fuels and de-forestation has caused atmospheric carbon dioxide concentrations to significantly increase and a notable diversity of species to go extinct. The result is rapid climate change unparalleled in Earth's history and an extinction event approaching the level of a mass extinction (Barnosky et al., 2011; Wake & Vredenburg, 2008). The corresponding rise of average atmospheric temperatures is intensifying many natural hazards, and further threatening biodiversity. The effects of climate change on these hazards are expected to intensify over time as temperatures continue to rise, so it is prudent to be aware of how climate change is impacting natural hazards.

The most obvious change is in regard to extreme temperature. As average atmospheric temperatures rise, extreme high temperatures become more threatening, with record high temperatures outnumbering record low temperatures 2:1 in recent years. As climate change intensifies, it is expected that the risk of extreme heat will be amplified whereas the risk of extreme cold will be attenuated. Some studies show increased insect activities during a similar rapid warming event in Earth's history. Other studies make projections that with the warming temperatures and lower annual precipitation that are expected with climate change, there will be an expansion of the suitable climate for mosquitos, potentially increasing the risk of infectious disease.

Climate change is likely to increase the risk of droughts (Section 4.3.1). Higher average temperatures mean that more precipitation will fall as rain rather than snow, snow will melt earlier in the spring, and evaporation and transpiration will increase. Along with the prospect of

decreased annual precipitation, the risk of hydrological and agricultural drought is expected to increase (Sheffield & Wood, 2008). Correspondingly this will impact wildfires. Drought is accompanied by drier soils and forests, resulting in an elongated wildfire season and more intense and long-burning wildfires (Pechony & Shindell, 2010). However, the Southwest United States is at a greater risk of this increased drought and wildfire activity than Mercer County in the Eastern United States.

While it may seem counterintuitive considering the increased risk of drought, there is also an increased risk of flooding associated with climate change (Section 4.3.3). Warmer temperatures mean more precipitation will fall as rain rather than snow. Combined with the fact that warmer air holds more moisture, the result is heavier and more intense rainfalls and dam and levee failures. Similarly, winter storms are expected to become more intense, if possibly less frequent. Climate change is also expected to result in more intense hurricanes and tropical storms. With the rise of atmospheric temperatures, ocean surface temperatures are rising, resulting in warmer and more moist conditions where tropical storms develop (Stott et al., 2010). A warmer ocean stores more energy and is capable of fueling stronger storms. It is projected that the Atlantic hurricane season is elongating, and there will be more category 4 and 5 hurricanes than before (Trenberth, 2010).

Climate change is contributing to the introduction of new invasive species (Section 4.3.5). As maximum and minimum seasonal temperatures change, non-native species are able to establish themselves in previously inhospitable climates where they have a competitive advantage. This may shift the dominance of ecosystems in the favor of non-native species, contributing to species loss and the risk of extinction.

This type of sudden global change is novel to humanity. Despite the myriad of well thought out research, there is still much uncertainty surrounding the future of the Earth. All signs point to the intensification of the hazards mentioned above, especially if human society and individuals do not make swift and significant changes combat species losses.

4.3. Hazard Profiles

4.3.1. Drought

4.3.1.1 Location and Extent

While Pennsylvania is generally more water-rich than many U.S. states, the commonwealth may experience drought conditions intermittently throughout the calendar year. A drought is broadly defined as a time period of prolonged dryness that contributes to the depletion of ground and surface water. Droughts are regional climatic events, so when such an event occurs in Mercer County, impacts are not restricted to the county and are often more widespread. The spatial extent of the impacted area can range from localized areas in Pennsylvania to the entire Mid-Atlantic region.

There are three types of droughts:

Meteorological Drought – A deficiency of moisture in the atmosphere compared to average conditions. Meteorological drought is defined by the duration of the deficit and degree of dryness and is often associated with below average rainfall. Depending on the severity of the drought, it may or may not have a significant impact on agriculture and the water supply.

Agricultural Drought – A drought inhibiting the growth of crops, due to a moisture deficiency in the soil. Agricultural drought is linked to meteorological and hydrologic drought.

Hydrologic Drought – A prolonged period without rainfall that has an adverse effect on streams, lakes, and groundwater levels, potentially impacting agriculture.

Droughts are often the leading contributing factor to wildfires, as they leave areas with little to no moisture. Droughts can have adverse effects on farms and other water-dependent industries resulting in local economic loss. Areas of extensive agriculture use are particularly vulnerable to drought; 156,397 acres of Mercer County, or roughly 35% of the 437,120 total land acreage, make up farmland (United States Department of Agriculture [USDA], 2017 Census). The total number of farms for Mercer County is 1,168 and the average acreage for farms in Mercer County is 134 acres. Mercer County ranks 32nd of sixty-seven counties in the commonwealth for agricultural production, totaling over $65.75 million annually. Agricultural production from crops, including nursery and greenhouse crops, accounts for more than $35.4 million in commerce annually. Production from livestock, poultry, and their products accounts for $30.3 million annually. Acreage for farming has decreased since the 2012 USDA Census when there was a reported total of 163,148 farming and drought vulnerable acres.

4.3.1.2 Range of Magnitude

The average annual precipitation of 3.76” (rain) occurs primarily during the spring and summer months. This value is derived from averaging ten years of mean annual precipitation data for

Mercer County. Rural farming areas of Mercer County are most at risk when a drought occurs. A drought can create a significant financial burden for the community. Approximately 99% of Mercer County farms are family-owned and operated. Additionally 63% of the county farmland use is devoted to crop cultivation and 11% to livestock and poultry. Wildfires are often the most severe secondary effect associated with drought. Wildfires can devastate wooded and agricultural areas, structures near high wildfire loads, and farm production facilities, and threaten natural resources. Prolonged drought conditions can have a lasting impact on the economy and can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Long-term water shortages during severe drought conditions can have a significant impact on agribusiness, public utilities, and other industries reliant on water for production services. Mercer County also has a growing agritourism business that would be threatened by long-term drought.

Local municipalities may, with the approval of the Pennsylvania Emergency Management Council, implement local water rationing. These individual water rationing plans, authorized through provisions of 4 PA code Chapter 120, will require specific limits on individual water consumption to achieve significant reductions in use. Under mandatory water usage restrictions imposed by the commonwealth and/or local municipalities, procedures are provided for granting of variances to consider individual hardships and economic dislocations. *Table 9 – Drought Preparation Phases* shows the FEMA-defined levels of drought severity along with suggested actions, requests, and goals.

Table 9 - Drought Preparation Phases

Drought Preparation Phases				
Phase	**General Activity**	**Actions**	**Request**	**Goal**
Drought Watch	Early stages of planning and alert for drought possibility.	Increased water monitoring, awareness, and preparation for response among government agencies, public water suppliers, water users, and the public.	Voluntary water conservation.	Reduce water use by 5%.

Drought Preparation Phases				
Phase	**General Activity**	**Actions**	**Request**	**Goal**
Drought Warning	Coordinate a response to imminent drought conditions and potential water shortages.	Reduce shortages – relieve stressed sources, develop new sources if needed.	Continue voluntary water conservation, impose mandatory water use restrictions if needed.	Reduce water use by 10 – 15%.
Drought Emergency	Management of operations to regulate all available resources and respond to emergency.	Support essential and high priority water uses and avoid unnecessary uses.	Possible restrictions on all nonessential water uses.	Reduced water use by 15%.
Source: Pennsylvania Department of Environmental Protection, 2017				

The commonwealth uses five parameters to assess drought conditions:

- Stream flows (compared to benchmark records)
- Precipitation (measured as the departure from normal, thirty-year average precipitation)
- Reservoir storage levels in a variety of locations such as three New York City reservoirs in the upper Delaware River Basin
- Groundwater elevations in a number of counties (comparing to past month, past year, and historic records)
- Soil moisture via the Palmer Drought Index as seen in *Table 10 – Palmer Drought Severity Index*, which is a soil moisture algorithm calibrated for relatively homogenous regions which measures dryness based on recent precipitation and temperature.

Table 10 - Palmer Drought Severity Index

Palmer Drought Severity Index (PDSI)	
Severity Category	**PDSI Value**
Extremely Wet	4.0 or more
Very Wet	3.0 to 3.99
Moderately Wet	2.0 to 2.99
Slightly Wet	1.0 to 1.99

Palmer Drought Severity Index (PDSI)	
Severity Category	**PDSI Value**
Incipient Dry Spell	0.5 to 0.99
Near Normal	0.49 to -0.49
Incipient Dry Spell	-0.5 to -0.99
Mild Drought	-1.0 to -1.99
Moderate Drought	-2.0 to -2.99
Severe Drought	-3.0 to -3.99
Extreme Drought	-4.0 or less

The effects of a drought can be far-reaching both economically and environmentally. Economic impacts include reduced productivity of aquatic resources, mandatory water use restrictions, well failures, cutbacks in industrial production, agricultural losses, and limited recreational opportunities. Environmental impacts of drought include the following: *Table 11 – Economic and Environmental Impacts of Drought Events* qualifies the potential economic and environmental impacts from a drought event.

Table 11 - Economic and Environmental Impacts of Drought Events

Economic and Environmental Impacts of Drought Events	
Economic	**Environmental**
- Reduced productivity of aquatic resources - Mandatory water use restrictions - Well failures - Cutbacks in industrial production - Agricultural losses - Limited recreational opportunities	- Hydrologic effects - Adverse effects on animal populations - Damage to plant communities - Increased number and severity of fires - Reduced soil quality - Air quality effects - Loss of quality in landscape

4.3.1.3 Past Occurrence

The Pennsylvania Department of Environmental Protection (PA DEP) maintains the most comprehensive data on drought occurrences across the commonwealth. Descriptions of drought status categories (i.e., watch, warning, and emergency) are included in the "Range of Magnitude" section above. The declared drought status from 1980 to 2021 is shown in *Table 12 – Past Drought Events in Mercer County*. Mercer County was in a drought watch a total of thirty-two times, a drought warning a total of nine times, and a drought emergency a total of three times.

The National Oceanic and Atmospheric Administration (NOAA) has archived records showing extreme droughts for the commonwealth in 1931 and a prolonged event in the 1960s as seen in *Figure 8 – Pennsylvania Palmer Drought Index 1900 – 1999*.

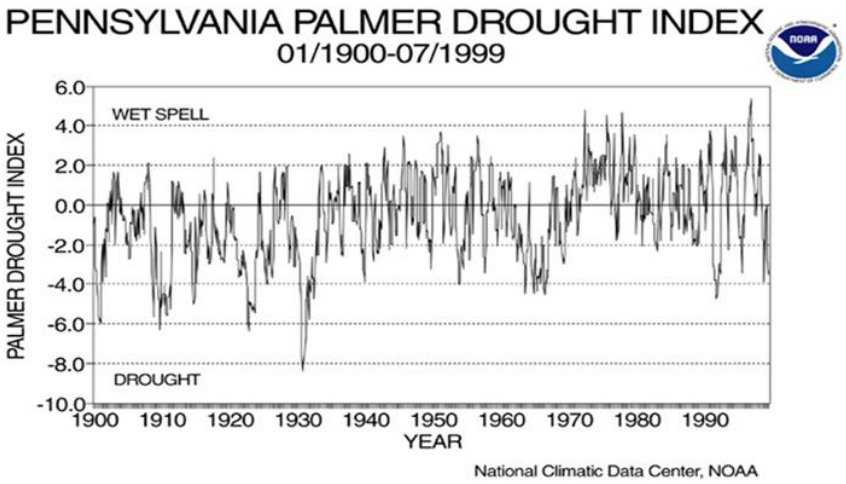
Based on the county's more recent disaster history and other drought occurrence data, the worst drought event in Mercer County occurred in the summer of 1991. Pennsylvania Governor Bob Casey, Sr. signed a disaster proclamation when the drought status for drought emergency was in place for fifty-five of Pennsylvania's sixty-seven counties.

Table 12 - Past Drought Events in Mercer County

Past Drought Events in Mercer County			
Start Date	**End Date**	**Drought Status**	**Event Duration**
07/07/1988	08/24/1988	Watch	1 month, 17 days
08/24/1988	12/12/1988	Warning	3 months, 18 days
03/03/1989	05/15/1989	Watch	2 months, 12 days
08/28/1991	07/24/1991	Watch	26 days
07/24/1991	08/16/1991	Warning**	23 days
08/16/1991	09/13/1991	Emergency**	28 days
09/13/1991	10/21/1991	Emergency	1 month, 8 days
10/21/1991	01/16/1992	Emergency	2 months, 25 days
01/17.1992	04/20/1992	Emergency	3 months, 3 days
04/20/1992	06/23/1992	Warning	2 months, 3 days
06/23/1992	09/11/1992	Warning	2 months, 19 days
09/01/1995	09/20/1995	Watch	19 days
09/20/1995	11/08/1995	Watch**	1 month, 19 days
11/08/1995	12/18/1995	Watch	1 month, 10 days
12/03/1998	12/08/1998	Watch	5 days
12/08/1998	12/14/1998	Watch	6 days
12/14/1998	12/16/1998	Watch	2 days
12/16/1998	01/15/1999	Warning	30 days
01/15/1999	03/15/1999	Warning	1 month
03/15/1999	06/10/1999	Watch	2 months, 25 days
06/10/1999	06/18/1999	Watch	8 days
06/18/1999	07/20/1999	Watch	1 month, 2 days
07/20/1999	09/30/1999	Watch**	2 months, 10 days
09/30/1999	12/16/1999	Warning	2 months, 16 days
12/16/1999	02/25/2000	Warning	2 months, 9 days
02/25/2000	05/05/2000	Watch	2 months, 10 days
08/24/2001	11/06/2001	Watch	2 months, 13 days
11/06/2001	12/05/2001	Watch	29 days
12/05/2001	02/12/2002	Watch	2 months, 7 days
02/12/2002	05/13/2002	Watch	3 months, 1 day
09/05/2002	11/07/2002	Watch	2 months, 2 days
11/07/2002	12/19/2002	Watch	1 month, 12 days

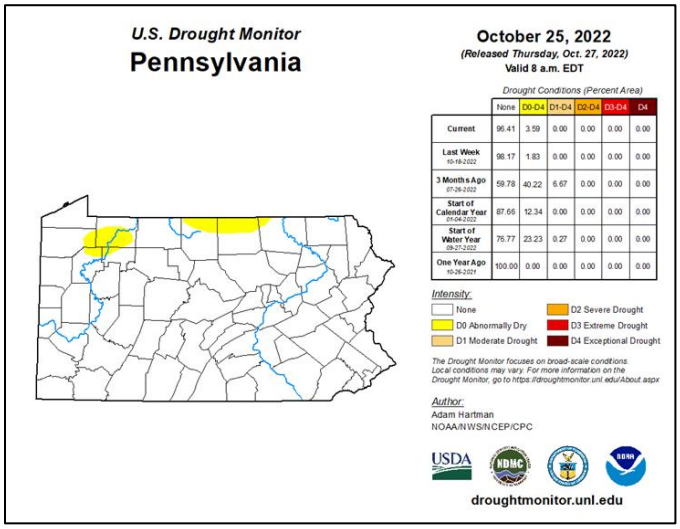
Past Drought Events in Mercer County			
Start Date	**End Date**	**Drought Status**	**Event Duration**
12/19/2002	01/08/2003	Watch	20 days
01/08/2003	06/18/2003	Watch	5 months, 10 days
04/11/2006	06/30/2006	Watch	2 months, 19 days
08/06/2007	09/05/2007	Watch	29 days
10/05/2007	01/11/2008	Watch	3 months, 6 days
11/08/2008	01/26/2009	Watch	2 months, 19 days
09/16/2010	11/10/2010	Warning	1 month, 25 days
11/10/2010	12/17/2010	Watch	1 month, 7 days
08/05/2011	09/2/2011	Watch	28 days
07/19/2012	08/31/2012	Watch	1 month, 12 days
03/24/2015	06/17/2015	Watch	2 months, 24 days
06/17/2015	07/10/2015	Watch	23 days
08/02/2016	09/06/2016	Watch	1 month, 4 days
09/06/2016	11/03/2016	Watch	1 month, 27 days
Source: Pennsylvania Department of Environmental Protection, 2022 **Gubernatorial Disaster Declaration			

Figure 8 - Pennsylvania Palmer Drought Index 1900-1999



The warmest July on record in Pennsylvania occurred in 2020, and sixteen counties entered Drought Watch status on August 21 of that year. In June 2021, dry conditions were again affecting the commonwealth. *Figure 9 – U.S. Drought Monitor, Pennsylvania* illustrates the conditions of drought in Pennsylvania at the time of the report.

Figure 9 - U.S. Drought Monitor, Pennsylvania



4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events. Climate change will lead to increased uncertainty and extremity of climate events. As Mercer County has experienced severe drought between 5% to 10% of the time between 1895 and 1995 as seen in *Figure 10 – Palmer Drought Severity Index*. This report can be used to make a rough estimate of the future probability of drought in Mercer County, although it does not account for changes introduced by climate change. Drought conditions are expected to become more severe with climate change, as evaporation and transpiration will increase with higher temperatures.

Figure 10 - Palmer Drought Severity Index

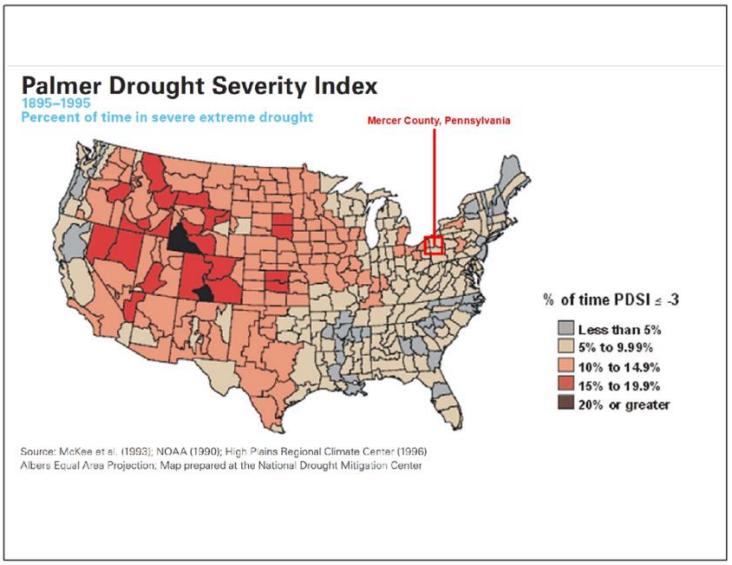
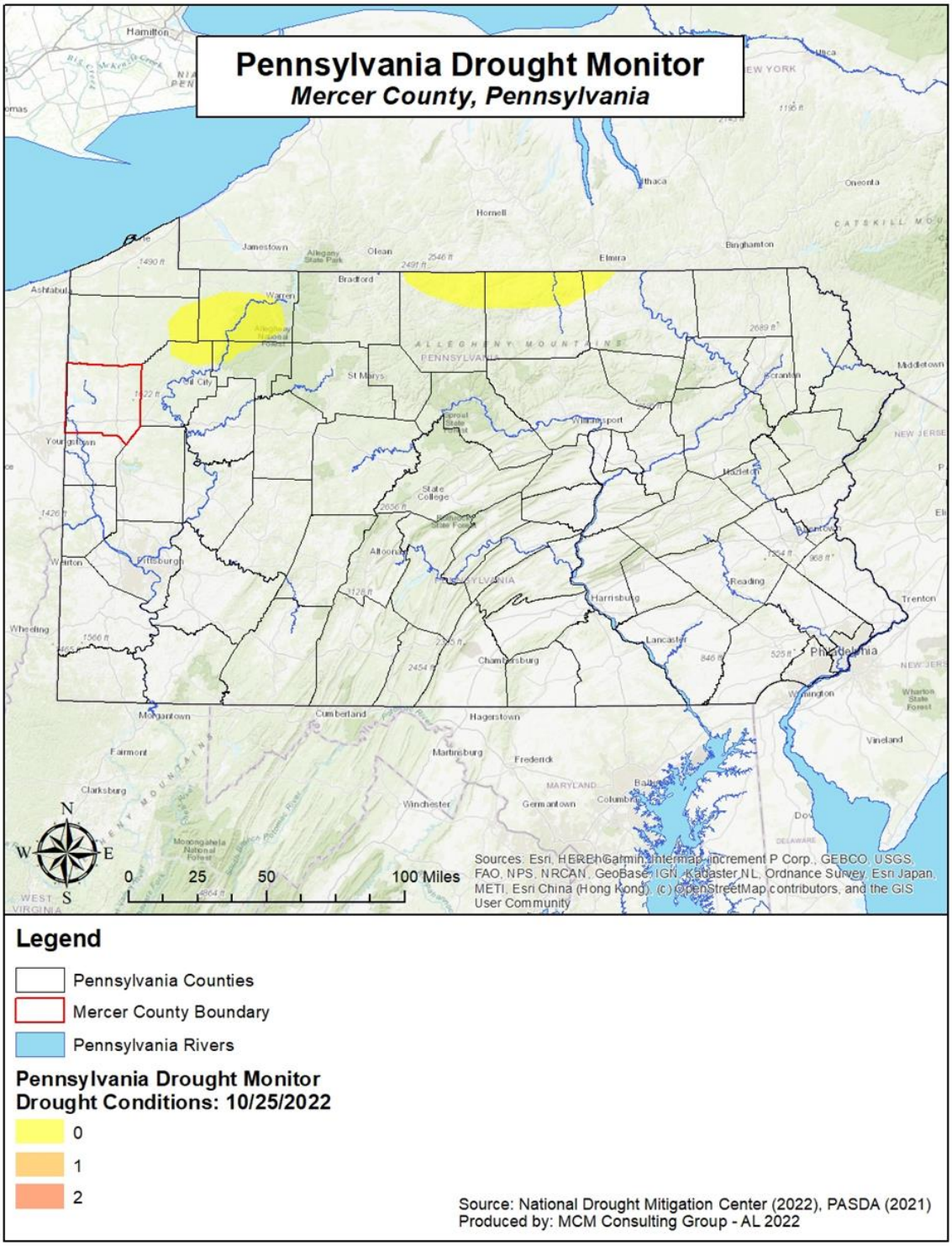


Figure 11 - Current Drought Index for Pennsylvania



The potential for a drought to occur in Mercer County is moderate. Given the frequency of drought watches issued for Mercer County and its municipalities, the county can reasonably expect to be under a drought watch at least once per year. While some form of drought condition frequently exists in Mercer County, the impact depends on the duration of the event, severity of conditions, and area affected. The map above shows that Mercer County, and most of Pennsylvania, is currently (and most often) in normal (non-drought) conditions.

4.3.1.5 Vulnerability Assessment

The magnitude of drought vulnerability depends on the duration and area of impact. However, other factors contribute to the severity of a drought. Unseasonably high temperatures, prolonged winds, and low humidity can heighten the impact of a drought.

Extended periods of drought can lead to lowered stream levels, altering the delicate balance of riverine ecosystems. Certain tree species are susceptible to fungal infections during prolonged periods of soil moisture deficit. Fall droughts pose a particular threat because groundwater levels are typically at their lowest following height of the summer growing season. Mercer County's farmland can be negatively impacted by a drought event. With 1,168 farms located in Mercer County as reported in the 2017 Census of Agriculture, with a total market value of $65,748,000.00, a drought could cause severe economic strain on the county, the local municipalities, and the residents. As stated above, a drought event could affect approximately 156,397 acres in Mercer County. Crop yields alone in Mercer County that could be negatively impacted by a potential drought event are worth approximately $35,416,000.00 based on 2017 information. That accounts for roughly 59% of the county market share in agricultural products. The most common crops vulnerable to drought in Mercer County are grains, oilseeds, dry beans, and dry peas. Mercer County is 20th in the state of Pennsylvania for crop production, which would be critically impacted by a drought event.

The Pennsylvania Groundwater Information System reports approximately 3,681 active domestic wells spread across every municipality for the county. Wells may see a decrease in yield and water level when a drought events lasts for longer than a short period and can lead to utility interruptions. A greater discussion of utility interruptions in Mercer County can be found in Section 4.3.21: Utility Interruption hazard profile.

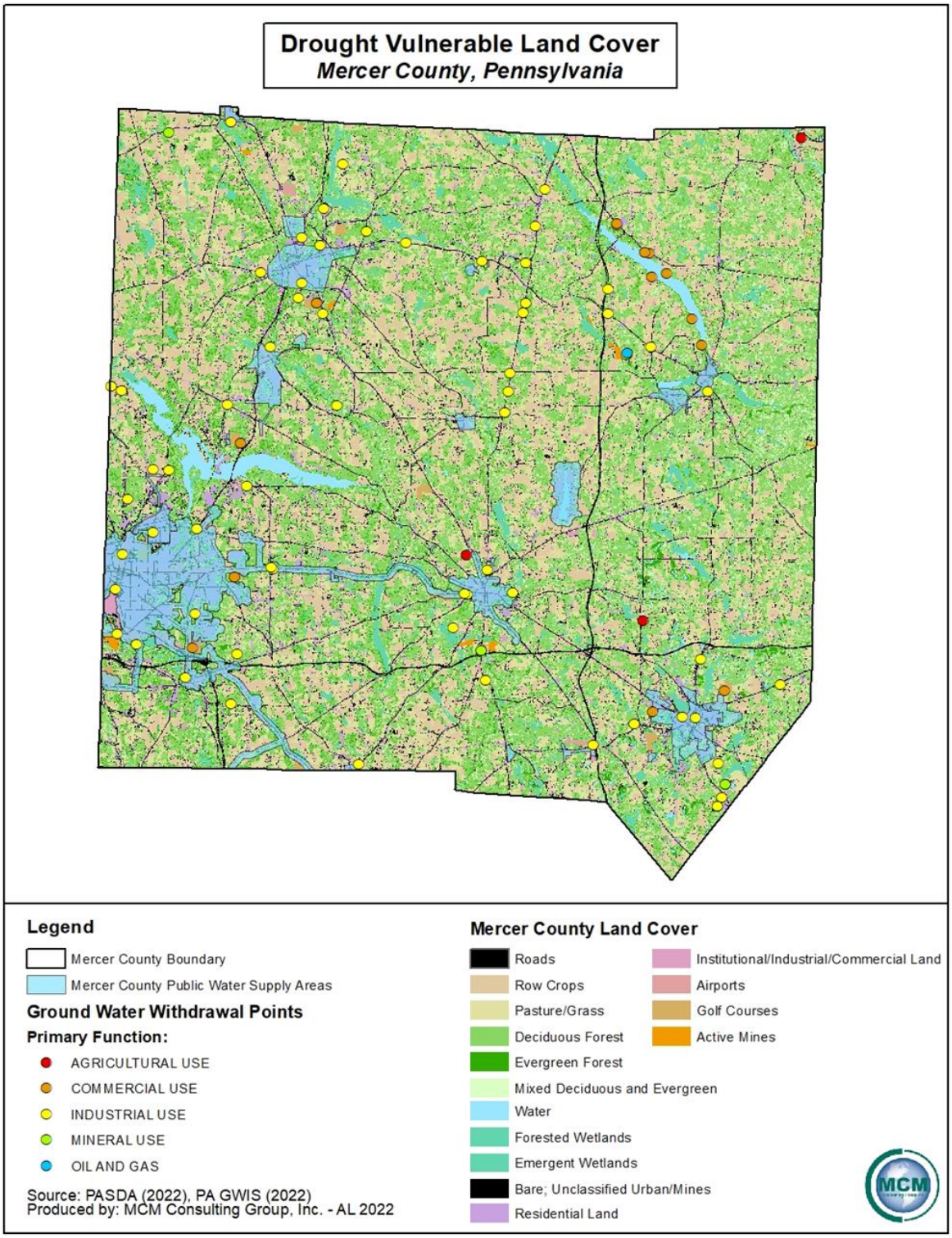
There are many hazards that can be considered cascading hazards related to drought events. Wildfire is the most severe cascading hazard effect associated with drought. Wildfires can devastate wooded and agricultural areas, threatening natural resources and farm production facilities. With drought events, water infiltration into the ground becomes more difficult. This lack of infiltration can result in flash flooding events in areas of steep slopes, canyons, and rolling hills. A loss of vegetation from a drought can also increase the occurrence of landslides in areas of steep slopes with loose packed soil profiles. A discussion on the county's vulnerability

to wildfire, flash floods, and landslides can be found in Section 4.3.11.5, 4.3.3.5, and 4.3.6.5 respectively.

Additionally, emergency services can be adversely impacted by drought as a cascading hazard. Local fire departments often utilize ponds, creeks, and streams for water onboard fire apparatus. With low water levels in waterbodies, responders may be unable to draft enough water to efficiently respond to and extinguish a fire. Also, with an increased number of potential wildfires due to drought conditions, agencies may not have the personnel to efficiently respond to all fires in a timely manner.

A map of properties with tillable agricultural land use, forestry, and other land in the county vulnerable to drought is shown below in *Figure 12 – Drought-Vulnerable Land Use and Public Water Supply*.

Figure 12 - Drought-Vulnerable Land Use and Public Water Supply

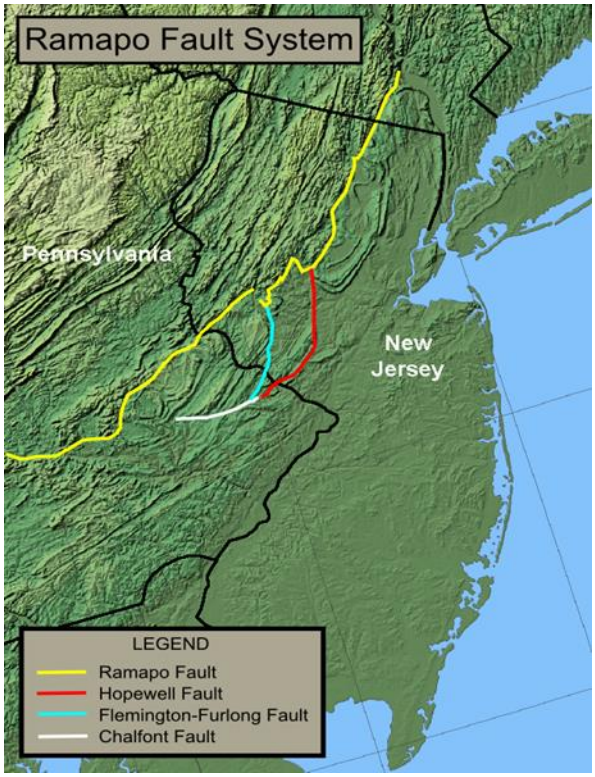


4.3.2. Earthquake

4.3.2.1 Location and Extent

An earthquake is sudden movement of the earth's surface caused by the release of stress accumulated within or along the edge off the earth's tectonic plates, a volcanic eruption, or by a human induced explosion (DCNR, 2007). Earthquake events in Pennsylvania, including Mercer County, are usually mild events, impacting areas no greater than 62 miles in diameter from the epicenter. A majority of earthquakes occur along boundaries between tectonic plates, and some earthquakes occur at faults on the interior of plates. Often, areas near convergent plate boundaries experience the most severe earthquake activity. Today, Eastern North America, including Mercer County, Pennsylvania, is far from the nearest plate boundary. That plate boundary is the Mid-Atlantic Ridge and is approximately 2,200 miles to the east, under the Atlantic Ocean. The nearest convergent plate boundary is the Caribbean Volcanic Arc, approximately 1200 miles to the south of Mercer County. The Ramapo Fault System runs through New York, New Jersey, and eastern Pennsylvania (See *Figure 13 – Ramapo Fault System*). This fault system is associated with some small earthquakes, and it is thought unlikely to produce significant disruption.

Figure 13 - Ramapo Fault System



When the supercontinent of Pangaea broke apart about 200 million years ago, the Atlantic Ocean began to form. Since then, many faults have developed. Locating all of the faults would be an ideal approach to identifying the region's earthquake hazard; however, many of the fault lines in this region have no seismicity associated with them. The best way to determine earthquake history for Mercer County is to conduct a probabilistic earthquake-hazard analysis with the earthquakes that have already happened in and around the county. (*See Figure 14 – Pennsylvania Earthquake Activity*). Nevertheless, the United States Geological Survey (USGS) indicates that Mercer County has a low earthquake risk, and three historical earthquake events have occurred.

Natural gas extraction of the Marcellus Shale formation has occurred in many regions of the commonwealth, but eastern and southeastern Pennsylvania are not among them. Hydraulic fracturing, or fracking, is used to extract the gas, and the process is thought to lead to an increase in seismic activity (Meyer, 2016).

However, fracking does not appear to be linked to the increased rate of magnitude three and larger earthquakes (USGS 2014). In recent years, permits for extraction of the natural gas and oil in the commonwealth have been issued by the Pennsylvania Department of Environmental

Protection, but no records of requested permits for gas extraction or injection wells were found for Mercer County at the writing of this plan.

4.3.2.2 Range of Magnitude

Earthquakes result in the propagation of seismic waves, which are detected using seismographs. These seismograph results are measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. *Table 13 – Richter Scale* summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. The Modified Mercalli Intensity Scale (*Table 14 – Modifited Mercalli Intensity Scale*) is an alternative measure of earthquake intensity that is scaled by the impacts of the earthquake event. Earthquakes have many secondary impacts, including disrupting critical facilities, transportation routes, public water supplies and other utilities.

Table 13 - Richter Scale

Richter Scale	
Richter Magnitude	**Earthquake Effects**
Less than 3.5	Not generally felt but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake; can cause serious damage over large areas.
8.0 or greater	Great earthquake; can cause serious damage in areas several hundred kilometers across.

Table 14 - Modified Mercalli Intensity Scale

Modified Mercalli Intensity Scale			
Scale	**Intensity**	**Earthquake Effects**	**Richter Scale Magnitude**
I	**Instrumental**	Detected only on seismographs.	<4.2

Modified Mercalli Intensity Scale			
Scale	**Intensity**	**Earthquake Effects**	**Richter Scale Magnitude**
II	**Feeble**	Some people feel it.	
III	**Slight**	Felt by people resting, like a truck rumbling by.	
IV	**Moderate**	Felt by people walking.	
V	**Slightly Strong**	Sleepers awake; church bells ring.	<4.8
VI	**Strong**	Trees sway; suspended objects swing; objects fall off shelves.	<5.4
VII	**Very Strong**	Mild alarm, walls crack, plaster falls.	<6.1
VIII	**Destructive**	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged.	<6.9
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open.	
X	**Disastrous**	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread.	<7.3
XI	**Very Disastrous**	Most buildings and bridges collapse, roads, railways, pipes, and cables destroyed, general triggering of other hazards.	<8.1
XII	**Catastrophic**	Total destruction, trees fall, ground rises and falls in waves.	>8.1

4.3.2.3 Past Occurrence

In October 1934, an earthquake struck Rochester County, New York; a slight tremor was felt though Warren County to Mercer County. No injuries or damages resulted. In January 1984, earthquakes tremors were felt. The tremors registered 4.0 on the Richter scale. It was felt from Erie to as far as Scranton. It had caused a 4-foot-long by 1/8" wide crack in the side of the Sharon City Hall Building. The strongest recorded earthquake in Pennsylvania is referred to as the Pymatuning Earthquake and it occurred on September 25th, 1998. The Pymatuning Earthquake registered as magnitude 5.1 on the Richter Scale and originated near the southern end of the Pymatuning Reservoir, just north of Mercer County. Major effects were felt in West Salem Township, Greene Township, and in the Jamestown and Greenville areas. Structural damage was

minimal, including reports of objects falling from shelves, and chimneys cracking. The most significant impacts from the Pymatuning Earthquake were hydrologic – approximately 120 domestic wells became desiccated as a result, and other previously dry wells began to flow, and some residents reported foul, sulfur-smelling water. About eighty of those 120 newly dried wells were on a ridge between Jamestown and Greenville where the water level dropped as much as 100 feet. Areas that experienced an increase in water level saw rises of up to sixty-two feet in wells located in the valley. A possible explanation of this phenomenon is that the earthquake increased the vertical flow of water through shales beneath the ridge, allowing groundwater to drain from the hilltops into the valleys.

On August 23, 2011, a 5.9 earthquake occurred in Virginia, and a 2.2 earthquake shook Reading, Pennsylvania (Berks County), on July 19, 2019. Further, a 3.4 earthquake struck Mifflintown (Juniata County) on June 13, 2019, and Bolivar (Westmoreland County) experienced a 2.9 event on October 6, 2020. Parts of the county may have experienced some of the shock waves from these minor earthquakes and others that have occurred around the region, most notably New Jersey.

The most likely cause of the wells drying was because of the increase in hydraulic conductivity or "fracking" of shale rock under this area caused by the earthquake. The quake affected the existing faults and created new faults in the shale. This created more permeability for the water to leak down from the hilltops on the ridge down to the valleys following the contours of the Meadville shale.
Because the effects of large earthquakes can be felt hundreds of miles away, the historical earthquake epicenters near Mercer County are shown below at *Figure 15 – Pennsylvania Earthquake Activity.* A wider depiction of earthquake occurrences in the northeastern United States may be found here: *https://earthquake.usgs.gov/earthquakes/map/?extent=14.26438,-141.32813&extent=56.51102,-48.60352*

4.3.2.4 Future Occurrence

Earthquake activity and intensities are difficult to predict, but a probabilistic analysis of prior earthquakes can assist in gauging the likelihood of future occurrences. *Figure 14 – Pennsylvania Earthquake Hazard Zones* in 4.3.2.1 shows that Mercer County is in the lowest hazard zone for earthquake activity according to the USGS (2014), suggesting a low probability of earthquake occurrence. However, according to the USGS, there has been a recent trend increasing the frequency of magnitude three and larger earthquakes in the central and eastern U.S. This uptick in seismicity is due to hydraulic fracturing activities, and specifically occurs as a result of wastewater from the fracking process being injected into the earth (Meyer, 2016). Recent studies have moved towards being able to predict such induced seismicity by looking at uplift after

injections, but more work needs to be done to confirm uplift as a reliable indicator of induced seismicity (Shirzaei et al., 2016). It is important to note that seismicity can occur even after wells become inactive and injection rates decline (Shirzaei et al., 2016).

Isostatic Rebound is a hypothesis for earthquake occurrence that has been conceptualized for many years, according to Charles Scharnberger, a retired professor of geology at Millersville University, who monitors the seismic station there. Scharnberger said Pennsylvania earthquakes are somewhat of a mystery, but they could have something to do with the westward shift of the North American tectonic plate. Though the plates meet in California, where most of the seismic activity occurs, that movement still causes stress, squeezing and pressure along the entire length of the plate, reverberating as far back as the East Coast. A 3.4 earthquake like the one in Mifflintown, Juniata County in 2019 is in the medium range for Pennsylvania and may occur every couple of years. According to the USGS, this was the strongest earthquake felt or originating in Pennsylvania that year. It was followed by a 1.3 aftershock.

The chances of a devastating earthquake are low, but do exist, according to Scharnberger, His calculations on the probability of a severe earthquake based on the historic record indicate it is about a one in 200 chance in any given year.

Table 15 - Recent Earthquake Trends in Northeastern United States

Earthquake Trends in Northeastern U.S. *(USGS, 2020)*	
Year	**Number of Magnitude 3+ Earthquakes**
2015	0
2016	3
2017	4
2018	0
2019	5
2020	3

4.3.2.5 Vulnerability Assessment

According to the U.S. Geological Society Earthquake Hazards Program, an earthquake hazard is anything associated with an earthquake that may affect a resident's normal activities. For Mercer County, this could include surface faulting, ground shaking, landslides, liquefaction, desiccated

or rejuvenated water wells, tectonic deformation, and seiches (sloshing of a closed body of water from earthquake shaking).

Earthquakes usually occur without warning and can impact areas a great distance from their point of origin (epicenter). Ground shaking is the greatest risk to building damage within Mercer County. Risk to public safety and loss of life from an earthquake is dependent upon the severity and proximity of the event. Injury or death to those inside buildings, or people walking below building ornamentation and chimneys is a higher risk to Mercer County's general public during an earthquake. Infrastructure is more at risk on the east coast than the west coast because its buildings are older.

Mercer County's infrastructure is at particular risk to earthquakes because of the age of infrastructure within the county. Vulnerability to infrastructure issues, and also earthquake damage, increases once a building or housing unit is over fifty years of age. For the purposes of this assessment, any building constructed in 1979 or prior is considered at an increased vulnerability due to the way in which data is presented in American Community Survey (ACS) by the United States Census Bureau for 2021. In Mercer County, there are approximately 37,489 housing units that were constructed in the calendar year 1979 or earlier. This is 73.6% of the total housing units reported in the ACS, which is 50,940 housing units.

The following list of historic homes and properties listed in the National Register of Historic Places for Mercer County also lists construction characteristics to evaluate the vulnerability to earthquakes:

1. The Alexander P. And James S. Waugh House – Sandstone Foundation, Brick Construction
2. The Christiana Lindsey House – Ashlar Sandstone Foundation, Brick Construction
3. The First Universalist Church of Sharpsville – Stone and Brick Construction
4. The Frank L. Buhl Mansion – Ashlar Sandstone Foundation, Stone Construction
5. The Gibson House – Brick Construction
6. The Jonas J. Pierce House – Wood Construction
7. The Mercer County Courthouse – Brick and Light Sandstone Construction
8. The Wendell August Forge – Concrete Foundation, Steel Frame Construction

Each of these structures is vulnerable to earthquakes, with a greater vulnerability for those buildings with sandstone or concrete foundations. The likelihood of damage to these facilities from an earthquake is low, but the vulnerability is moderate to high, if a major earthquake event were to occur.

More populous areas including the cities of Farrell, Hermitage, and Sharon, and Mercer Borough are at a higher vulnerability to earthquake damage due to the increased building and population density. Rural areas of the county can also be damaged by an earthquake, but the damage a building can sustain from neighboring structures is less than in a more densely developed area. Structure level data, including type of construction, is not included in this assessment, due to the limit of information available from data sources, including Mercer County and the United States Census Bureau.

Figure 14 - Pennsylvania Earthquake Hazard Zones

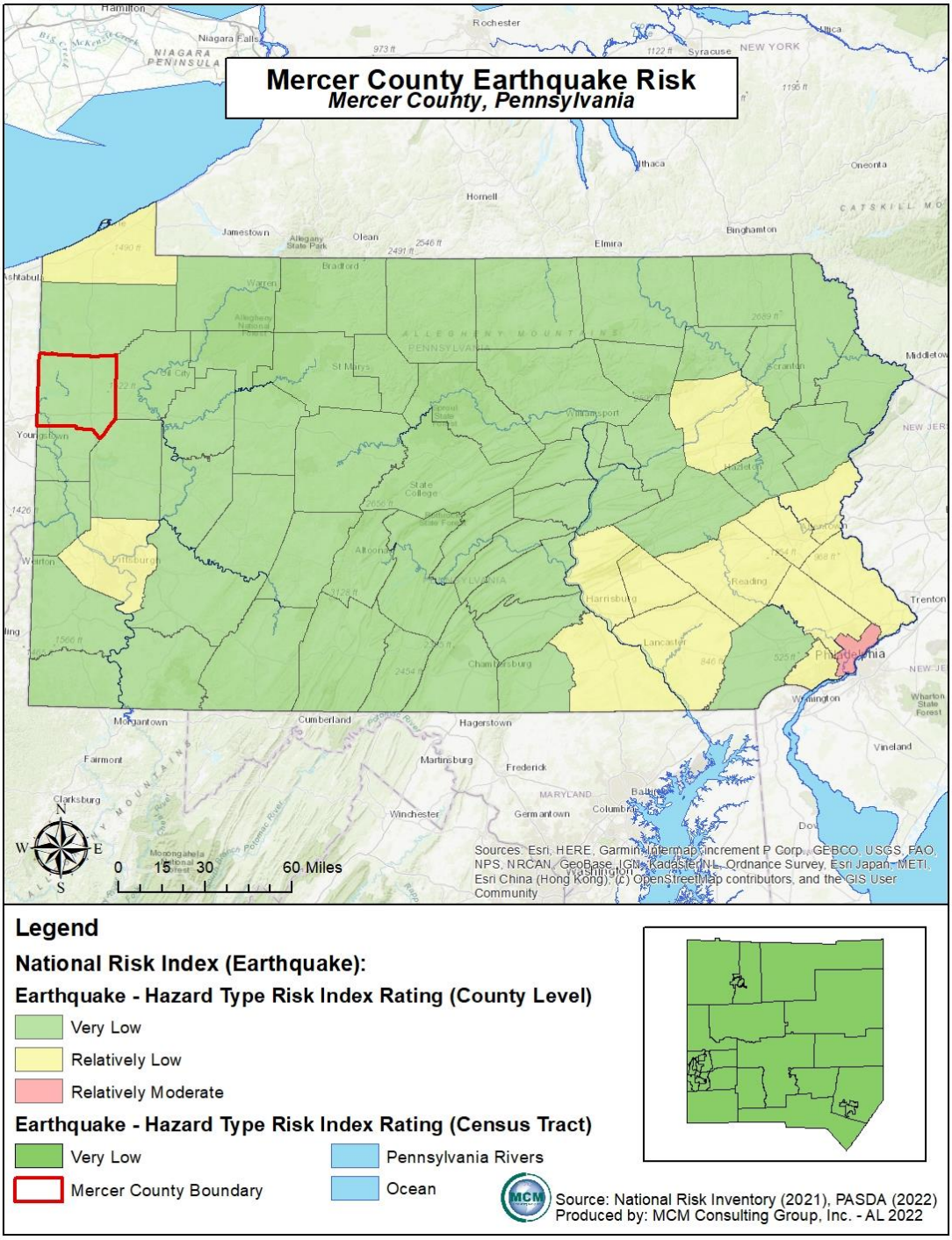
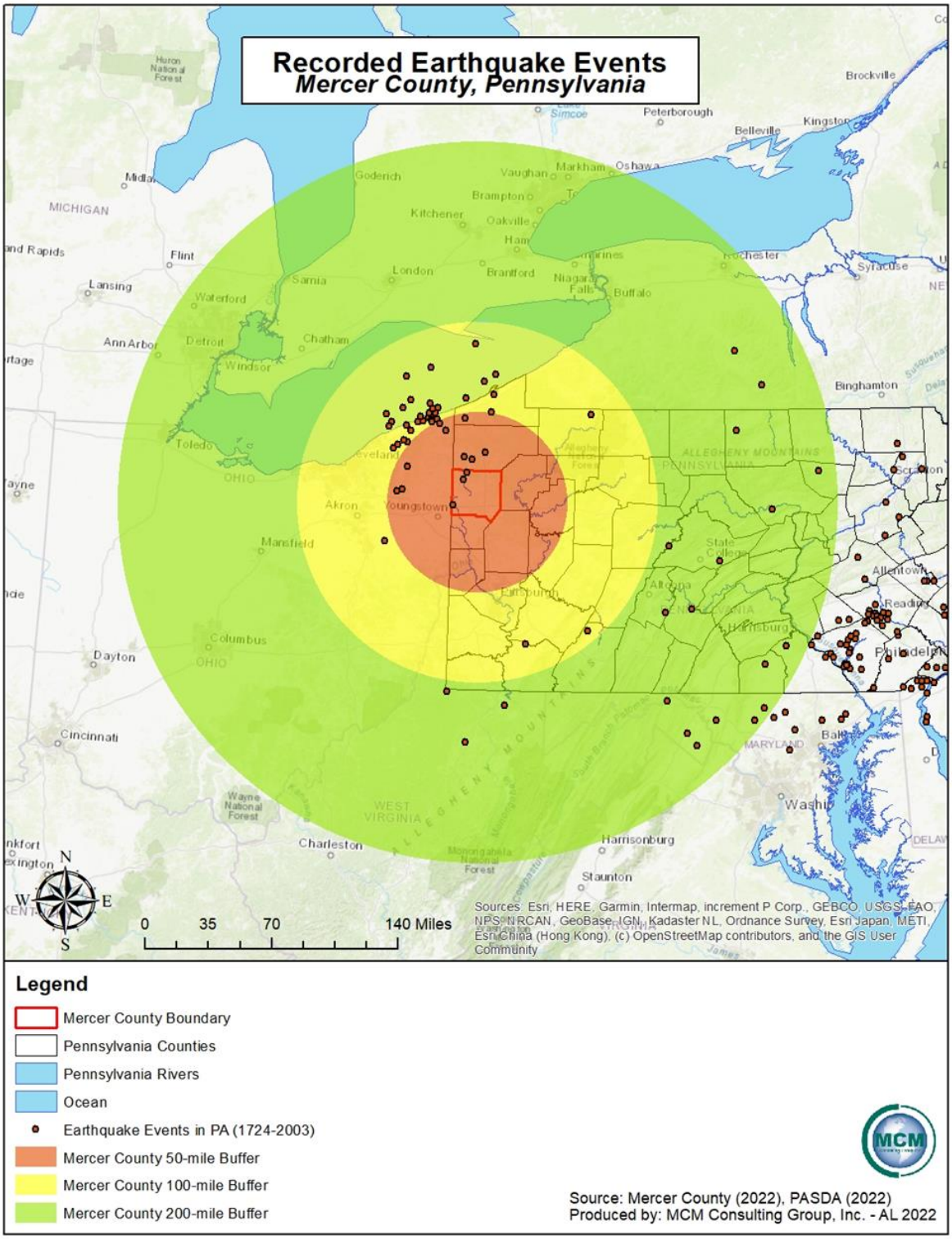


Figure 15 - Pennsylvania Earthquake Activity



4.3.3. Flooding, Flash Flooding, and Ice Jam Flooding

4.3.3.1 Location and Extent

Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period. Flash flooding is usually the result of heavy, localized precipitation falling in a short period of time over a given location, often in mountain streams and mountainous regions, and in urban areas where much of the ground is covered in impervious surfaces. Flash floods are relatively common in Mercer County and the severity of those flood events is dependent upon a combination of creek, stream, and river basin topography and physiography, hydrology, precipitation, and weather patterns. Present soil conditions, the degree of vegetative clearing, and the presence of impervious cover must also be considered when determining the severity of a flood or flood event.

Winter flooding can include ice jams, which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure.

Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood event. Flood recurrence intervals are explained in more detail in section 4.3.3.4. However, in assessing the potential spatial extent of flooding, it is important to know that a floodplain associated with a flood that has a 10% chance of occurring in a given year is smaller than a floodplain associated with a flood that has a 0.2% chance of occurring.

The National Flood Insurance Program (NFIP) publishes digital flood insurance rate maps (DFIRMs). These maps identify the 1% annual chance of flood area. The special flood hazard area (SFHA) and base flood elevations (BFE) are developed from the 1% annual chance flood event as seen in *Figure 16 – Flooding and Floodplain Diagram*. Structure located within the SFHA have a 26% chance of flooding in a thirty-year period. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania, and the Mercer County local government. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply to the following high-risk special flood hazard areas in *Table 16 – Flood Hazard High Risk Zones*. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Mercer County with vulnerable structures and community lifeline facilities identified using the most current DFIRM data for Mercer County.

Past flooding events have been primarily caused by heavy rains, which cause small creeks and streams to overflow their banks, often leading to road closures. Flooding poses a threat to community lifeline facilities, agricultural areas, and those who reside or conduct business in the floodplain. The most significant hazard exists for facilities in the floodplain that process, use, or store hazardous materials. A flood could potentially release and transport hazardous materials throughout the area. Most flood damage to a property and structure located in the floodplain is caused by water exposure to the interior, high velocity water, and debris flow.

Figure 16 - Flooding and Floodplain Diagram

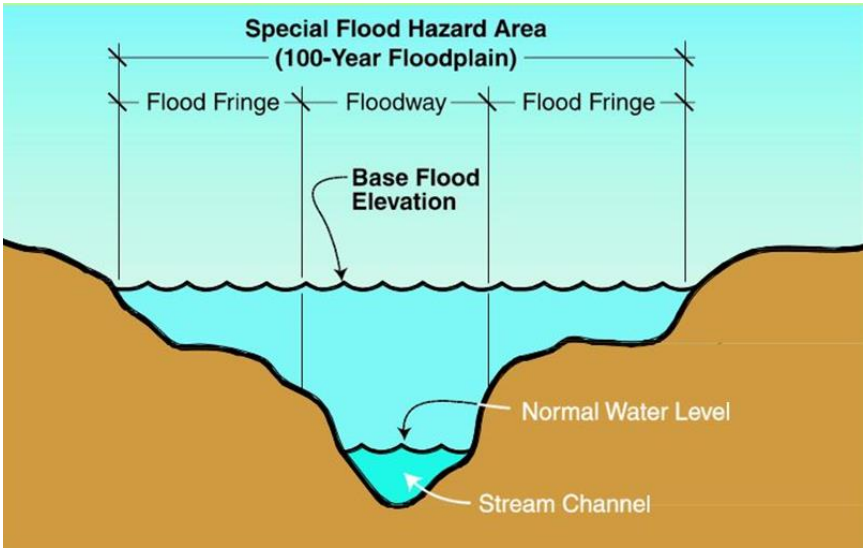


Table 16 - Flood Hazard High Risk Zones

Flood Hazard High Risk Zones	
Zone	**Description**
A	Areas subject to inundation by the 1% annual chance flood event. Because detailed hydraulic analysis has not been performed, no base flood elevations or flood depths are shown.
AE	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.
AH	Areas subject to inundation by the 1% annual chance shallow flooding (usually areas of ponding) where average depths are 1 – 3 feet. BFEs derived from detailed hydraulic analysis are shown in this zone.
AO	Areas subject to inundation by the 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are 1 – 3 feet. Average flood depths derived from detailed hydraulic analysis are shown within this zone.

Flood Hazard High Risk Zones	
Zone	**Description**
AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.
Source: FEMA, 2017	

4.3.3.2 Range of Magnitude

The Ohio River Basin has caused significant flooding in Mercer County, specifically on the following streams, creeks, and their tributaries:

- Shenango River
    - Little Shenango River
    - Pymatuning Creek
    - Neshannock Creek

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover, and the rate of snowmelt. Water runoff is greater in areas with steep slopes and little to no vegetative ground cover. The mountainous terrain of Mercer County can cause more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. This is of particular concern for areas along steep slopes and on the edges of valleys throughout Mercer County.

Urbanization typically results in the replacement of vegetative ground cover with impermeable surfaces like asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems. A large amount of rainfall over a short time span can cause flash flood events. Flash floods can occur very quickly and with little warning. A flash flood can also be deadly because of the rapid rise in water levels and devastating flow velocities. The more developed areas in the county can be easily susceptible to flash floods because of the significant presence of impervious surfaces, such as streets, sidewalks, parking lots, and driveways. Additionally, small amounts of rain can cause floods in locations where the soil is still frozen, saturated from a previous wet period or if the areas is largely covered in impermeable surfaces such as parking lots, paved roadways, and other developed areas. The county occasionally experiences intense rainfall from tropical storms in later summer and early fall, which can potentially cause flooding as well.

Severe flooding can cause injuries and deaths and can have long-term impacts on the health and safety of citizens. Severe flooding can also result in significant property damage, potentially disrupting the regular function of community lifeline facilities and can have widespread negative effects on local economies. Industrial, commercial, and public infrastructure facilities can

become inundated with flood waters, threatening the continuity of government and business. The vulnerable populations must be identified and located in flooding situations, as they are often home bound. Mobile homes and manufactured structures are especially vulnerable to high water levels. Flooding can have significant environmental impacts when the flood water release and/or transport hazardous materials.

Severe flooding also comes with secondary effects that could have long lasting impacts on the population, economy, and infrastructure within Mercer County. Power failures are the most common secondary effect associated with flooding. Coupled with a shortage of critical services and supplies, power failures could cause a public health emergency. Community lifelines, such as sewage and water treatment facilities, can fail, causing sewage overflows and the contamination of groundwater and drinking water. Flooding also has the potential to trigger other hazards, such as landslides, hazardous material spills, and dam failures.

The maximum threat of flooding for Mercer County is estimated by looking at the potential loss data and repetitive loss data, both analyzed in the risk assessment section of the hazard mitigation plan. In these cases, the severity and frequency of damage can result in permanent population displacement, and business may close if they are unable to recover from the disaster.

Estimation of potential loss is completed through FEMA's HAZUS software, A level two HAZUS scenario was performed for the entirety of Mercer County. The FEMA Global Flood Risk Report and other reports generated by the software at the end of the scenario were utilized to estimate the amount of damage and loss from a flood. The total building loss for a 100-year flood based on a HAZUS level two scenario is displayed in *Table 17 – HAZUS Building Economic Loss Figures*. The total business interruption vales occurring from a proposed 100-year flood based on FEMA HAZUS data is illustrated in *Table 18 – HAZUS Business Interruption Economic Loss Figures*. *Figure 17 – Loss by Occupancy Type* illustrates the breakdown of economic losses by either residential, commercial, industrial, or other use type.

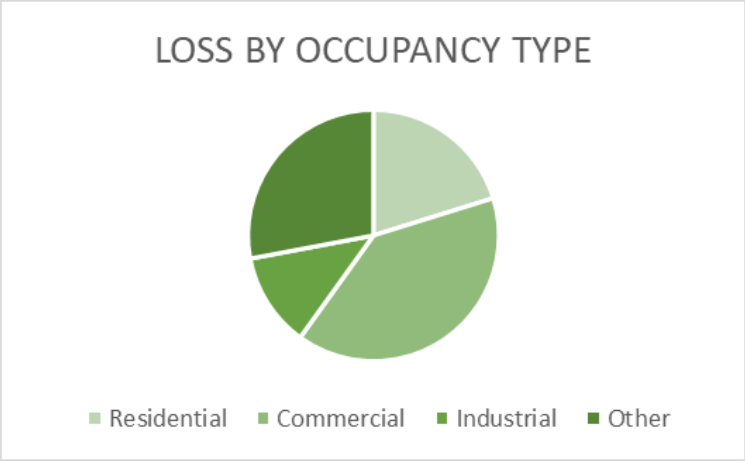
Table 17 - HAZUS Building Loss Figures

HAZUS Building Economic Loss Figures					
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Building:	$24,040,000.00	$11,460,000.00	$8,150,000.00	$1,510,000.00	$45,150,000.00
Content:	$21,880,000.00	$32,500,000.00	$21,060,000.00	$8,810,000.00	$3,620,000.00
Inventory:	$0.00	$760,000.00	$2,810,000.00	$50,000.00	$3,620,000.00
Subtotal:	**$45,920,000.00**	**$44,720,000.00**	**$32,020,000.00**	**$10,360,000.00**	**$133,020,000.00**
Source: HAZUS, 2022					

Table 18 - HAZUS Business Interruption Economic Loss Figures

HAZUS Business Interruption Economic Loss Figures					
	Residential	**Commercial**	**Industrial**	**Other**	**Total**
Income:	$540,000.00	$26,770,000.00	$1,210,000.00	$2,600,000.00	$31,110,000.00
Relocation:	$6,460,000.00	$8,080,000.00	$980,000.00	$1,660,000.00	$17,180,000.00
Rental Income:	$5,400,000.00	$4,230,000.00	$220,000.00	$170,000.00	$10,030,000.00
Wage:	$1,290,000.00	$34,150,000.00	$1,120,000.00	$67,840,000.00	$104,390,000.00
Subtotal:	**$13,690,000.00**	**$73,230,000.00**	**$3,520,000.00**	**$72,270,000.00**	**$162,710,000.00**
Source: HAZUS, 2022					

Figure 17 - Loss by Occupancy Type



Although floods can cause deaths, injuries, and damage to property, they are naturally occurring events that benefit riparian systems which have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient rich sediments which improves soil fertility. However, human development often disrupts natural riparian buffers by changing land use and land cover, and the introduction of chemical or biological contaminants that often accompany human presence and can contaminate habitats after flood events.

4.3.3.3 Past Occurrence

Mercer County has experienced numerous flooding, flash flooding, and ice jam events in the past. The flooding and flash flooding were caused by a variety of heavy storms, inclement weather, tropical storms, and other issues. A summary of recent flood event history for Mercer County from January 1996 to December 2022 is found in *Table 19 – Past Flood and Flash Flood Events*. Details of each event can be found in NOAA's National Center for Environmental

Information (NCEI) database. Additional data was also acquired by examining Mercer County's WebEOC information from 2018 to 2023.

Table 19 - Past Flood and Flash Flood Events

Past Flood and Flash Flood Events			
Event Location	**Event Date**	**Event Type**	**Property Damage Estimate**
Mercer Borough	01/19/1996	Flash Flood	$5,000.00*
Mercer Borough	05/11/1996	Flash Flood	$0.00*
Stoneboro Borough	06/22/1996	Flash Flood	$5,000.00*
Sandy Lake Borough	07/19/1996	Flash Flood	$100,000.00*
Mercer Borough	08/08/1996	Flash Flood	$0.00*
Sandy Lake Borough	09/28/1996	Flash Flood	$3,000.00*
Greenville Borough	06/12/1997	Flash Flood	$0.00*
Greenville Borough	06/25/1997	Flash Flood	$0.00*
City of Sharon	06/30/1997	Flash Flood	$8,000.00*
City of Sharon	08/16/1997	Flash Flood	$0.00*
Mercer County (Entire County)	04/16/1998	Flash Flood	$5,000.00*
Greenville Borough	01/24/1999	Flash Flood	$0.00*
Mercer County (Southern Portion)	07/28/1999	Flash Flood	$25,000.00*
Mercer County (Entire County)	04/08/2000	Flash Flood	$5,000.00*
Mercer County (Entire County)	08/02/2000	Flash Flood	$25,000.00*
New Lebanon Borough	04/15/2002	Flash Flood	$5,000.00*
Stoneboro Borough	05/13/2002	Flash Flood	$0.00
City of Sharon	08/16/2002	Flash Flood	$250,000.00*
Mercer Borough	07/04/2003	Flash Flood	$10,000.00*
City of Sharon / Greenville Borough / Grove City Borough	07/06/2003	Flash Flood	$25,000.00*
City of Sharon / Greenville Borough / Grove City Borough	07/21/2003	Flash Flood	$10,000.00*
City of Sharon / West Middlesex Borough	07/22/2003	Flash Flood	$0.00*
West Middlesex Borough	07/23/2003	Flash Flood	$0.00*
City of Sharon	07/24/2003	Flash Flood	$0.00*
Shenango Township	07/27/2003	Flash Flood	$0.00*
City of Farrell	08/04/2003	Flash Flood	$0.00*
Greenville Borough	08/05/2003	Flash Flood	$0.00*
Stoneboro Borough	08/08/2003	Flash Flood	$0.00*
Mercer Borough	08/09/2003	Flash Flood	$10,000.00*

Past Flood and Flash Flood Events			
Event Location	**Event Date**	**Event Type**	**Property Damage Estimate**
City of Sharon	08/29/2003	Flash Flood	$0.00*
Greenville Borough	05/22/2004	Flash Flood	$2,000.00*
Mercer County (Entire County)	05/23/2004	Flood	$1,000.00*
Mercer County (Entire County)	07/18/2004	Flood	$0.00*
Mercer County (Entire County)	08/28/2004	Flood	$0.00*
Mercer County (Entire County)	09/08/2004	Flood	$200,000.00*
Mercer County (Entire County)	09/17/2004	Flood	$66,000.00*
City of Sharon	06/10/2005	Flash Flood	$0.00*
City of Sharon	06/28/2005	Flash Flood	$0.00*
Greenville Borough	07/16/2005	Flash Flood	$30,000.00*
Jamestown Borough	07/27/2006	Flash Flood	$0.00*
Greenville Borough	07/31/2006	Flash Flood	$0.00*
Sandy Lake Borough / New Lebanon Borough	08/29/2006	Flash Flood	$0.00*
Mercer Borough	03/15/2007	Flood	$0.00*
Greenville Borough / Mercer Borough	03/27/2007	Flash Flood	$0.00*
Salem Township	02/11/2009	Flood	$25,000.00*
City of Sharon	02/28/2011	Flood	$75,000.00*
Wilmington Township	08/19/2011	Flood	$50,000.00*
City of Sharon	05/07/2012	Flash Flood	$25,000.00*
Coolspring Township	07/10/2013	Flash Flood	$25,000.00
Greenville Borough / Mercer Borough / West Salem Township	06/18/2014	Flood	$30,000.00*
West Salem Township	08/21/2014	Flash Flood	$75,000.00*
City of Farrell / Greenville Borough / Jamestown Borough	05/31/2015	Flood	$0.00*
Grove City Borough	06/14/2015	Flash Flood	$5,000.00*
Grove City Borough	06/15/2015	Flash Flood	$2,000.00*
Sharpsville Borough	06/16/2016	Flood	$5,000.00*
Sharpsville Borough	10/20/2016	Flash Flood	$12,000.00*
Jamestown Borough / Sharpsville Borough	01/12/2017	Flood	$6,000.00*
Stoneboro Borough / Shenango Township / Fairview Township	01/12/2017	Flash Flood	$15,000.00*
Greenville Borough	05/28/2017	Flood	$0.00*
Grove City Borough / Mercer Borough	06/19/2017	Flood	$0.00*
City of Farrell	06/30/2017	Flash Flood	$0.00*

Past Flood and Flash Flood Events			
Event Location	**Event Date**	**Event Type**	**Property Damage Estimate**
West Salem Township	06/05/2019	Flood	$0.00*
West Salem Township	06/05/2019	Flash Flood	$0.00*
West Salem Township / Greenville Borough / Jamestown Borough	07/05/2019	Flash Flood	$5,000.00*
Jamestown Borough	07/20/2019	Flash Flood	$10,000.00*
City of Sharon	08/05/2019	Flash Flood	$0.00*
Jamestown Borough	08/18/2019	Flash Flood	$0.00*
Delaware Township / Fredonia Borough	07/16/2021	Flash Flood	$70,000.00*
Sandy Lake Borough	08/13/2021	Flash Flood	$0.00*
		Total:	**$1,225,000.00***
Source: NCEI NOAA, 2022 *Property Damage Values are estimated and are not exact figures. Data from NCEI			

The National Flood Insurance Program (NFIP) identifies properties that frequently experience flooding. Repetitive loss properties are structures insured under the NFIP which have had at least two paid flood losses of more than $1,000 over any ten-year period since 1978. The hazard mitigation assistance (HMA) definition of a repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that has incurred flood-related damage on two occasions, in which the cost of repair, on average, equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage. *Table 20 – Repetitive Loss Properties* illustrates the communities that have repetitive loss properties, the total building payments, the contents payments, and the number of losses. There are twelve repetitive loss properties in Mercer County. *Table 21 – Summary of Type of Repetitive Loss Properties by Municipality* illustrates the breakdown of type of repetitive loss properties in Mercer County.

A property is considered a severe repetitive loss property either when there are at least four losses each exceeding $5,000 or when there are two or more losses where the building payments exceed the property value. *Table 22 – Severe Repetitive Loss Properties* illustrates the communities within Mercer County that have severe repetitive loss properties, the total building payments, the contents payments, and the number of losses. The data used in the table is based on data provided by PEMA. There are three severe repetitive loss properties in Mercer County. *Table 23 – Municipal NFIP Participation* lists the municipalities participating in NFIP.

Table 20 - Repetitive Loss Properties

Repetitive Loss Properties					
Community Name	**Community Number**	**Cumulative Building Payment**	**Cumulative Contents Payment**	**Sum of Total Paid**	**Losses**
Mercer Borough	420676	$31,614.85	$0.00	$31,614.85	2
City of Hermitage	421862	$5,871.82	$0.00	$5,871.82	3
City of Hermitage	421862	$12,860.33	$0.00	$12,860.33	2
Coolspring Township	421863	$23,172.78	$3,209.11	$26,381.89	2
French Creek Township	421867	$5,642.34	$0.00	$5,642.34	2
Hempfield Township	421868	$4,416.26	$0.00	$4,416.26	2
West Salem Township	422490	$33,365.53	$0.00	$33,365.53	3
Pymatuning Township	422285	$13,453.22	$1,834.99	$15,288.21	2
Pymatuning Township	422285	$19,660.71	$6,349.08	$26,009.79	2
Total:		$150,057.84	$11,393.18	$161,451.02	20
Source: FEMA, 2023					

Table 21 - Summary of Type of Repetitive Loss Properties by Municipality

Summary of Type of Repetitive Loss Properties by Municipality					
Municipality	**Type**				
	Non-Residential	**2-4 Family**	**Single Family**	**Condo**	**Other Residential**
Coolspring Township	0	0	1	0	0
French Creek Township	0	0	1	0	0
Hempfield Township	0	0	1	0	0
Hermitage, City of	2	0	0	0	0

Summary of Type of Repetitive Loss Properties by Municipality					
Municipality	**Type**				
	Non-Residential	**2-4 Family**	**Single Family**	**Condo**	**Other Residential**
Mercer Borough	1	0	0	0	0
Pymatuning Township	0	0	2	0	0
Sharon, City of	2	0	0	0	0
Stoneboro Borough	0	0	1	0	0
West Salem Township	0	0	1	0	0
Source: FEMA, 2023					

Table 22 - Severe Repetitive Loss Properties

Severe Repetitive Loss Properties					
Community Name	**Community Number**	**Cumulative Building Payment**	**Cumulative Contents Payment**	**Sum of Total Paid**	**Losses**
City of Sharon	420678	$18,318.06	$86,629.94	$104,948.00	7
City of Sharon	420678	$167,572.82	$73,928.93	$241,502.75	7
Stoneboro Borough	420679	$36,534.82	$20,103.27	$56,638.09	8
Total:		$222,425.70	$180,662.14	$403,088.84	22
Source: FEMA, 2023					

Table 23 - Municipal NFIP Participation

Municipal Participation in the National Flood Insurance Program	
Municipal Name	**Community Number**
Coolspring Township	421863
French Creek Township	421867
Hempfield Township	421868
Hermitage, City of	421862
Mercer Borough	420676
Pymatuning Township	422285
Sharon, City of	420678

Municipal Participation in the National Flood Insurance Program	
Municipal Name	**Community Number**
Stoneboro Borough	420679
West Salem Township	422490
Source: FEMA, 2023	

4.3.3.4 Future Occurrence

Flooding is a frequent problem throughout the Commonwealth of Pennsylvania. Mercer County will certainly be impacted by flooding events in the future, as Mercer County experiences some degree of flooding annually. The threat of flooding is compounded in the late winter and early spring months, as melting snow can overflow streams, creeks, and tributaries, increasing the amount of groundwater, clogging stormwater culverts and bridge openings. The NFIP recognizes the 1% annual chance flood, also known as the base flood of a one-hundred-year flood, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1% annual chance flood is a flood which has a 1% chance of occurring in a given year or is likely once every one-hundred years. The digital flood insurance maps (DFIRMs) are used to identify areas subject to the 1% annual chance of flooding.

A property's vulnerability to a flood is dependent upon its location in the floodplain. Properties along the banks of a waterway are the most vulnerable. The property within the floodplain is broken into sections depending on its distance from the waterway. The ten-year flood zone has a 10% chance of being flooded every year. However, this label does not mean that this area cannot flood more than once every ten years. This label simply designates the probability of a flood of this magnitude every year. Further away from this area is the fifty-year floodplain. This area includes all of the ten-year floodplain plus additional property. The probability of a flood of this magnitude occurring during a one-year period is 2%. A summary of flood probability is shown in *Table 24 – Flood Probability Summary*.

Table 24 - Flood Probability Summary

Flood Probability Summary	
Flood Recurrence Intervals	**Annual Chance of Occurrence**
10-year	10.00%
50-year	2.00%
100-year	1.00%

Flood Probability Summary	
Flood Recurrence Intervals	**Annual Chance of Occurrence**
500-year	0.20%
Source: FEMA, 2009	

4.3.3.5 Vulnerability Assessment

Riverine and Stream Flooding

Mercer County is vulnerable to stream and river flooding on an annual basis. Flooding puts the entire population at some level of risk, whether through flooding of homes, businesses, places of employment, roadways, sewers, and water infrastructure. Flooding can cause significant power outages and poor road conditions that can lead to heightened transportation accident risk.

County community lifelines are the most vulnerable buildings and services when riverine and stream flooding is considered. Community lifeline facilities are facilities that, if damaged, would present an immediate threat to life, public health, and safety. Facilities that use and store hazardous materials pose a potential threat to the environment during flooding events if flooding causes a leak, inundation, or equipment failure. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in Mercer County, with vulnerable structures and community lifeline facilities that are located within the special flood hazard area.

Table 25 – Expected Damage to Essential Facilities (HAZUS) illustrates the estimated damage levels to certain essential facilities based on classifications in the HAZUS General Building Stock. There are two facilities that are estimated to be at least moderately damaged by a 100-year flooding event in the HAZUS Level Two scenario that was completed for Mercer County. Of those two facilities that are estimated to be moderately damaged by the scenario, both of those facilities will undergo a loss of use. The two locations are police stations in Mercer County. No fire stations will experience a loss of use. No hospitals will experience a loss of use for this scenario. Also, no schools will experience enough damage to result in loss of use and the education of the students would need to be moved to another location until such a time that repairs can be completed. Plans for such an event, and the damage that would result to essential facilities, must be in place to successfully mitigate the potential disruption to community lifeline facilities.

Table 25 - Expected Damage to Essential Facilities (HAZUS)

Expected Damage to Essential Facilities				
Classification	**Number of Facilities**			
	Total:	**At Least Moderate:**	**At Least Substantial:**	**Loss of Use:**
Emergency Operations Center	1	0	0	0
Fire Stations	32	0	0	0
Hospitals	6	0	0	0
Police Stations	18	2	0	2
Schools	80	0	0	0

Table 26 - County Structures Within Special Flood Hazard Area shows the number of site structure address points within the Special Flood Hazard Area as well as the community lifeline facilities. This information was compiled using the Special Flood Hazard Area and GIS data provided by the Mercer County GIS Department.

Table 26 - County Structures Within Special Flood Hazard Area

County Structures Within Special Flood Hazard Area		
Municipality	**Site Structure Address Points Within Flood Area**	**Community Lifelines within Flood Area**
City of Farrell	0	0
City of Hermitage	9	0
City of Sharon	61	1
Clark Borough	1	0
Coolspring Township	1	0
Deer Creek Township	0	0
Delaware Township	0	0
East Lackawannock Township	2	0
Fairview Township	3	0
Findley Township	129	0
Fredonia Borough	0	1
French Creek Township	9	0
Greene Township	0	0
Greenville Borough	166	2
Grove City Borough	43	0
Hempfield Township	21	0
Jackson Township	1	0

County Structures Within Special Flood Hazard Area		
Municipality	**Site Structure Address Points Within Flood Area**	**Community Lifelines within Flood Area**
Jackson Center Borough	0	0
Jamestown Borough	32	0
Jefferson Township	1	0
Lackawannock Township	0	0
Lake Township	0	0
Liberty Township	1	0
Mercer Borough	23	1
Mill Creek Township	1	0
New Lebanon Borough	0	0
New Vernon Township	0	0
Otter Creek Township	5	0
Perry Township	2	0
Pine Township	8	0
Pymatuning Township	1	0
Salem Township	0	0
Sandy Creek Township	0	0
Sandy Lake Borough	33	2
Sandy Lake Township	4	0
Sharpsville Borough	1	0
Sheakleyville Borough	1	0
Shenango Township	3	1
South Pymatuning Township	0	0
Springfield Township	7	0
Stoneboro Borough	23	0
Sugar Grove Township	7	0
West Middlesex Borough	2	1
West Salem Township	1	0
Wheatland Borough	1	0
Wilmington Township	0	0
Wolf Creek Township	2	0
Worth Township	0	0
Totals:	**605**	**9**

Table 27 – Community Lifeline Facilities Additional Information illustrates the additional information including name, the municipality, and the type of facility for each community lifeline facility that falls within the Special Flood Hazard Area for Mercer County. This

information was compiled using Mercer County's GIS information with the assistance of the Mercer County GIS Department.

Table 27 - Community Lifeline Facilities Additional Information

Community Lifeline Facilities Additional Information		
Type of Facility:	**Facility Name:**	**Municipality:**
Community Lifelines		
HazMat	Fredonia Sewer Plant	Fredonia Borough
Safety and Security	Greenville Police Department	Greenville Borough
Food, Water, Shelter	Greenville Water Filter Plant	Greenville Borough
HazMat	Mercer Borough Sewer Plant	Mercer Borough
Safety and Security	U.S. Post Office	Sandy Lake Borough
Safety and Security	Sandy Lake Police Department	Sandy Lake Borough
HazMat	Sharon Wastewater Treatment Plant	City of Sharon
Energy	FirstEnergy/Penn Power Substation	Shenango Township
Food, Water, Shelter	West Middlesex Viaduct	West Middlesex Township

Flash Flooding

Flash flooding is a common occurrence in Mercer County and can occur anywhere in the county. A large portion of flash flooding occurs in populated areas that have increased impervious ground cover. During the risk assessment process, numerous resources were utilized to determine flash flooding locations in Mercer County. Municipalities were asked to identify locations within the municipality that were prone to frequent flash flooding. The National Climatic Data Center was also queried to determine flash flood vulnerable areas. This data reflected in *Table 19 – Past Flood and Flash Flood Events* above.

Locations that are identified as vulnerable to flash flooding in Mercer County are as follows:

- City of Sharon
- Greenville Borough
- Grove City Borough
- Any other urban areas or areas with limited permeability

Although the above locations were identified as vulnerable areas in Mercer County, they are not the only locations that are vulnerable to flash flooding. The Mercer County Hazard Mitigation Team will continue to work with municipalities to identify vulnerable flash flooding locations and identify vulnerable populations and community lifelines.

4.3.4. Hurricane and Tropical Storm

4.3.4.1 Location and Extent

Mercer County does not have any open-ocean coastline areas. However, the impacts from coastal storms such as tropical storms and hurricanes can expand inland. Tropical depressions are cyclones with maximum sustained winds of less than 39 miles per hour (mph). The system becomes a tropical storm when the maximum sustained winds reach between 39 and 74 miles per hour. When wind speeds exceed 74 mph, the system is considered a hurricane. Tropical storms impacting Mercer County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico. Another type of tropical storms is the nor'easter, which is a large cyclone that rotates clockwise and is typically associated with the Atlantic Ocean and the East Coast of the United States between North Carolina and Massachusetts. The name nor'easter comes from the direction that the strongest winds typically blow from the cyclone.

While Mercer County is located about 334 miles inland of the East Coast of the United States, tropical storms can track inland and cause heavy rainfall and strong winds. Mercer County is located inland of the East Coast region, designated by FEMA, as being Hurricane-Susceptible (see *Figure 18 – Pennsylvania Wind Zones*). Mercer County falls within wind Zone 4 as shown in *Figure 18 – Pennsylvania Wind Zones*. Zone 4 for Mercer County suggests that shelters and critical facilities should be able to withstand a 3-second wind gust of up to 250 mph. Tropical storms and hurricanes are regional and seasonal events that can impact very large areas that are hundreds to thousands of miles across over the life of the storm. Hurricane and tropical storm seasons are typically from June to November. All communities within Mercer County are equally subject to the impacts of hurricanes and tropical storms that track near the county. Areas in Mercer County which are subject to flooding, wind, and winter storm damage are particularly vulnerable.

4.3.4.2 Range of Magnitude

Table 28 - Saffir-Simpson Scale

Saffir-Simpson Hurricane Scale		
Category	Wind Speed	
	mph	knots
5	≥156	≥135
4	131-155	114-134
3	111-130	96-113
2	96-110	84-95
1	74-95	65-83
Non-Hurricane Classifications		
Tropical Storm	39-73	34-64
Tropical Depression	0-38	0-33

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Flood damage results from intense precipitation and wind, typically from coastal storms, which impact Mercer County. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale (*Table 28 – Saffir-Simpson Scale*). The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. Categories three, four, and five are classified as "major" hurricanes, but category one and two storms can contain potential significant storm surge. Category one storms result in very dangerous winds with some damage, while category two storms results in extremely dangerous winds with extensive damage. Category three storms result in devastating damage and category four/five storms result in catastrophic damage. Although major hurricanes comprise only 20% of all tropical cyclones making landfall, they account for over 70% of the damage in the United States. While hurricanes can cause high winds and associated impacts, it is also important to recognize the potential for flooding events during hurricanes, tropical storms, and nor'easters. In Mercer County, wind impacts from tropical events include downed trees and utility poles to cause utility interruptions. Mobile home, because they may not be well-anchored, have a greater potential to be impacted by high winds. Additionally, these storms can produce high volumes of rainfall that cause flash flooding which can be followed by stream and riverine flooding. The risk assessment and associated impact for flooding events is included in the vulnerability assessment section of the flooding, flash flooding, and ice jam flooding hazard profile.

4.3.4.3 Past Occurrence

Table 29 – History of Coastal Storms Impacting Mercer County lists all coastal storms that have impacted Mercer County from 1955 to 2021. *Figure 19 – Historic Tropical Storms/Hurricanes in Pennsylvania* identifies some past hurricanes that had an inland path through Pennsylvania.

Hurricane Agnes was a severe coastal storm event in June 1972. After making first landfall as a hurricane near Florida, Agnes weakened and exited back into the Atlantic off the North Carolina coast. The storm moved along the coast and made a second landfall near New York City as a tropical storm and merged with an extra-tropical low-pressure system over Pennsylvania. This brought extremely heavy rains to Pennsylvania that caused major flooding. Pennsylvania incurred $2.8 billion in damages. There were fifty storm related deaths statewide. However, in Mercer County, the most significant effects of Hurricane Agnes were due to secondary flooding**.** Agnes was only a category one hurricane but dropped more than fifteen inches of rain in the northeastern United States. Pennsylvania received the greatest amount of flood damage.

Table 29 - History of Coastal Storms Impacting Mercer County

History of Coastal Storms Impacting Mercer County (NOAA 2022)			
Year	**Name**	**Category at Time of Mercer County Impact**	**Wind Speed at Time of Mercer County Impact**
1955	Connie	Tropical Storm	45 Knots
1959	Gracie	Extra Tropical Storm	25 Knots
1968	Candy	Extra Tropical Storm	25 Knots
1979	Frederic	Tropical Storm	35 Knots
1989	Hugo	Extra Tropical Storm	35 Knots
1995	Opal	Extra Tropical Storm	40 Knots
1996	Fran	Tropical Depression	30 Knots
2002	Isidore	Extra Tropical Storm	20 Knots
2003	Isabel	Extra Tropical Storm	35 Knots
2004	Frances	Extra Tropical Storm	30 Knots
2012	Sandy	Extra Tropical Storm	35 Knots
2017	Nate	Extra Tropical Storm	25 Knots
2021	Fred	Tropical Depression	20 Knots

4.3.4.4 Future Occurrence

Although hurricanes and tropical storms can cause flood events consistent with 100 and 500-year flood levels, the probability of occurrence of hurricanes and tropical storms is measured relative to wind speed. *Table 30 – Annual Probability of Wind Speeds* shows the annual probability of winds that reach the strength of tropical storms and hurricanes in Mercer County and the surrounding areas based on a sample period of forty-six years. According to NOAA, there is a low probability each year that Mercer County will experience winds from coastal storms that could cause minimal to moderate damages, however it is likely that a storm event will occur

during this planning period. The potential future impacts from a tropical storm or hurricane will be approximately once every five years, or 20% annually. The probability of winds exceeding 118 mph is less than 0.1% annually (*Table 30 – Annual Probability of Wind Speeds*).

Table 30 - Annual Probability of Wind Speeds

Annual Probability of Wind Speeds (FEMA, 2000)		
Wind Speed (mph)	Saffir-Simpson Scale	Annual Probability of Occurrence (%)
45-77	Tropical Storms// Category 1 Hurricane	91.59
78-118	Category 1 to 2 Hurricanes	8.32
119-138	Category 3 to 4 Hurricanes	.0766
139-163	Category 4 to 5 Hurricanes	.0086
164-194	Category 5 Hurricanes	.00054
195+	Category 5 Hurricanes	.00001

There has been an increase in North Atlantic hurricane activity since the 1970s with locations of peak intensity tropical cyclones migrating poleward coinciding with tropics expansion. An index potential hurricane destructiveness suggests an increase over the past thirty years. Variability in tropical cyclone activity in the Atlantic is due to natural variability in ocean circulation, volcanic eruptions, and Saharan dust, as well as climate change resulting from greenhouse gases and sulfate aerosols.

Climate change is causing atmospheric temperatures to rise, which corresponds to a rise in ocean surface temperatures, resulting in warmer and moister conditions where tropical storms develop. However, the relationship between climate change and hurricanes can be complex due to the many other factors that are associated with hurricane development which include wind shear and air pollution. Warmer oceans store more energy and are capable of fueling stronger storms and it is projected that Atlantic hurricanes will become more intense and produce more precipitation as ocean surface temperatures rise. The storms associated with the tropical storms/hurricanes can also linger around for a longer period of time in a given place due to the climate change which enhances destructive impacts in the future. Other possible connections of hurricanes in near future related to climate change are the length of hurricane season and seeing more hurricanes earlier or later than usual hurricane season. There are expected to be more category four and five hurricanes in the Atlantic and the hurricane season may be elongated, all which impact the future of Mercer County.

4.3.4.5 Vulnerability Assessment

The impacts of climate change are tangible and hazardous realities. Tropical storms tracking nearby Mercer County can not only cause high winds, but also heavy rains to occur. A vulnerability assessment for hurricanes and tropical storms focusses on the impacts of flooding and severe winds. Flooding associated from hurricanes/tropical storms can occur in areas throughout Mercer County which can cause damage to buildings and infrastructure. The vulnerability assessment for flooding and wind related damage can be found in the vulnerability section of those hazard profiles.

Based on the information included in Section 4.3.4 related to flooding and HAZUS scenarios, the number of community lifeline and critical infrastructure facilities that could be impacted by a 100-year flood event is two separate facilities in Mercer County. Two police stations would be moderately impacted by a flood with that occurrence interval. This table can be seen in greater detail in Section 4.3.3.5. A total of nine community lifeline or critical infrastructure facilities are also located within the special flood hazard area for Mercer County. This table can also be seen in Section 4.3.3.5 of this hazard mitigation plan. A listing of these locations and more details can be found in Section 4.3.3.5 (*Table 27 – Community Lifeline Facilities Additional Information*).

Mobile homes are at a greater vulnerability during a hurricane or tropical storm because those locations could be less well anchored to the ground than typical homes constructed with footings and foundations. High wind events make these locations particularly vulnerable because of sustained gale-force winds that can be associated with hurricanes and tropical storms. Mobile homes and improperly anchored homes can be found in locations throughout the county, and these are common around the entire Commonwealth of Pennsylvania. Based on data provided by the Mercer County GIS Department, there are approximately 1,943 mobile homes and 240 double-wide trailers located within the county. This information is presented in tabular format in *Table 31 – Mercer County Mobile Home Count and Locations*.

Table 31 - Mercer County Mobile Home Count and Locations

Mercer County Mobile Homes by Location		
Number	Location	Number of Mobile Homes
01	COOLSPRING	127
02	DEER CREEK	7
03	DELAWARE	14
04	EAST LACKAWANNOCK	15
05	FAIRVIEW	15
06	FINDLEY	23

Mercer County Mobile Homes by Location		
Number	Location	Number of Mobile Homes
07	FRENCH CREEK	50
08	GREENE	27
09	HEMPFIELD	61
10	HERMITAGE A	2
11	HERMITAGE B	66
12	HERMITAGE C	65
13	JACKSON	18
14	JEFFERSON	94
15	LACKAWANNOCK	256
16	LAKE	8
17	LIBERTY	47
18	MILL CREEK	15
19	NEW VERNON	21
20	OTTER CREEK	21
21	PERRY	84
22	PINE	185
23	PYMATUNING	272
24	SALEM	17
25	SANDY CREEK	23
26	SANDY LAKE TWP	64
27	SHENANGO	135
28	SOUTH PYMATUNING	12
29	SPRINGFIELD	50
30	SUGAR GROVE	27
31	WEST SALEM	77
32	WILMINGTON	5
33	WOLF CREEK	29
34	WORTH	23
51	CLARK	1
52	FARRELL	0
54	FREDONIA	8
55	GREENVILLE	1
59	GROVE CITY	60
63	JACKSON CENTER	2
64	JAMESTOWN	38
65	MERCER	15
66	NEW LEBANON	23
67	SANDY LAKE BORO	0
68	SHARON I	0

Mercer County Mobile Homes by Location		
Number	Location	Number of Mobile Homes
69	SHARON II	0
70	SHARON III	0
71	SHARON IV	0
72	SHARPSVILLE	0
73	SHEAKLEYVILLE	6
74	STONEBORO	44
75	WEST MIDDLESEX	29
76	WHEATLAND	1

Due to the impact of hurricanes and tropical storms, the vulnerability for Mercer County is high. Potential economic losses could include direct building loss and business interruption. Direct building loss is direct damage to any building or structure. Business interruption includes relocation, employee wage loss, expenses, income loss, etc. Mercer County's vulnerability level is high for direct building loss. The total direct building loss amount for Mercer County equates to $133,020,000.00. The total business interruption value for Mercer County equates to $162,710,000.00. Therefore, the vulnerability of direct building loss and business interruption is high.

Figure 18 - Pennsylvania Wind Zones

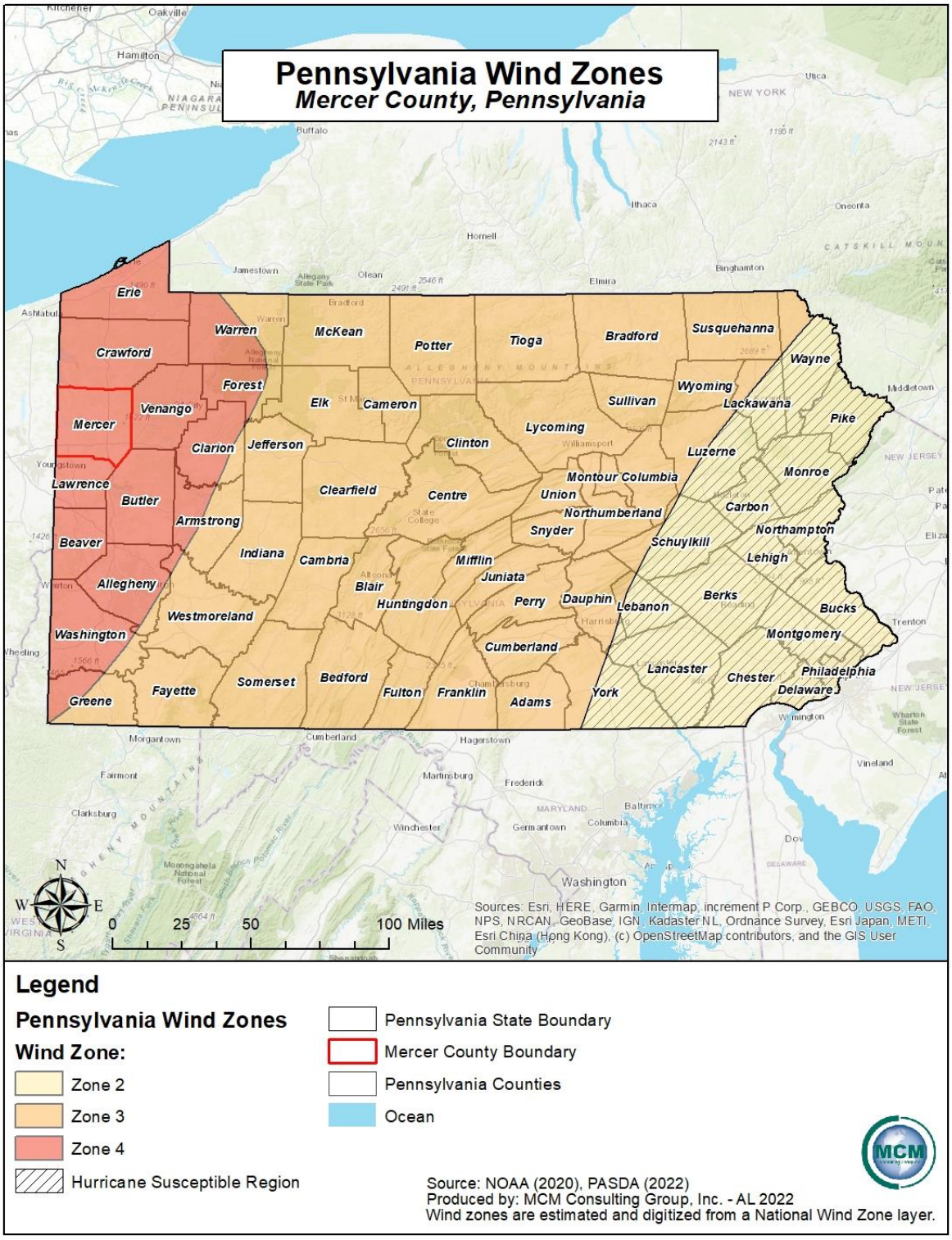
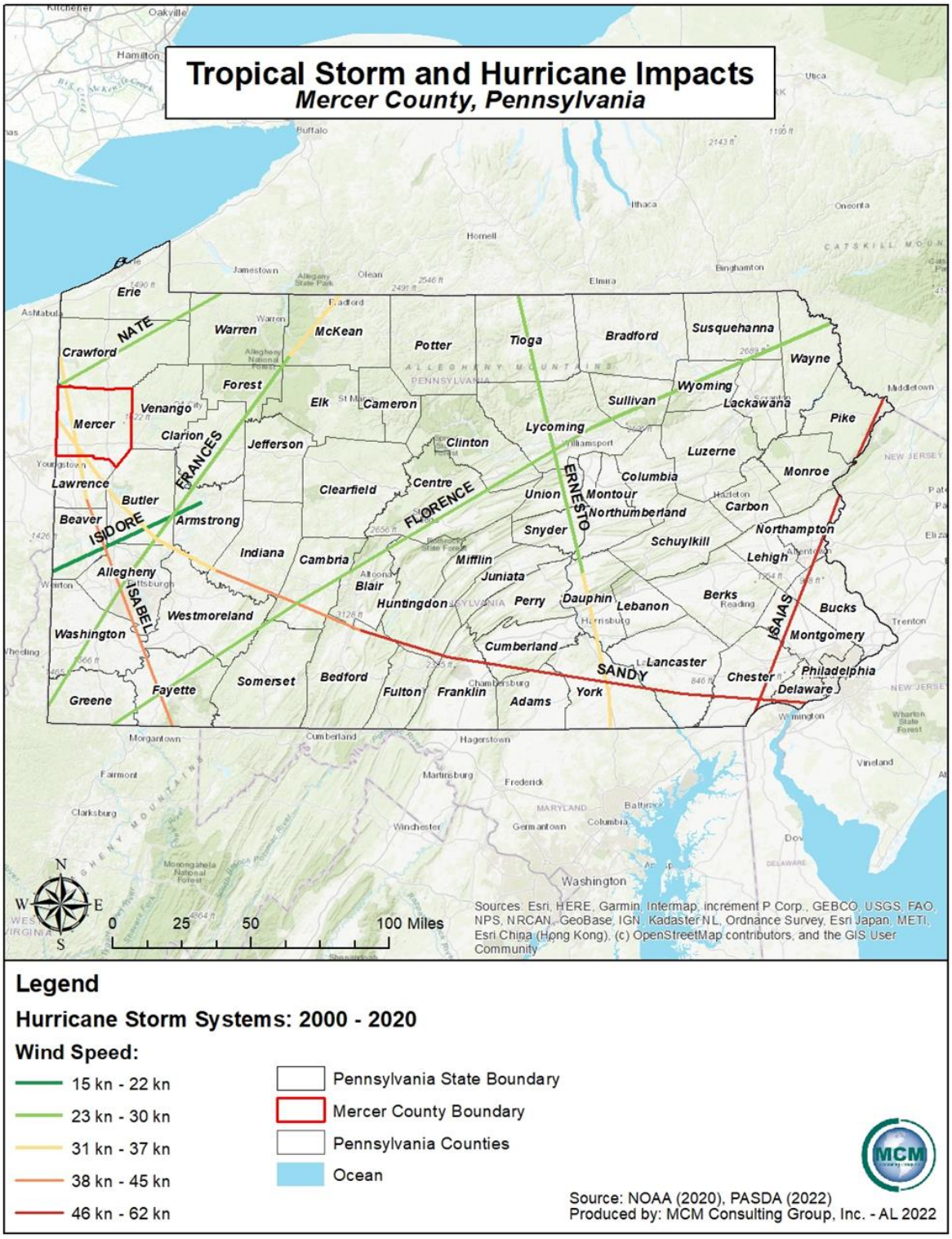


Figure 19 - Historic Tropical Storms/Hurricanes in Pennsylvania



4.3.5. Invasive Species

4.3.5.1 Location and Extent

An invasive species is a species that is not indigenous to a given ecosystem and that, when introduced to a non-native environment, tends to thrive. The spread of an invasive species often alters ecosystems, which can cause environmental and economic harm and pose a threat to human health. Often, an invasive species spreads and reproduces quickly. Invasive species are not limited to organisms that come from a foreign country. Invasive species can come from a different region in the United States. The main instigator of invasive species is human activity. Either intentionally or unintentionally, other species may accompany people when they travel, introducing the stowaway species to a novel ecosystem. In a foreign ecosystem, a transported species may thrive, potentially restructuring the ecosystem and threatening its health. Common pathways for invasive species introduction to Pennsylvania include but are not limited to:

- Contamination of internationally traded products
- Hull fouling
- Ship ballast water release
- Discarded live fish bait
- Intentional release
- Escape from cultivation
- Movement of soil, compost, wood, vehicles or other materials and equipment
- Unregulated sale of organisms
- Smuggling activities
- Hobby trading or specimen trading

The Governor's Invasive Species Council of Pennsylvania (PISC), the lead organization for invasive species threats, recognizes two types of invasive species: Aquatic and Terrestrial.

Aquatic Invasive Species (AIS) are nonnative invertebrates, fishes, aquatic plants, and microbes that threaten the diversity or abundance of native species, the ecological stability of the infested waters, human health and safety, or commercial, agriculture, or recreational activities dependent on such waters.

Terrestrial Invasive Species (TIS) are nonnative plants, vertebrates, arthropods, or pathogens that complete their lifecycle on land instead of in an aquatic environment and whose introduction does or is likely to cause economic/environmental damage or harm to human health.

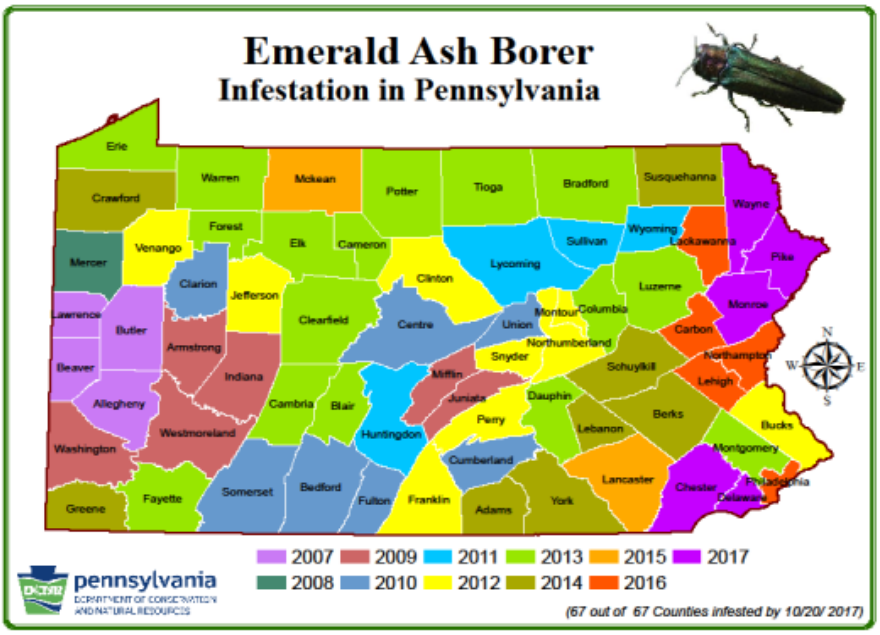
The location and extent of invasive threats is dependent on the preferred habitat of the species, as well as the species' ease of movement and establishment. For example, kudzu vine is an aggressive vascular plant. With wide ecological parameters and ease of spread, the vine is a more widespread invasive species threat. Other species' spread, such as the spotted lantern fly, has

been limited by state agency activity. First discovered in Berks County in 2014, the spotted lantern fly was placed under a quarantine by the Pennsylvania Department of Agriculture in thirteen counties. *Table 32 - Prevalent Invasive Species* lists invasive species that have been found in Mercer County.

4.3.5.2 Range of Magnitude

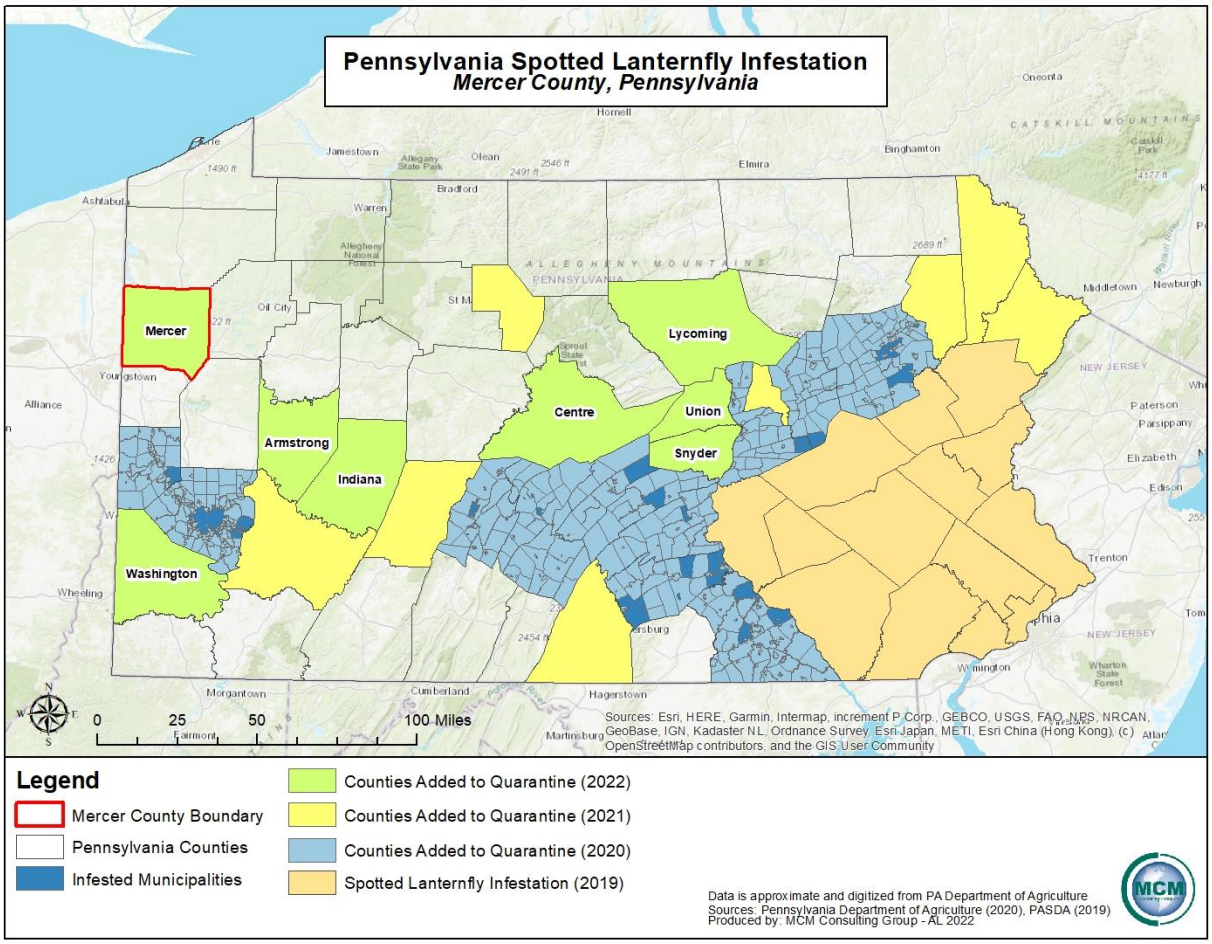
The magnitude of invasive species threats ranges from nuisance to widespread killer. Some invasive species are not considered agricultural pests, and do not harm humans or cause significant ecological problems. For example, Brown Marmorated Stink Bugs are not considered to be an agricultural pest and do not harm humans. Other invasive species can have many negative impacts and cause significant changes in the composition of ecosystems. For example, the Emerald Ash Borer creates a 99% mortality rate in any ash tree it infects. The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem. An example of a worst-case scenario for invasive species in Pennsylvania is the Emerald Ash Borer in Mercer County and the surrounding region (see *Figure 20 - Emerald Ash Borer Infestation in Pennsylvania*).

Figure 20 - Emerald Ash Borer Infestation in Pennsylvania



Another example of an invasive species is the Spotted Lanternfly. The Spotted Lanternfly is a harmful invasive species which feeds on plants, damaging or destroying them. This can negatively impact the areas of Pennsylvania known for outdoor scenery and activities. According to the Penn State Extension, the Spotted Lanternfly is a significant threat to Pennsylvania agriculture, landscapes, and natural ecosystems, including grape, tree-fruit, hardwood, and nursery industries, which collectively are worth nearly $18 billion to the state's economy, outdoor recreation, and biodiversity. The total number of infected counties is 45, including Mercer County, as of November 2022. *Figure 21 – Pennsylvania Spotted Lanternfly Infestation* illustrates the counties in Pennsylvania that are considered to be in the quarantine zone for this pest.

Figure 21 - Pennsylvania Spotted Lanternfly Infestation in Pennsylvania



The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought. The already weakened state of the native ecosystem causes it to succumb to an infestation more easily.

4.3.5.3 Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of European settlers, but not all occurrences required government action. Mercer County is known for its great number of geographic features. There are various state game lands within the area which include state game lands 130, 151, 270, 284, and 294. Maurice K. Goddard State Park is fully located in Mercer County, as well as the Clear Creek State Forest. Due to the vast area of forests, there are many invasive terrestrial species that have been widespread in Mercer County that are common problems throughout the Commonwealth. Some of the most popular problematic species in Mercer County include but are not limited to:

- Emerald Ash Borer
- Brown Marmorated Stink Bug
- Japanese Beetle
- Spotted Lanternfly
- Garlic Mustard

Many of the extreme problematic species have been around for many years. However, the most recent problematic species are the Emerald Ash Borer and the Spotted Lanternfly. In 2007 the Emerald Ash Borer was a newly spotted species that caused extreme damage. Even more recently than 2007, the Spotted Lanternfly appeared in Mercer County. In 2014, this invasive species became prevalent in Eastern Pennsylvania, however, it was not until 2021 that Mercer County had entered the quarantine zone for the Spotted Lanternfly infestation.

Table 32 - Prevalent Invasive Species lists problematic non-native species that are established in Mercer County. While all species listed here are not native to Mercer County, those species highlighted in red are considered to pose a more severe ecological threat than some of the others (Rank 1), species highlighted in yellow are considered to pose a significant ecological threat but not considered to spread as easily and aggressively (Rank 2), and species highlighted in green are considered to pose a lesser ecological threat (Rank 3).

Table 32 - Prevalent Invasive Species

Prevalent Invasive Species		
Scientific Name	**Common Name**	**Type**
Nelumbo lutea	American Water Lotus	Plant
Lonicera maackii	Amur Honeysuckle	Plant

Prevalent Invasive Species		
Scientific Name	**Common Name**	**Type**
Corbicula fluminea	Asiatic Clam	Animal
Elaeagnus umbellata	Autumn Olive	Plant
Rumex obtusifolius	Bitter Dock	Plant
Typha x glauca	Blue Cattail, Hybrid Cattail	Plant
Cirsium vulgare	Bull Thistle	Plant
Cirsium arvense	Canada Thistle	Plant
Tussilago farfara	Colt's-foot	Plant
Cyprinus carpio	Common Carp	Animal
Hydrocharis morsus-ranae	Common Frogbit	Plant
Phragmites australis ssp. australis	Common Reed	Plant
Veronica officinalis	Common Speedwell	Plant
Hypericum perforatum	Common St. John's-wort	Plant
Lysimachia nummularia	Creeping Jenny	Plant
Potamogeton crispus	Curly-leaf Pondweed	Plant
Hesperis matronalis	Dame's Rocket	Plant
Myriophyllum spicatum	Eurasian Water-milfoil	Plant
Craspedacusta sowerbyi	Freshwater Jellyfish	Animal
Lotus corniculatus	Garden Bird's-foot-trefoil	Plant
Alliaria petiolata	Garlic Mustard	Plant
Epilobium hirsutum	Great Hairy Willowherb	Plant
Chelidonium majus	Greater Celandine	Plant
Lonicera spp. (species unknown)	Honeysuckle (species unknown)	Plant
Hydrilla verticillata	Hydrilla	Plant
Berberis thunbergii	Japanese Barberry	Plant
Reynoutria japonica	Japanese Knotweed	Plant
Microstegium vimineum	Japanese Stiltgrass	Plant
Pachysandra terminalis	Japanese-spurge	Plant
Reynoutria spp. (species unknown)	Knotweed (species unknown)	Plant
Ranunculus ficaria	Lesser Celandine	Plant
Vinca minor	Lesser Periwinkle	Plant
Lonicera morrowii	Morrow's Honeysuckle	Plant
Rosa multiflora	Multiflora Rose	Plant
Cipangopaludina spp. (species unknown)	Mysterysnail spp. (species unknown)	Plant
Typha angustifolia	Narrowleaf Cattail	Plant

Prevalent Invasive Species		
Scientific Name	**Common Name**	**Type**
Hemerocallis fulva	Orange Daylily	Plant
Dactylis glomerata	Orchard Grass	Plant
Celastrus orbiculatus	Oriental Bittersweet	Plant
Ligustrum spp. (species unknown)	Privet (species unknown)	Plant
Lamium purpureum	Purple Deadnettle	Plant
Osmerus mordax	Rainbow Smelt	Animal
Trachemys scripta elegans	Red-eared Slider	Animal
Phalaris arundinacea	Reed Canary Grass	Plant
Ulmus pumila	Siberian Elm	Plant
Lymantria dispar	Spongy moth	Animal
Anthoxanthum odoratum	Sweet Vernal Grass	Plant
Ailanthus altissima	Tree-of-Heaven	Plant
Myosotis scorpioides	True Forget-me-not	Plant
Trapa natans	Water Chestnut	Plant
Dipsacus fullonum	Wild Teasel	Plant
Lamiastrum galeobdolon	Yellow Arch-angel	Plant
Iris pseudacorus	Yellow Iris	Plant
Dreissena polymorpha	Zebra Mussel	Animal
Source: EDDMaps, 2022; iMapInvasives, 2022; PA DCNR, 2019		

4.3.5.4 Future Occurrence

According to the Pennsylvania Invasive Species Council (PISC), the probability of future occurrence for invasive species threats is growing due to the increasing volume of transported goods, increasing efficiency and speed of transportation, and expanding international trade agreements. Expanded global trade has created opportunities for many organisms to be transported to and establish themselves in new counties and regions. In 2017, Pennsylvania alone imported over $83 billion in goods from abroad, including agricultural, forestry, and fishery goods that commonly carry unknow pests.

Climate change is contributing to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests can establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth, possibly shifting the dominance of ecosystems in the favor of non-native species. In order to combat the increase in future occurrences, the PISC released the Invasive Species Management Plan in April 2010 and updated the plan in 2017. The plan

outlines the Commonwealth's goals for managing the spread of nonnative invasive species and creates a framework for responding to threats through research, action, and public outreach and communication. More information can be found here: https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/GISC/Pages/default.aspx.

There are several invasive species that are found near Mercer County but have not yet been formally detected inside the county (see *Table 33 – Future Vulnerable Species*). Especially in cases like this, control efforts, heightened awareness, and public outreach and education can help prevent an invasive species from becoming established in the future. Once a species is established, it is more difficult to eradicate it from an ecosystem, so prevention is very important. The development of appropriate plans will assist the county in reducing the possibility of a future encounter with any of these species. Working toward keeping these species from entering the area would be beneficial to the forests of Mercer County.

Table 33 - Future Vulnerable Species

Future Vulnerable Species		
Scientific Name	**Common Name**	**Type**
Alosa pseudoharengus	Alewife	Plant
Phellodendron amurense	Amur Corktree	Plant
Commelina communis	Asiatic Dayflower	Plant
Lonicera x bella [morrowii x tatarica]	Bell's Honeysuckle	Plant
Aegopodium podagraria	Bishop's Goutweed	Plant
Rhodotypos scandens	Black Jetbead	Plant
Brassica nigra	Black Mustard	Plant
Cynanchum louiseae	Black Swallow-wort	Plant
Reynoutria x bohemica	Bohemian Knotweed	Plant
Ligustrum obtusifolium	Border Privet	Plant
Egeria densa	Brazilian Waterweed	Plant
Najas minor	Brittle Naiad	Plant
Bipalium spp. (species unknown)	Broadhead planarians (species unknown)	Plant
Myriophyllum heterophyllum	Broadleaf Water-milfoil	Plant
Centaurea jacea	Brown Starthistle	Plant
Rhamnus cathartica	Buckthorn	Plant
Euonymus alatus	Burning Bush	Plant
Cabomba caroliniana	Carolina Fanwort; Fanwort	Plant

Future Vulnerable Species		
Scientific Name	**Common Name**	**Type**
Ajuga reptans	Carpet-bugle	Plant
Bromus tectorum	Cheatgrass	Plant
Cipangopaludina chinensis; Bellamya chinensis	Chinese Mystery snail	Animal
Miscanthus sinensis	Chinese Silver Grass	Plant
Wisteria sinensis	Chinese Wisteria	Plant
Agrostis capillaris	Colonial Bentgrass	Plant
Securigera varia	Common Crown-vetch	Plant
Ornithogalum umbellatum	Common Star-of-Bethlehem	Plant
Euphorbia cyparissias	Cypress Spurge	Plant
Epipactis helleborine	Eastern Helleborine	Plant
Fiorinia externa	Elongate Hemlock Scale	Plant
Hedera helix	English Ivy	Plant
Alnus glutinosa	European Alder	Plant
Berberis vulgaris	European Barberry	Plant
Convallaria majalis	European Lily-of-the-valley	Plant
Ligustrum vulgare	European Privet	Plant
Allium vineale	Field Garlic	Plant
Ludwigia peploides ssp. glabrescens	Floating Seedbox	Plant
Butomus umbellatus	Flowering-rush	Plant
Reynoutria sachalinensis	Giant Knotweed	Plant
Myosoton aquaticum	Giant-chickweed	Plant
Frangula alnus	Glossy False Buckthorn	Plant
Carassius auratus	Goldfish	Animal
Ctenopharyngodon idella	Grass Carp	Animal
Arctium lappa	Greater Burdock	Plant
Viburnum opulus var. opulus	Guelder-rose Viburnum	Plant
Aralia elata	Japanese Angelica Tree	Plant
Humulus japonicus	Japanese Hop	Plant
Cipangopaludina japonica	Japanese Mystery snail	Animal
Viburnum plicatum	Japanese Snowball	Plant
Datura stramonium	Jimsonweed	Plant
Amynthas-Metaphire spp. (species unknown)	Jumping Worms (species unknown)	Animal
Lolium arundinaceum	Kentucky Fescue	Plant

Future Vulnerable Species		
Scientific Name	**Common Name**	**Type**
Schedonorus pratensis	Meadow Fescue	Plant
Tragopogon dubius	Meadow Goat's-beard	Plant
Phleum pratense	Meadow Timothy	Plant
Polygonum perfoliatum; Persicaria perfoliata	Mile-a-minute-weed	Plant
Hieracium pilosella	Mouse-ear Hawkweed	Plant
Artemisia vulgaris	Mugwort	Plant
Cygnus olor	Mute Swan	Plant
Leucanthemum vulgare	Oxeye Daisy	Plant
Mentha x piperita	Peppermint	Plant
Conium maculatum	Poison-hemlock	Plant
Ampelopsis brevipedunculata	Porcelainberry	Plant
Bromus sterilis	Poverty Brome	Plant
Ludwigia peploides	Primrose-willow	Plant
Dreissena bugensis	Quagga Mussel	Animal
Neogobius melanostomus	Round Goby	Plant
Faxonius rusticus	Rusty Crayfish	Animal
Pinus sylvestris	Scotch Pine	Plant
Petromyzon marinus	Sea Lamprey	Animal
Miscanthus spp. (species unknown)	Silver grass (species unknown)	Plant
Trachemys scripta	Slider	Plant
Bromus inermis	Smooth brome	Plant
Centaurea biebersteinii; Centaurea stoebe ssp. micranthos	Spotted Starthistle	Plant
Prunus avium	Sweet Cherry	Plant
Lonicera tatarica	Tatarian Honeysuckle	Plant
Cardamine impatiens	Touch-me-not Bittercress	Plant
Abutilon theophrasti	Velvetleaf	Plant
Morus alba	White Mulberry	Plant
Procambarus acutus	White River Crayfish	Animal
Salix alba	White Willow	Plant
Pastinaca sativa	Wild Parsnip	Plant
Rubus phoenicolasius	Wineberry	Plant
Nymphoides peltata	Yellow Floatingheart	Plant
Source: EDDMaps, 2022; PA DCNR, 2019; iMapInvasives, 2022		

4.3.5.5 Vulnerability Assessment

Mercer County's vulnerability to invasion depends on the species in question. Human activity and mobility are ever increasing, and combined with the prospects of climate change, invasive species are becoming increasingly threatening. Invasive species can have adverse economic effects by impacting agriculture and logging activities. Natural forest ecosystems provide clean water, recreational opportunities, habitat for native wildlife, and places to enjoy the tranquility and transcendence of nature. The balance of forest ecosystems and forest health are vulnerable to invasive species threats. While there is significant acreage of wetlands, waterways, state parks, and game lands in Mercer County where forest managers can impact invasive species, private lands can provide refuge for invasive species if landowners are unaware of or apathetic towards the threat.

Since there are large swatches of public land in Mercer County, there is a risk of future damage from invasive species that are present in the area. With about 430,720 acres of total land in Mercer County, there is vulnerability to various land sites and waterways. If an invasive species were to invade the popular terrestrial areas or waterways in Mercer County, a negative impact could occur. The invasion from an invasive species could cause damage to the scenic and natural resources needed in the county. Additionally, tourism for the county is vulnerable to the invasive species as well and would be affected if the parks were destroyed. Therefore, a great amount of land and native wildlife within Mercer County are at risk with the presence of invasive species.

An interesting facet of the invasive species problem in Pennsylvania is that deer do not eat many invasive plants, giving invasive species a competitive advantage over the native species that deer prefer. As such, the management of deer populations in Mercer County has a significant impact on the vulnerability of an ecosystem to invasive species, where overpopulation of deer favors invasive species.

The Governor's Invasive Species Council of Pennsylvania (PISC) has identified over 100 species threats that are or could potentially become significant in Pennsylvania. Of these threats, county and municipal leaders believe that the most significant are invasive forest pests like the Emerald Ash Borer, Hemlock Woolly Adelgid, the Spotted Lanternfly, and plants like the Tree-of-Heaven which have all been identified in red in *Table 32 - Prevalent Invasive Species.*

Due to the past experiences with invasive plants in the county, there are five primary components which help with managing invasive plants to lower vulnerability:

Prioritize: Public use areas such as state parks and other healthy forest ecosystems should be prioritized over developed and private areas. Locations with lower densities of invasive plants are often easier to control and should be given quick attention. Locations where humans are disturbing the landscape opens up niche space, and often times the aggressive invasive species move in faster than native species. Such locations include areas around road work, ditch/culvert

work, logging activities, stream improvement/stabilization and bridge work. Some species pose a higher risk than others - invasive species are easiest to control before they become widespread and established in an area, and for that reason, species that are less widespread should be prioritized for management.

Locate: Detailed locations should be recorded for invasive plants so sites can be easily relocated, treated, and monitored.

Delineate: The scale and extent of the infestation should be recorded and mapped so that the progress of the infestation can be monitored.

Control: Methods of control depend on the specific infestation, but the most common approaches are mechanical (cutting and hand-pulling) and chemical (herbicide treatments).

Monitor: Identified sites should be monitored and revisited as often as several times in a growing season (depending on the location/species). Monitoring can allow for early detection of spreading infestations. Most importantly, it prevents a relapse towards full-blown infestation.

It is best to act before a species can become established in the county, so forest management such as park rangers should be aware of invasive species found nearby Mercer County, but not yet present in the county (priority species in *Table 33 – Future Vulnerable Species*). Public outreach and education are important to increase knowledge of these species to improve identification and prevention of invasion. Without action, due to the instances and extent of the current infestations, it is reasonable to project that the county's vulnerability will increase.

4.3.6. Landslide

4.3.6.1 Location and Extent

Rock falls and other slope failures can occur in areas of Mercer County with moderate to steep slopes. Many slope failures are associated with precipitation events – periods of sustained above-average precipitation, specific rainstorms, or snowmelt events. Rockfalls, rockslides, rock topples, block slides, debris flows, mud flows, and mud slides are all forms of landslides. Areas experiencing erosion, decline in vegetation cover and earthquakes are also susceptible to landslides. Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil and water content, and removing vegetation cover. Areas where this type of human activity is common are areas that were excavated along highways and other roadways.

The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) describes landslide susceptibility in Mercer County as generally high vulnerability along lake bluffs and stream banks. *Figure 22 – Landslide Hazard Vulnerability* shows areas of landslide susceptibility in Mercer County. Mercer County is located in the Appalachian Plateaus physiographic province which is known for moderate to high vulnerability to all forms of landslide. Steep slopes are evenly spread throughout the county and there are locations that can be prone to landslides in almost every municipality.

4.3.6.2 Range of Magnitude

Landslides cause damage to transportation routes, utilities, and buildings. They can also create travel delays and other side effects for transportation of people and material. Fortunately, death and injuries due to landslides are relatively rare in Pennsylvania. Almost all of the known deaths due to landslides have occurred when rocks fall or other slide along highways involve vehicles. Storm-induced debris flows are the only other type of landslide likely to cause injuries. As residential and recreational development increase on and near steep mountain slopes, the hazard from these rapid events will also increase. Most Pennsylvania landslides are moderate to slow moving and damage objects and buildings, rather than people.

The Pennsylvania Department of Transportation (PennDOT) and large municipalities incur substantial costs due to landslide damage and to additional construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of $10 million per year is spent on landslide repair contracts across the Commonwealth of Pennsylvania and a similar amount is spent on mitigation costs for grading projects (DCNR, 2009). A number of highway sites in Pennsylvania need temporary or permanent repair at an estimated cost of between $300,000.00 and $2 million each. Similar landslide events that effect traffic and roadways

throughout the commonwealth occur intermittently throughout the year. A 7,500-pound rockslide closed down parts of Pennsylvania State Route 11 in Montour County, Pennsylvania in November of 2020 for a number of weeks. Events of similar magnitude can and have occurred in and around Mercer County.

The 2018 Pennsylvania Hazard Mitigation Plan lists Mercer County as having a low incidence of landslides but high susceptibility. Mercer County landowners and real estate developers must know the magnitude of susceptibility within the county prior to the start of development.

4.3.6.3 Past Occurrence

No comprehensive list of landslide incidents in Mercer County is available, as there is no formal reporting system in place. PennDOT and municipal departments are responsible for slides that inhibit the flow of traffic or damage roads and bridges, but they generally only repair the road and the adjacent right-of-way areas.

Landslides occur have occurred very infrequently in Mercer County. Only one major event has occurred since the last plan update in 2018. On approximately July 17th, 2021, flooding caused a landslide that removed a portion of Crestview Drive near Transfer Borough. The landslide caused a lengthy detour that affected the travel and commutes of citizens in Mercer County. This event was confirmed by the Mercer County Conservation District and was reported by CBS News out of Pittsburgh, Pennsylvania.

4.3.6.4 Future Occurrence

Historically, significant landslide events are likely to occur on average once every four years in Mercer County. Mismanaged development in steeply sloped areas could increase the frequency of occurrence. Road cuts are the most common development that puts an area at an increased probability of a slide. The Pennsylvania Department of Environmental Protection (PA DEP) has an Erosion and Sediment (E & S) program that sets requirements intended to mitigate erosion associated with development projects of a certain scale. The guidelines offered in this program are similar to landslides prevention practices.

4.3.6.5 Vulnerability Assessment

Landslides are often precipitated by other natural hazards such as earthquakes or floods. A significant landslide can cause millions of dollars in damages. Continued enforcement of floodplain management and proper road and building construction can mitigate the vulnerability to landslides. Floodplain management is important where mining has occurred within proximity to watercourses and associated flat-lying areas. Surface water may permeate into areas that still have open fractures and the build-up of surface water in those fractures could lead to unexpected flood events and landslide events.

A comprehensive database of land highly prone to erosion and landslides is difficult to produce. The potential for erosion and landslides should be considered when planning construction projects in Mercer County. There are several general factors that can be indicators of landslide prone areas including:

- Locations on or close to steep hills.
- Areas of steep road cuts or excavations.
- Steep areas where surface run-off is channeled.
- Fan shaped areas of sediment and rock accumulations.
- Evidence of past sliding such as tilted utility line, tilted trees, cracks in the ground and irregularly, surfaced ground.

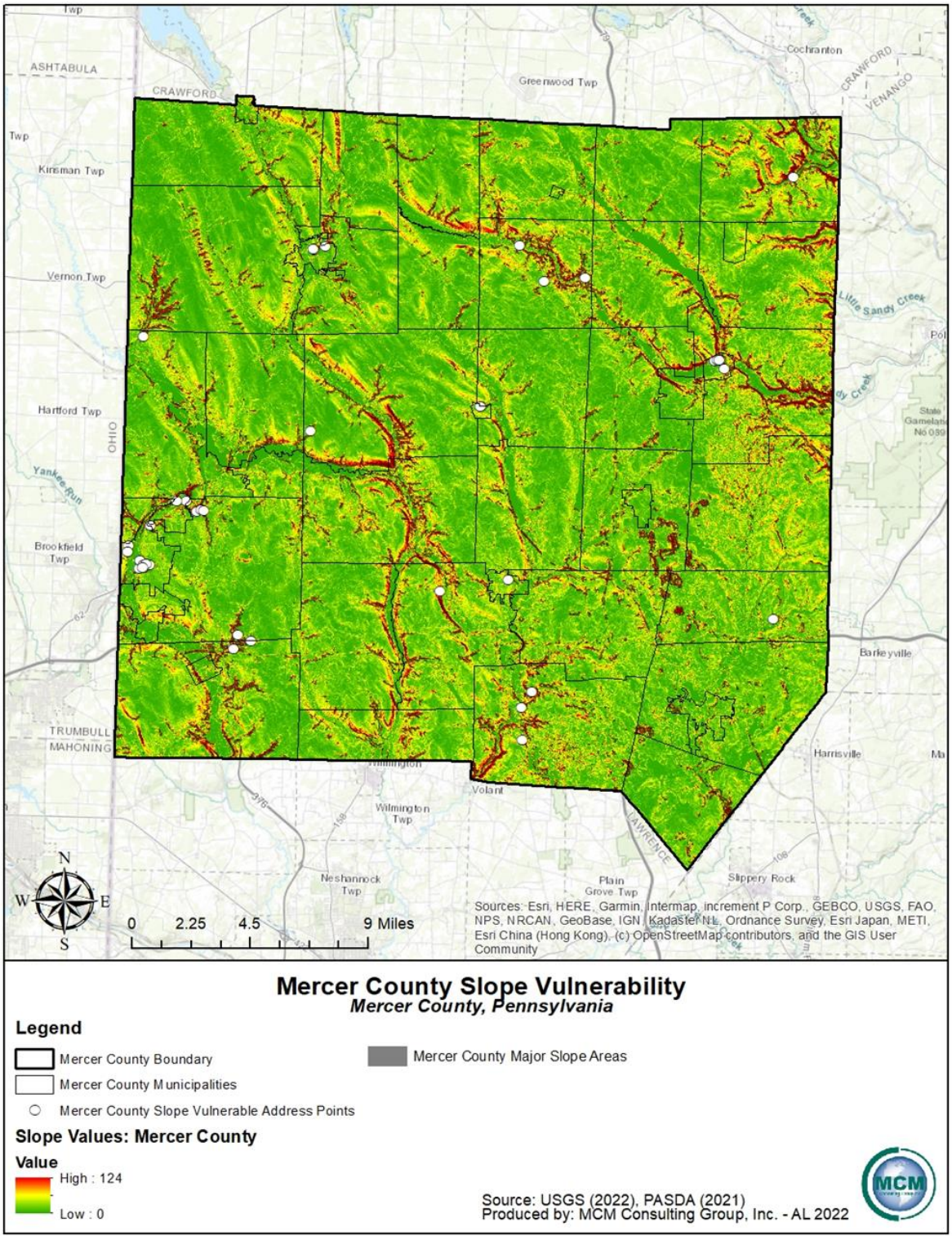
All the municipalities in Mercer County are vulnerable to landslides. *Table 34 – Structure Vulnerability Data* illustrates the number of site structure address points per municipality and the number of structures in high slope areas. Landslide events are most likely to occur in steeply sloped areas and in places where landforms have been altered for purposes of highway construction or other development. This is especially true if development is located at the base or crest of cliffs or near large highway cut-outs. These areas should be considered vulnerable to landslides, particularly if mitigation measures have not been implemented.

Table 34 - Structure Vulnerability Data

Structure Vulnerability Data		
Municipality	**Number of Addressable Structures Per Municipality**	**Number of Structures in Slope Area**
City of Farrell	2792	0
City of Hermitage	7783	4
City of Sharon	6578	16
Clark Borough	257	0
Coolspring Township	1047	0
Deer Creek Township	729	0
Delaware Township	904	1
East Lackawannock Township	764	1
Fairview Township	381	0
Findley Township	1293	0
Fredonia Borough	254	2
French Creek Township	373	1
Greene Township	465	0
Greenville Borough	2464	4

Structure Vulnerability Data		
Municipality	**Number of Addressable Structures Per Municipality**	**Number of Structures in Slope Area**
Grove City Borough	2569	0
Hempfield Township	1764	0
Jackson Township	642	0
Jackson Center Borough	98	0
Jamestown Borough	308	0
Jefferson Township	881	0
Lackawannock Township	1168	0
Lake Township	263	0
Liberty Township	542	0
Mercer Borough	1131	1
Mill Creek Township	296	0
New Lebanon Borough	100	0
New Vernon Township	212	0
Otter Creek Township	241	0
Perry Township	843	3
Pine Township	2029	0
Pymatuning Township	1805	0
Salem Township	345	0
Sandy Creek Township	325	0
Sandy Lake Borough	330	9
Sandy Lake Township	522	0
Sharpsville Borough	2023	2
Sheakleyville Borough	58	0
Shenango Township	1812	3
South Pymatuning Township	1197	1
Springfield Township	825	3
Stoneboro Borough	496	0
Sugar Grove Township	448	0
West Middlesex Borough	411	0
West Salem Township	1489	0
Wheatland Borough	318	0
Wilmington Township	563	0
Wolf Creek Township	335	1
Worth Township	380	0
Totals:	**52,853**	**52**

Figure 22 - Landslide Hazard Vulnerability



4.3.7. Pandemic and Infectious Disease

4.3.7.1 Location and Extent

Epidemic

An epidemic occurs when an infectious disease spreads more quickly than expected by medical and healthcare authorities. It is characterized by widespread growth or extent that spreads quickly and incurs a greater rate of novel or endemic cases than baseline estimates would initially project. When an epidemic occurs, it typically impacts a larger area than a localized outbreak. Epidemics often include multiple countries, although not always spreading to different continents. In short, epidemics are regional.

Pandemic

A pandemic is a disease outbreak that spreads across countries or continents, which affects the population of a vast area. When a pandemic occurs, the event usually affects more people and takes more lives than an epidemic. Pandemics are described as an extensive epidemic. Generally, pandemic diseases cause sudden illness in all age groups on a global scale. Pandemics are continuous events in third-world countries but do not frequently affect the United States. A pandemic is measured and defined by the spreading of a disease rather than the fatalities with which it is associated. The characteristics of a pandemic outbreak include large and rapid scale spread, overload of healthcare systems, inadequate medical supplies, disruption of economy/society, and medical supply shortages. While a pandemic may be characterized as a type of epidemic, an epidemic is not a type of pandemic. Additionally, pandemics travel more efficiently than epidemics. In the event that a pandemic occurs in the eastern United States, the entirety of Mercer County would likely be impacted.

Endemic

An endemic is described as a disease that is present in a community at all times but occurs in a relatively low frequency and is not spreading at a rapid rate. An endemic can be a previous pandemic such as influenza, or coronavirus (COVID-19), or a more regionalized virus such as Ebola virus in Africa. An endemic can become a pandemic if the disease mutates into a more virulent strain.

Infectious Disease

Infectious diseases are illnesses caused by pathogenic organisms such bacteria, viruses, fungi, or parasites. Organisms become harmful and cause disease under certain conditions. The sources of infectious disease may originate from contaminated food or waterways, infected animals/livestock, or infection from biological vectors such as mosquitoes, etc. Infectious

diseases include influenza, rabies, Middle East Respiratory Syndrome (MERS), West Nile virus, Lyme Disease, Zika virus, and Ebola virus.

Pandemic and infectious disease events cover a wide geographical area and can affect large populations, potentially including the entire population of the Commonwealth of Pennsylvania. The exact size and extent of an infected population is dependent upon how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in more populated and urban areas where there are large concentrations of people. The transmission rate of infectious disease will depend on the mode of transmission of a given illness. Pandemic events can also occur after other natural disasters, particularly floods, when there is the potential for bacteria to grow in, and contaminate, standing water.

4.3.7.2 Range of Magnitude

Public health emergencies typically occur on a regional basis. The magnitude of pandemic or infectious disease threat in the Commonwealth will range significantly depending on the aggressiveness of the virus in question, factors within the community that are impacted (medical care access, population density, etc.), and the ease of transmission. For example, the West Nile virus produces clinically asymptomatic cases less than 80% of the time. Therefore, approximately 20% of the cases result in mild infection, also known as West Nile fever. However, there is a small percentage of cases that could result in severe neurological disease and even death.

Pandemic influenza has a higher transmission rate from person-to-person compared to the West Nile virus. Advances in medical technologies have greatly reduced the number of deaths caused by influenza over time. In the early 1900s, flu pandemics historically caused tens of millions of deaths, while the 2009 Novel H1N1, known as swine flu, caused fewer than 20,000 deaths world-wide. Many people infected with swine flu in 2009 recovered without needing medical treatment. Without recent medical inventions and technologies, modern influenza would be associated with higher morbidity rates. About 70% of those who were hospitalized during the 2009 H1N1 flu virus in the United States belonged to a high-risk group. However, with the COVID-19 pandemic, the transmission rates were much higher than any previous outbreaks related to other members of the coronavirus family such as SARS-CoV and MERS-CoV.

In the past 100 years, humanity did not face a microbial pandemic similar in scale to the COVID-19 pandemic. The worldwide transmission rate of COVID-19 from human to human rapidly advanced in 2020 and 2021. Of the six global outbreaks of viral infections, three were caused by coronaviruses (SARS, MERS, and COVID-19).

While there are limited secondary hazards related to public health emergencies, an outbreak can cause a variety of cascading hazards. Civil disorder due to supply shortages is the most common cascading hazard to result from pandemic, epidemic, or infectious disease. Additional potential effects could include: a shortage of medical supplies and personnel, hoarding of household paper and cleaning supplies, school and business disruption, government closings, government restrictions on travel, low attendance at places of employment, slowed productivity, and widespread economic instability.

The World Health Organization (WHO) developed an alert system to help inform the world about the seriousness of a pandemic. The alert system has six phases, with Phase 1 being the lowest risk and Phase 6 being the greatest risk of pandemic. The phases were developed in 1999, but then revised in 2005 and 2009 to provide a global framework and aid countries in pandemic preparedness and response planning. These phases of alert systems were used during the COVID-19 pandemic. These phases are listed below in *Table 35 - Pandemic Influenza Phases*.

Table 35 - Pandemic Influenza Phases

Pandemic Influenza Phases	
Phase	**Characteristics**
Phase 1	No animal influenza virus circulating among animals has been reported to cause infection in humans.
Phase 2	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.
Phase 3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks.
Phase 4	Human-to-human transmission (H2H) of an animal or human-animal influenza virus able to sustain community-level outbreaks has been verified.
Phase 5	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.
Phase 6	The pandemic phase is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.

Pandemic Influenza Phases	
Phase	**Characteristics**
Post-Peak Period	Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.
Possible New Wave	Level of pandemic influenza activity in most countries with adequate surveillance rising again.
Post-Pandemic Period	Levels of influence activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance.
Source: (WHO, 2009)	

4.3.7.3 Past Occurrence

Pandemic & Epidemic

Several pandemic influenza outbreaks have occurred over the past 100 years that not only affected Mercer County but the United States as a whole. *Table 36 - Past Pandemic Events in the United States* illustrates the various past pandemic events that have occurred since the late 1800's. Prior to COVID-19, the worst recorded pandemic was the Spanish Flu, due to the amount of infection spread that was present in the world. The two most recent pandemics that have occurred in Mercer County and the United States are the swine flu/Novel H1N1 and COVID-19 pandemics, with COVID-19 being the most current and having the highest transmission rates.

Spanish Flu

An estimated 1/3 of the world's population was infected and had clinically apparent illnesses during the 1918 - 1919 influenza pandemic. Pennsylvania experienced severe effects from the Spanish Flu. It claimed 500,000 lives in the United States, which included individuals in Mercer County. There is a lack of data which provides exact numbers of deaths that occurred in Mercer County from the Spanish Flu, however there were a total of 60,000 deaths in Pennsylvania. Deaths occurring in Mercer County are included in this number. There were approximately 47,000 reported cases and 12,000 deaths in Philadelphia in just over four weeks. In the first six months, there were about half a million cases and 16,000 deaths of the Spanish Flu in

Philadelphia. The factors of high population density including crowded and unhygienic conditions contributed to higher numbers of cases and death rates across Pennsylvania.

Swine Flu/Avian Flu/H1N1

Each year, different strains of influenza are labeled as potential pandemic threats. Strains of influenza, or the flu, are highly contagious as they commonly attack the respiratory tract in humans. Influenza pandemic planning began in response to the H5N1 (avian) flu outbreak in Asia, Africa, Europe, the Pacific, and the Near East in the late 1990s and early 2000s. Avian flu did not reach pandemic proportions in the United States, but the country began planning for flu outbreaks.

Mercer County was impacted by the H1N1 virus during 2009. The Pennsylvania Department of Health (PA DOH) set up clinics throughout the county to administer vaccines to at-risk populations. A total 10,940 cases and seventy-eight deaths occurred in Pennsylvania from this pandemic but there is insufficient data to determine the exact number of cases and deaths from swine flu in Mercer County.

COVID-19

Mercer County was directly impacted by the COVID-19 pandemic. As of November 2022, Pennsylvania had an estimated 2.74 million total cases and 48,126 deaths related to the COVID-19 pandemic. Mercer County has had a total of 28,320 reported cases of COVID-19 and a total number of 544 deaths. The first cases in Pennsylvania were reported on March 6, 2020, in Delaware and Wayne counties. The first confirmed case of COVID-19 in Mercer County was on March 20, 2020 as reported by the New Castle News. Beginning in December of 2020, there was a large-scale vaccination effort to combat COVID-19. Municipalities in Mercer County indicated an increase in the pandemic and infectious disease section of the risk factor assessment municipal comparison.

Table 36 - Past Pandemic Events in the United States

Past Pandemic Events in the United States	
Year(s)	**Common Name**
1889	Russian Flu
1918	Spanish Flu/H1N1
1957	Asian Flu/H2N2
1968	Hong Kong Flu/H3N2
2009	Swine flu/Novel H1NI
2020	COVID-19
Sources: (WHO & CDC, 2020)	

Infectious Disease

Not only has Mercer County experienced pandemic events, but the county has also experienced infectious disease events. The two major infectious disease events experienced across Mercer County and Pennsylvania as a whole are the West Nile Virus and Lyme Disease. Due to the climatic traits of Pennsylvania these infectious diseases thrive in Mercer County. Both diseases are transmitted by the biological vector of an insect which is found throughout the county.

West Nile Virus

West Nile virus reached the United States in 1999 and a year later was detected in Pennsylvania when mosquito pools, dead birds, and/or horses in nineteen counties tested positive for the virus. By 2003, all counties in the Commonwealth had confirmed cases. A comprehensive network has been developed in Pennsylvania that includes trapping mosquitoes, collecting dead birds, and monitoring horses, people and, in past years, sentinel chickens. Although West Nile Virus positive cases are few in Mercer County, 2022 had the most positive cases in Mercer County since 2016. Over the past seven years, no human has tested positive for West Nile Virus in Mercer County. *Table 37 - West Nile Virus Control Program in Mercer County since 2016* outlines the West Nile Virus within Mercer County from 2016 to 2022.

Table 37 - West Nile Virus Control Program in Mercer County since 2016

West Nile Virus Control Program in Mercer County Since 2016				
Year	**Total Positives**	**Human Positives**	**Mosquito Positives**	**Bird Positives**
2016	0	0	0	0
2017	1	0	0	1
2018	3	0	3	0
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
2022*	4	0	4	0
Source: (PA Department of Environmental Protection, 2022) **Data not finalized until end of calendar year.*				

Lyme Disease

Lyme Disease has been present in the United States and Mercer County for many years. More wooded areas have higher cases due to ticks being the main biological vector. Lyme disease is

found in all sixty-seven counties within Pennsylvania. Mercer County has an overall approximated 516 confirmed cases of Lyme disease from 2000 until 2020, although actual totals may be significantly higher due to under reporting. Mercer County as a whole has a moderately high positive total for Lyme Disease in the county, especially over the past several years. It is possible that numbers have risen dramatically due to lack of testing in previous years. Mercer County experienced the highest number of positive cases in 2019 at 144 cases. Lyme disease case counts have been consistently rising over the past several years. It should be noted that information represented for each county may vary due to reporting practices. Hence these figures represent a rough estimate of the Lyme disease burden in Mercer County. *Table 38 - Lyme Disease Data for Mercer County* outlines the total positive cases of Lyme Disease within Mercer County from 2016 to 2020. Data after 2020 was not available for this report.

Table 38 - Lyme Disease Data for Mercer County

Lyme Disease Data for Mercer County	
Year	**Total Positives**
2016	68
2017	75
2018	75
2019	144
2020	28
Source: (PA Department of Health, 2022)	

Zika Virus

The Zika virus is another infectious disease that is spread by mosquito bites, and it is related to West Nile virus. Zika virus can also be spread through sexual intercourse, blood transfusion, or passed from mother to child in the womb. The virus was first identified in 1947, but largely came to the attention of the United States in 2015 when there was an outbreak of Zika in Brazil. The direct illness caused by Zika can include fever, red eyes, joint pain, headache, and a rash, or sometimes no symptoms at all. Zika is problematic for pregnant mothers as the virus can result in microcephaly or cause other problems for brain development. For adults, the virus can be linked to increased incidence of Guillain-Barré syndrome.

4.3.7.4 Future Occurrence

Pandemic & Epidemic

The probability of a widespread public health emergency effecting Mercer County is approximately once every ten years. Minor outbreaks of less serious communicable disease, such as influenza, will occur much more frequently. The occurrence of pandemic influenza outbreaks is unpredictable, and complete avoidance of the events is unlikely. Therefore, future occurrences

of pandemics and infectious disease events are very likely. Pandemics may also emerge from other diseases, especially invasive pathogens for which Mercer County and Pennsylvania as a whole lack natural immunity.

Influenza

It is estimated that 5% to 25% of Pennsylvanians get the flu each year, and 120 to 2,000 individuals die from complications of influenza. The CDC recommends that everyone six months and older get a flu vaccine every season to prevent future cases from rising. People who are at a high risk of serious flu illness should take flu antiviral drugs as soon as they get sick.

Infectious Disease

Infectious diseases such as West Nile Virus and Lyme Disease have been present in Mercer County for many years and are expected to perpetuate. The best way to prevent infectious disease outbreaks, including West Nile Virus and Lyme Disease, is to actively address the causes of the diseases. West Nile Virus occurrence can be reduced by removing mosquito breeding locations in stagnant water sources and Lyme Disease occurrence can be reduced by utilizing insect repellant, removing ticks promptly, applying pesticides, and reducing tick habitats. Occurrence of Zika Virus can also be reduced by removing mosquito breeding areas and areas of stagnant water. Both West Nile Virus and Lyme Disease are expected to continue occurring in Mercer County in the future.

4.3.7.5 Vulnerability Assessment

Mercer County is considered to be at higher vulnerability county in regard to the pandemic events. It is extremely difficult to predict the occurrence and the magnitude of a pandemic or epidemic event. The COVID-19 pandemic disproportionately affected populations over the age of sixty-five, especially those in nursing homes. It has had disparate effect on socially vulnerable populations, including unsheltered and homeless individuals.

Elderly individuals, children and immune deficient individuals are the most vulnerable to disease. Nursing facilities, personal care facilities, daycares, schools, and hospitals are considered more vulnerable since there are often groups of these socially vulnerable individuals present at these community lifelines. Congregate living facilities, including correctional institutions and dormitories would also be at an increased risk due to the difficulties in adhering to the social distancing required to help stop the spread of a pandemic. During the COVID-19 pandemic, nursing homes and personal care homes in Pennsylvania reported high numbers of cases and deaths, and several county jails and state correctional institutions reported wide community spread.

Health-care workers and those working in direct-care (such as correctional institutions or those who cannot social distance due to their jobs) are more likely to be exposed to a pandemic disease. Those who work outdoors for extended periods of time in warm months may be more vulnerable to West Nile Virus, Lyme Disease, or the Zika virus.

The number of hospitals within the county, and availability of beds within the hospitals, determine the amount of care vulnerable and sick patients will receive. It is important for hospitals to review and exercise emergency response plans and continuity of operations plans (COOP) to ensure that there is an effective public health response.

During a public health emergency, the PA DOH may open emergency medicine centers called points of dispensing (PODs) to ensure that medicine, supplies, vaccines, and information reach Pennsylvania residents during a public health emergency. An open POD is where the general public goes to receive free emergency medicine and supplies from public health officials, while a closed POD provides free emergency medicine and supplies to a specific community, like a university, including faculty, staff, and students. Dispensing of medications/vaccines is a core function of the Strategic National Stockpile's Mass Dispensing of Medical Countermeasures Plan.

PODs are coordinated with county emergency managers by the PA DOH with the six regional healthcare districts (see *Figure 23 - Pennsylvania Department of Health Districts*). Mercer County is in the Northwest district. At the time of the writing of this plan, PODs have been involved with mass vaccinations against COVID-19.

Figure 23 - Pennsylvania Department of Health Districts

4.3.8. Radon Exposure

4.3.8.1 Location and Extent

Airborne radon gas is radioactive and is a step in the radioactive decay of uranium to radium. Radon is a noble gas, cannot be seen and has no odor. Like other noble gasses, radon gas is very stable, so it does not easily combine with other chemicals. Two isotopes of radon are commonly found: 222Rn and 220Rn. The 220Rn isotope has a very short half-life, so it often only exists for fifty-five seconds, not long enough to pose a hazard to humans. The 222Rn isotope has a half-life of 3.8 days which is long enough to pose a threat to humans. Still, due to the relatively short half-life of 222Rn, it only exists in relative proximity to its radioactive parent, usually within tens of feet away. Radon is a carcinogen and when inhaled, it can lead to the development of lung cancer.

Radioactivity, caused by airborne radon, has been recognized for many years as an important component in the natural background radioactivity exposure of humans, but it was not until the 1980s that the wide geographic distribution of elevated values in houses and the possibility of extremely high radon values in houses were recognized. Radon was discovered as a significant source of natural radiation for humans in 1984 in the Reading Prong geologic province in Eastern Pennsylvania, when routine monitoring of employees leaving the not yet active Limerick nuclear power plant showed readings that a construction worker working on the plant frequently exceeded expected radiation levels despite the fact that the plant was not active. The Environmental Protection Agency (EPA) guidelines state that mitigation actions should be taken if levels exceed 4pCi/L in a home, and most uranium miners have a maximum exposure of 67 pCi/L. Subsequent testing of the Limerick power plant worker's home showed high radon levels of 2,500 pCi/L (pico Curies per Liter), triggering the Reading Prong to become the focus of the first large-scale radon scare.

Radon gas is considered ubiquitous and can be found in indoor and outdoor environments. There is no known safe level of exposure to radon. For most people in Pennsylvania, the greatest risk of radon exposure is from within their home in rooms that are below, directly in contact with, or immediately above the ground. Sources of radon include radon in the air from soil and rock beneath homes, radon dissolved in water from private wells and exsolved during water use (rare in Pennsylvania), and radon emanating from uranium-rich building materials such as concrete blocks or gypsum wallboard (also rare in Pennsylvania). Key factors in radon concentration in homes are the rates of air flow into and out of the house, the location of air inflow, and the radon content of air in the surrounding soil. Because of the flow dynamics of air inside of most houses, even a small rate of soil radon gas inflow can lead to elevated radon concentrations.

There are several factors that contribute to higher radon levels in soil gas:

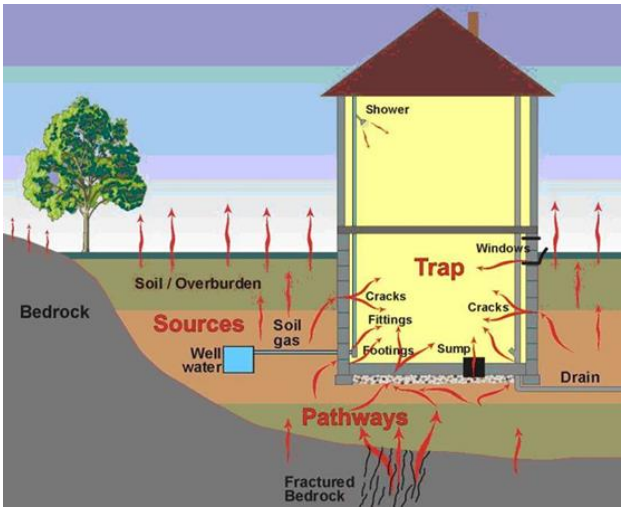
- Proximity to elevated uranium rich deposits (>50ppm). Areas within a few hundred feet of such deposits are most at risk. Such deposits are rare in Pennsylvania.
- Some more common rocks have higher than average uranium content (5 to 50 ppm), and proximity to such rocks also increases the risk of radon exposure. These rock types include black shales as well as granitic and felsic alkali igneous rocks. This is the most common source of high radon levels in Pennsylvania. The Reading Prong elevated radon levels come from Precambrian granitic gneisses.
- Other soil and bedrock properties that facilitate radon mobility. The amount of pore space in the soil and its permeability – more porous soils will allow radon to travel more easily. Limestone-dolomite soils can also be predisposed to collect radon from radium resultant from weathering of iron oxide or clay surfaces. In some cases (like State College in Centre County, PA) even with underlying bedrock having normal uranium concentrations (.5 to 5 ppm), the vast majority of locations built on limestone-dolomite soils exceed radon concentrations of 4pCi/L, and many exceeded 20 pCi/L.

The following three sources of radon in houses are now recognized (see *Figure 24 - Sketch of Radon Entry Points into a House* below):

- Radon in soil air that flows into the house
- Radon dissolved in water from private wells and exsolved during water usage; this is rarely a problem in Pennsylvania
- Radon emanating from uranium-rich building materials (e.g., concrete blocks or gypsum wallboard); this is not known to be a problem in Pennsylvania

High radon levels were initially thought to be exacerbated in houses that are tightly sealed, but it is now recognized that rates of airflow into and out of houses, plus the location of air inflow and the radon content of air in the surrounding soil, are key factors in radon concentrations. Outflows of air from a house, caused by a furnace, fan, thermal “chimney” effect, or wind effects, require that air be drawn into the house to compensate. If the upper part of the house is tight enough to impede influx of outdoor air (where radon concentration is generally <0.1 pCi/L), then an appreciable fraction of the air may be drawn in from the soil or fractured bedrock through the foundation and slab beneath the house, or through cracks and openings for pipes, sumps, and similar features. Soil gas typically contains from a few hundred to a few thousand pCi/L of radon; therefore, even a small rate of soil gas inflow can lead to elevated radon concentrations in a house.

Figure 24 - Sketch of Radon Entry Points into a House



The radon concentration of soil gas depends upon a number of soil properties, the importance of which is still being evaluated. In general, 10% to 50% of newly formed radon atoms escape the host mineral of their parent radium and gain access to the air-filled pore space. The radon content of soil gas clearly tends to be higher in soils containing higher levels of radium and uranium, especially if the radium occupies a site on or near the surface of a grain from which the radon can easily escape. The amount of pore space in the soil and its permeability for airflow, including cracks and channels, are important factors determining radon concentration in soil gas and its rate of flow into a house. Soil depth and moisture content, mineral host and form for radium, and other soil properties may also be important. For houses built on bedrock, fractured zones may supply air having radon concentrations similar to those in deep soil.

The second factor listed above is most likely the cause of high radon levels in Mercer County. The data show that most reported zip codes in the county have high basement radon level test results. The areas and test results are shown in more detail in the past occurrence section.

4.3.8.2 Range of Magnitude

According to the EPA, about 21,000 lung cancer deaths each year in the U.S. are related to radon. It is the second leading cause of lung cancer after smoking and the number one cause of lung cancer among nonsmokers. Radon causes lung cancer by continuing to radioactively decay after being inhaled, and turning into a daughter product (218Po, 214Pb, 214Bi) which may become attached to lung tissue and induce lung cancer due to the continued radioactive decay.

The EPA reports that the national average radon concentration of indoor air of homes is about 1.3 pCi/L, and they recommend that homes be fixed if the radon level is 4pCi/L or more. There

is however no safe level of radon exposure, so the EPA also recommends considering fixing a home if the radon level is between 2 pCi/L and 4 pCi/L.

Table 39 - Radon Risk for Smokers and Nonsmokers shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action thresholds. As seen in *Table 39 - Radon Risk for Smokers and Nonsmokers* below, a smoker exposed to radon has a much higher risk of lung cancer.

Table 39 - Radon Risk for Smokers and Nonsmokers

Radon Risk for Smokers and Nonsmokers			
Radon Level (pCi/L)	**If 1,000 People Were Exposed to this level over a lifetime…***	**Risk of cancer from radon exposure compares to...*****	**Action Threshold**
SMOKERS			
20	About 260 people could get lung cancer	250 times the risk of drowning	Fix Structure
10	About 150 people could get lung cancer	200 times the risk of dying in a home fire	
8	About 120 people could get lung cancer	30 times the risk of dying in a fall	
4	About 62 people could get lung cancer	5 times the risk of dying in a car crash	
2	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
NON-SMOKERS			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix Structure
10	About 18 people could get lung cancer	20 times the risk of dying in a home fire	

Radon Risk for Smokers and Nonsmokers			
Radon Level (pCi/L)	**If 1,000 People Were Exposed to this level over a lifetime…***	**Risk of cancer from radon exposure compares to...*****	**Action Threshold**
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	
*Note: Risk may be lower for former smokers * Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003). ** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.*			

4.3.8.3 Past Occurrence

In 1984, the Pennsylvania Radon Bureau responded to the newly detected high radon levels with a massive radon monitoring, educational, and remediation effort. In the start of November 1986, over 18,000 homes had been screened for radon and approximately 59% were found to have radon daughter levels in excess of the 0.020 Working Level (WL) guideline. Radon daughter levels ranged up to 13 WL or 2600 pCi/L or radon gas.

The Pennsylvania Department of Environmental Protection (PA DEP) provides information for homeowners about how to test for radon in their homes, and when they receive a test result over 4 pCi/L, the PA DEP Bureau of Radiation Protection works to help homeowners repair the home and mitigate the hazard. The DEP has estimated that the national average indoor radon concentration is 1.3 pCi/L and the level for action is 4.0 pCi/L; however, they have estimated that the average indoor concentration in Pennsylvania basements is about 7.1 pCi/L and 3.6 pCi/L on the first floor. The PA DEP records all the tests they receive and categorize them in a searchable database by zip code. There are currently 2,174 zip codes in Pennsylvania, but the zip code radon test data only covers for 986 zip codes. The missing zip codes that report in the data base as “N/A” for insufficient data either had fewer than thirty test results or no test results at all.

Table 40 – Radon Test Results in Mercer County shows a total of twenty-eight zip codes in Mercer County where tests were reported to the PA DEP to report their findings; those with no available data were included in the table with a data entry of "N/A". The highest average radon level was reported from the 16145-zip code, which is in the north eastern part of the county, with a maximum reading of 267.0 pCi/L within location of the basement. About half of reporting zip codes in Mercer County have average basement Radon levels significantly above the suggested EPA action level of 4 pCi/L. The average basement reading for reporting zip codes in the county is 5.23 pCi/L, and the average first floor reading is 2.71 pCi/L.

Table 40 - Radon Test Results in Mercer County

Radon Level Test Results (PA DEP, 2022)					
Zip Code	**Postal Community**	**Location**	**Number of Tests**	**Max Result pCi/L**	**Average Result pCi/L**
16057	Slippery Rock, PA	Basement	687	130.2	6.1
		First Floor	57	20.0	2.6
16110	Adamsville, PA	Basement	N/A	N/A	N/A
		First Floor	N/A	N/A	N/A
16113	Clark, PA	Basement	N/A	N/A	N/A
		First Floor	N/A	N/A	N/A
16114	Clarks Mills, PA	Basement	N/A	N/A	N/A
		First Floor	N/A	N/A	N/A
16121	Farrell, PA	Basement	138	25.0	3.1
		First Floor	N/A	N/A	N/A
16124	Fredonia, PA	Basement	43	40.5	4.8
		First Floor	N/A	N/A	N/A
16125	Greenville, PA	Basement	750	97.3	5.2
		First Floor	147	23.9	2.2
16127	Grove City, PA	Basement	1,062	70.4	4.6
		First Floor	112	24.2	3.3
16130	Hadley, PA	Basement	32	18.2	4.5
		First Floor	N/A	N/A	N/A
16133	Jackson Center, PA	Basement	40	9.7	3.0
		First Floor	N/A	N/A	N/A
16134	Jamestown, PA	Basement	101	52.2	5.2
		First Floor	N/A	N/A	N/A

Radon Level Test Results (PA DEP, 2022)					
Zip Code	**Postal Community**	**Location**	**Number of Tests**	**Max Result pCi/L**	**Average Result pCi/L**
16137	Mercer, PA	Basement	799	96.7	5.2
		First Floor	120	28.6	3.2
16142	New Wilmington, PA	Basement	574	105.9	5.3
		First Floor	43	11.2	3.4
16143	Pulaski, PA	Basement	136	19.6	4.5
		First Floor	N/A	N/A	N/A
16145	Sandy Lake, PA	Basement	87	267.0	7.8
		First Floor	N/A	N/A	N/A
16146	Sharon, PA	Basement	432	32.6	2.7
		First Floor	N/A	N/A	N/A
16148	Hermitage, PA	Basement	1,576	84.2	3.8
		First Floor	89	19.8	2.0
16150	Sharpsville, PA	Basement	388	60.2	3.8
		First Floor	32	14.0	2.3
16151	Sheakleyville, PA	Basement	N/A	N/A	N/A
		First Floor	N/A	N/A	N/A
16153	Stoneboro, PA	Basement	75	14.0	3.6
		First Floor	N/A	N/A	N/A
16154	Transfer, PA	Basement	93	53.0	5.3
		First Floor	N/A	N/A	N/A
16156	Volant, PA	Basement	108	29.0	4.4
		First Floor	N/A	N/A	N/A
16159	West Middlesex, PA	Basement	215	75.1	4.7
		First Floor	N/A	N/A	N/A
16161	Wheatland, PA	Basement	N/A	N/A	N/A
		First Floor	N/A	N/A	N/A
16311	Carlton, PA	Basement	N/A	N/A	N/A
		First Floor	N/A	N/A	N/A
16314	Cochranton, PA	Basement	186	91.0	8.2
		First Floor	N/A	N/A	N/A

Radon Level Test Results (PA DEP, 2022)					
Zip Code	**Postal Community**	**Location**	**Number of Tests**	**Max Result pCi/L**	**Average Result pCi/L**
16342	Polk, PA	Basement	39	132.5	14.1
		First Floor	N/A	N/A	N/A
16362	Utica, PA	Basement	N/A	N/A	N/A
		First Floor	N/A	N/A	N/A

4.3.8.4 Future Occurrence

Radon exposure is likely given the geologic and geomorphic conditions in Mercer County. The EPA and USGS have mapped radon potential in the US to help target resources and assist local governments in determining if radon-resistant features are applicable for new construction. The designations are broken down in three zones and are assigned by county, as shown in *Figure 25 – Pennsylvania Radon Levels*. Each zone reflects the average short-term measurement of radon that can be expected in a building without radon controls. Mercer County is located within Zone 2 with counties of moderate potential for radon which indicate an intermediate likelihood of occurrence in the future.

1. Zone 1 has the highest potential and readings can be expected to exceed the 4 pCi/L recommended limit.
2. Zone 2 has a moderate potential for radon with levels expected to be between 2 and 4 pCi/L and
3. Zone 3 has a low potential with levels expected to be less than 2 pCi/L.

Due to the moderate likelihood of future occurrence, the level of radon daughters should be monitored. Radon daughters are the concentration of decay products of radon in the uranium chain. Fortunately, the presence of radon daughters can be monitored through the means as radon gas. *Table 41 - Suggested Actions and Time Frame for Exposure to Radon Daughters* provides suggested actions and time frames for varying levels of exposure to radon daughters.

Table 41 - Suggested Actions and Time Frame for Exposure to Radon Daughters

Suggested Actions and Timeframe for Exposure to Radon Daughters		
Exposure Level*	Suggested Action**	Timeframe For Plan
more than 5.0 WL***	Residents should either promptly relocate or undertake temporary remedial action to lower levels as far below 5.0 WL as possible. Smoking in high areas discouraged.	Within 2-3 days
1.0 to 5.0 WL	Residents should undertake temporary remedial action to lower levels as far below 1.0 WL as possible. Smoking in high areas discouraged.	Within 1 week
0.5 to 1.0 WL	Residents should undertake temporary remedial action to lower levels as far below 0.5 WL as possible.	Within 2 weeks
0.1 to 0.5 WL	Residents should undertake temporary remedial action to lower levels as far below 0.1 WL as possible. Higher exposure levels require action to be taken in a shorter	3 weeks to 3 months
0.02 to 0.1 WL	Residents should undertake temporary and/or permanent remedial action to lower levels below 0.02 WL. Higher exposure levels require action to be taken in a shorter	4 to 15 months

4.3.8.5 Vulnerability Assessment

Proper testing for radon levels should be conducted across Mercer County, especially in the areas of higher incidence levels, and for those individuals and households that face the contributing risks. This testing will determine the level of vulnerability that residents face in their homes, as well as in their businesses and schools.

Mercer County is in the EPA Radon Hazard Zone 2, meaning there is a moderate risk of radon exposure. Smokers can be up to ten times more vulnerable to lung cancer from high levels of radon depending on the level of radon they are exposed to. Additionally, older homes that have crawl spaces or unfinished basements are more vulnerable to having high radon levels. Average basement radon levels for homes who reported their results to the PA DEP are often found to be above the EPA action level of 4 piC/L. *Figure 26 – Radon Levels by Zip Code* shows the best available data from the DEP about testing results of homes with radon levels at or above the EPA action level. The EPA estimates that an average radon mitigation system costs approximately $1,200.00. The PA DEP Bureau of Radiation Protection provide short- and long-term tests to determine radon levels, as well as information on how to mitigate high levels of radon in a building. The 2018 PA HMP estimates that there are 45,730 vulnerable buildings in Mercer County that are

in areas with high radon test results, and the cost to mitigate the most impacted of those buildings (an estimated 20% of them or 9,146 buildings) would be $10,975,200.00.

Figure 25 - Pennsylvania Radon Levels

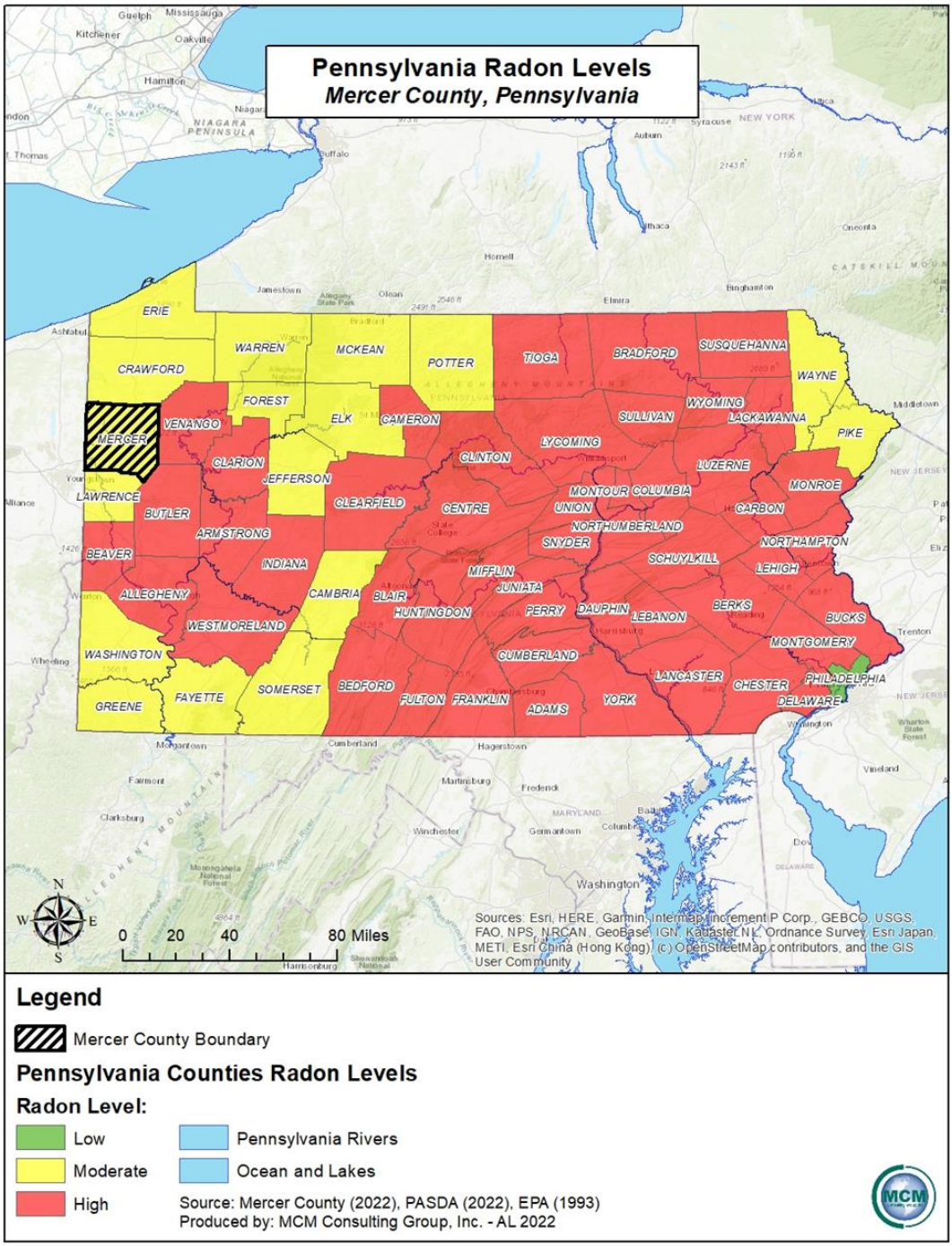
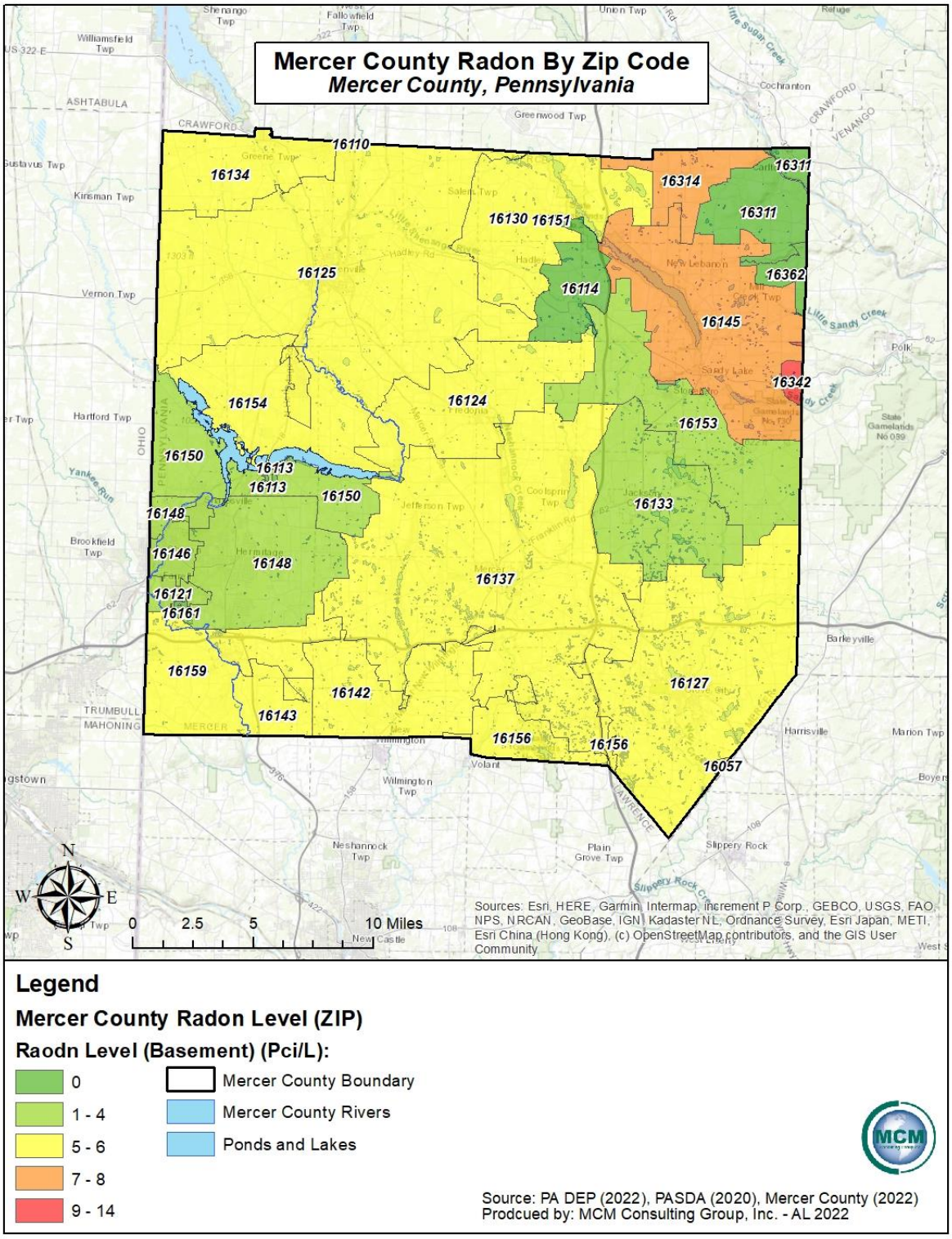


Figure 26 - Radon Levels by Zip Code



4.3.9. Subsidence and Sinkhole

4.3.9.1 Location and Extent

Subsidence is the sinking movement of the earth's surface; the result of this movement is commonly referred to as a sinkhole. There are two common causes of subsidence in Pennsylvania: 1) dissolution of carbonate rock such as limestone or dolomite and 2) mining activity. In the first case, water passing through naturally occurring fractures and bedding planes dissolves bedrock leaving voids below the surface. Eventually, overburden on top of those voids collapses, leaving surface depressions resulting in what is known as karst topography. Characteristic structures associated with karst topography include sinkholes, linear depressions, and cases. Often, sub-surface solution of limestone will not result in the immediate formation of karst features. Collapse sometimes occur only after a large amount of activity, or when a heavy burden is placed on overlying material. The bedrock geology is found mostly in the south-central and eastern portions of the Commonwealth of Pennsylvania, although Mercer County is not located in a karst vulnerable area. Subsidence in Mercer County is primarily due to mining activity. This plan will focus on mining activity. Mercer County has a history of subsidence due to mining activity.

Mining activity is concentrated in the southwestern region of the state. The majority of sub-surface (i.e., underground) extraction of materials such as oil, gas, coal, metal ores (i.e., copper, iron, and zinc), clay, shale, limestone, or water can result in slow-moving or abrupt shifts in the ground surface and these areas have a higher potential to be impacted by sinkholes and subsidence. Sinkholes often develop where the cover above a mine is thin. Sinkhole development normally occurs where the interval to the ground surface is less than three to five times the thickness of the extracted seam and the maximum interval is up to ten times the thickness of the extracted seam. In western Pennsylvania, most sinkholes develop where the soil and rock above a mine are less than fifty feet thick.

Human activity can also result in subsidence or sinkhole events. Leaking water pipes or structures that convey storm-water runoff may result in areas of subsidence as the water dissolves substantial amounts of rock over time. Poorly managed stormwater can be an exacerbating factor is subsidence events. In some cases, construction, land grading, or earthmoving activities that cause changes in stormwater flow can trigger sinkhole events.

4.3.9.2 Range of Magnitude

No two subsidence areas or sinkholes are exactly alike. Variations in size and shape, time period under which they occur (i.e., gradually, or abruptly), and the proximity to development ultimately determine the magnitude of damage incurred. Events could result in minor elevation

changes or deep, gaping holes in the surface. Subsidence and sinkhole events can be addressed before significant damage occurs.

Primarily, problems related to subsidence include the disruption of utility services and damages to private and public property including buildings, roads, and underground infrastructure. Isolated incidents of subsidence throughout the coal regions over the past years have affected houses, garages, and trees that have been swallowed up by subsidence holes. Lengths of local streets and highways, and countless building foundations have been damaged.

If long-term subsident or sinkhole formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may result. The worst-case scenario of a mine subsidence event for Mercer County would be similar to an event in Allegheny County in 2013, when sixty-nine homes in Hyde Park sustained mine subsidence damage. The Pennsylvania Department of Environmental Protection responded to the subsidence by filling the mine voids at a cost of $3.7 million. If mitigation measures are not taken, the cost to fill in and stabilize sinkholes can be significant although sinkholes are limited in range of magnitude.

Voids in the earth's subsurface are created where coal was previously mined and removed. The condition removes a significant portion of the support of the overlying rock strata that usually causes the rock strata to fall or subside into the voids that may damage dwellings or other surface structures above the affected areas. Mining locations across the county should be carefully noted and avoided as sites for new construction unless the proper measures are taken to ensure the mine's soundness.

The Mercer County local planning team assigned a risk factor assessment score of 2.9 to subsidence and sinkhole formation. This places the hazard at a high risk factor. *Figure 27 – Sinkhole Susceptibility in Pennsylvania* illustrates the portions of the Commonwealth of Pennsylvania where sinkholes and subsidence are common. The hazard for subsidence and sinkholes in these regions is very high. Mercer County has a large portion of mining areas and is therefore one of these regions.

4.3.9.3 Past Occurrence

There is no comprehensive list of mine subsidence in Mercer County. The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) provides an online sinkhole inventory database, which lists a total of 3,619 identified sinkholes in Pennsylvania as of 2021. Of these sinkholes none fall within Mercer County. The fact that no sinkholes were identified does not necessarily mean there are no sinkholes in Mercer County. Additionally, the Pennsylvania Department of Environmental Protection indicates that some small incidences of

sinkholes occur several times per week and cause limited damage and that many of these are related to failing infrastructure like water main breaks or collapsed pipes.

4.3.9.4 Future Occurrence

There is currently no reliable information regarding the probability of future occurrence of subsidence or sinkholes in Pennsylvania. One way of estimating the probability of future occurrences would be to project the historical trends into the future, but there is no comprehensive documentation of previous events in Mercer County. The PA DEP has noted that mine subsidence events are constant though they vary in intensity and damage. Based on mining activities in Mercer County, the annual occurrence of subsidence and sinkholes where mining occurs is considered likely. Although precise locations of future occurrences is difficult to predict due to site-specific conditions that contribute to sinkhole development, there are several signs that can signal potential development.

The signs include:

- Slumping or falling fence posts, trees, or foundations.
- Sudden formation of small ponds.
- Wilting vegetation.
- Discolored well water.
- Structural cracks in walls and/or floors.

Based on mining activity, subsidence events are likely to occur in Mercer County. If land development and mining were to occur in an area that is unstable or unsafe, a subsidence event or sinkhole is likely to form. *Figure 29 – Unsuitable Areas for Mining in Pennsylvania* illustrates the areas of Pennsylvania where mining could potentially cause a subsidence event or a sinkhole. None of these areas that are unsuitable for mining are located in or around Mercer County.

4.3.9.5 Vulnerability Assessment

Areas of the county where commercial mining operations take place are the most vulnerable to subsidence and sinkhole hazards. Natural subsidence and sinkholes have never been reported in Mercer County. A mined area may be differentially prone to subsidence based on its geology and depth of mineral seam, but reliable information about the different locations of varying depths of seams are not available. Geologists agree that all areas that are mined are prone to subsidence; therefore, coal mined areas are shown as vulnerable to mine subsidence. Most of the mining that has occurred in Mercer County was superficial mining of natural resources. The mine sites were abandoned after extraction can potentially become areas susceptible to subsidence events. These areas can be seen in *Figure 28 – Abandoned Mined Sites in Mercer County*. Subsidence cannot be ruled out as a potential hazard for Mercer County. There are not state or county critical infrastructure facilities at risk in the county due to sinkholes.

Figure 27 - Sinkhole Susceptibility in Pennsylvania

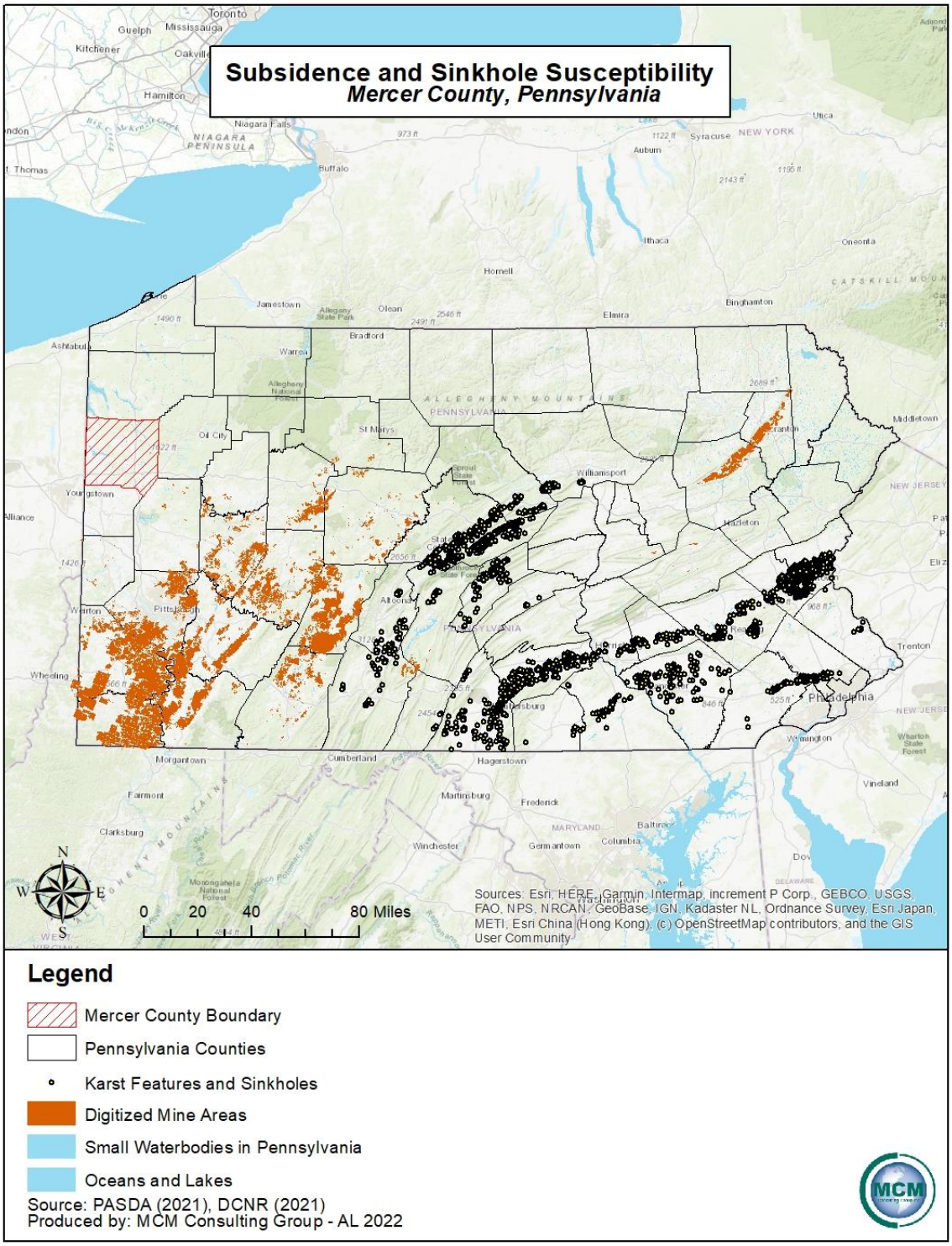


Figure 28 - Abandoned Mined sites in Mercer County

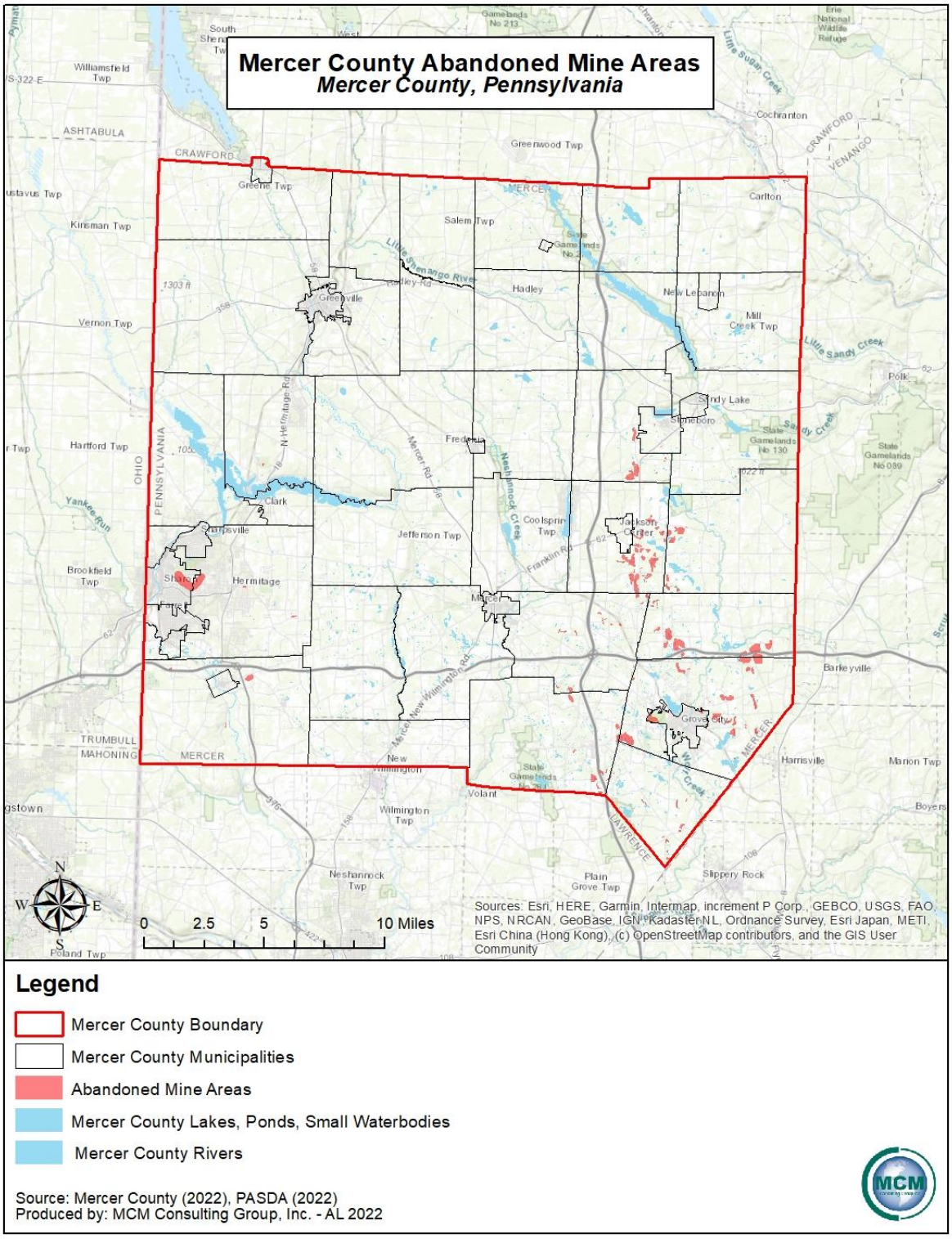
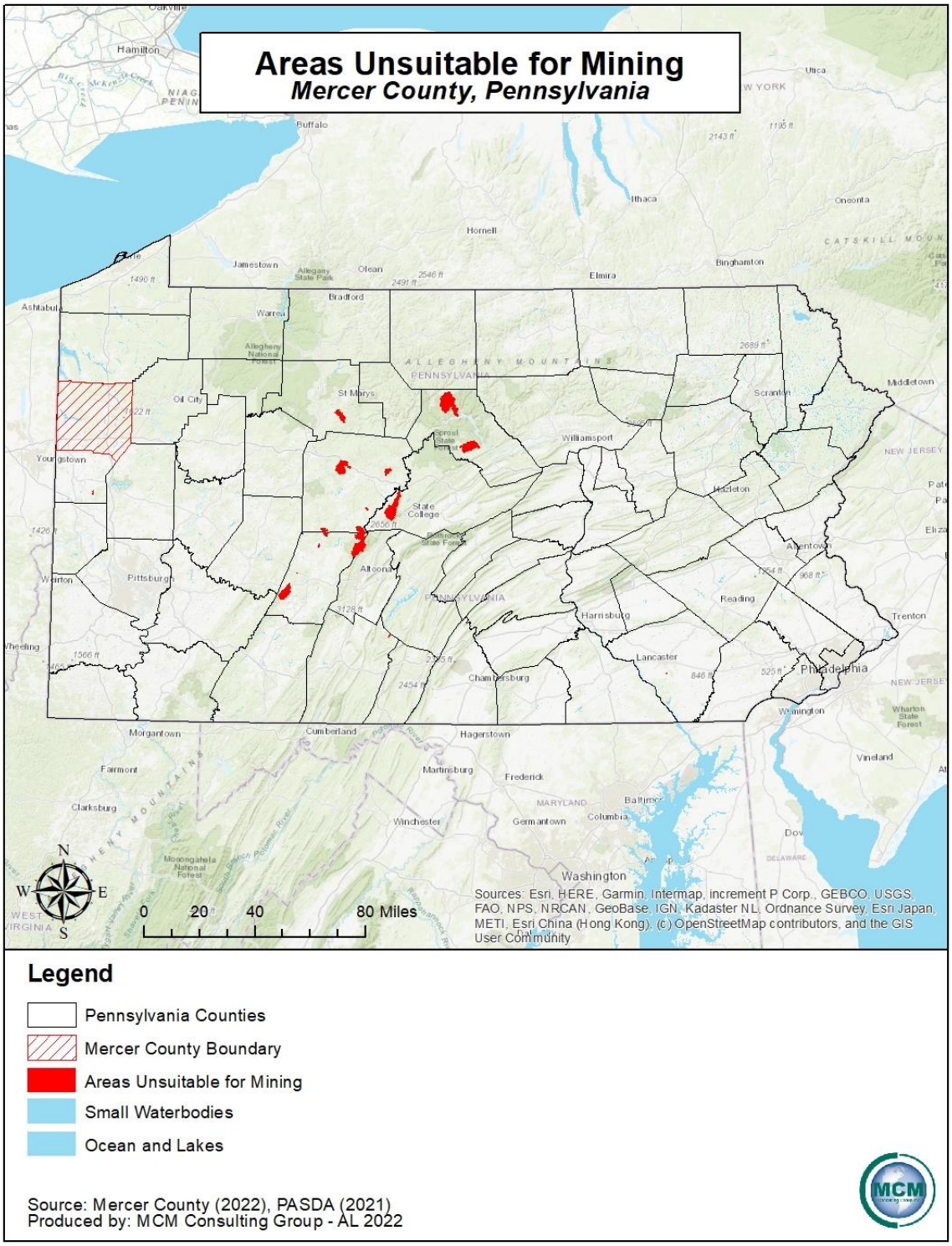


Figure 29 - Unsuitable Areas for Mining in Pennsylvania



4.3.10. Tornadoes/Windstorm

4.3.10.1 Location and Extent

Tornadoes

Tornadoes and windstorms can occur throughout Mercer County and are usually limited in their location and extent. Severe thunderstorms may result in conditions favorable for the formation of numerous tornadoes. Tornadoes are nature's most violent storms and can cause fatalities and devastation to neighborhoods and municipalities within the county and surrounding region. Tornadoes can occur at any time during the day or night, but they are most frequent during the later afternoon and early evening, which are typically the warmest hours of the day. Tornadoes are also most likely to occur in the spring and early summer months of March through June.

Tornado movement is characterized in two ways: direction/speed of spinning winds and the forward movement of the tornado, also known as the storm track. The rotational wind speeds can range from 100 to more than 250 miles per hour (mph). The speed of forward motion can range from 0 mph to 50 mph. On average, the maximum velocity of tornadoes is about 300 mph. Forward motion of a tornado path can be a few to several hundred miles in length. Widths of tornadoes vary from less than 100 feet in diameter to more than a mile wide in regard to the largest tornadoes on record. The National Centers for Environmental Information (NCEI) reports that "the maximum winds in tornadoes are often confined to extremely small areas and vary tremendously over short distance," which explains why one house in a tornadoes path may be completely demolished while a neighboring house could remain untouched. Some tornadoes never touch the ground and remain short lived, while others may touch the ground or "jump" along its path.

There are two main types of tornadoes: supercell and non-supercell. Supercell tornadoes are the most common and often the most dangerous type of tornado. A rotating updraft is key to the development of a supercell and, eventually, a tornado. Once the updraft is rotating and being fed by warm air, a tornado is formed. The other type of tornado is categorized as non-supercell, which is not as common as a supercell tornado. One type of non-supercell tornado is the "Quasi-Linear Convective Systems" (QLCS). The QLCS tornadoes typically arise during the late night or early morning hours and are typically weaker and more shorter-lived than supercell tornadoes. However, QLCS are more difficult to detect effectively. Another type of non-supercell tornado is a landspout. These tornadoes are narrow, rope-like funnels that form when a thundercloud grows with no rotating updraft, which causes the spinning motion common with tornadoes to appear near the ground more often. Waterspouts are similar to non-supercell tornadoes to the landspout but are unlikely to be found within Mercer County.

Windstorms

Windstorms are experienced on a region-wide scale. Windstorms may be caused by thunderstorms, hurricanes, and tornadoes, but the most frequent cause of windstorms in Pennsylvania are thunderstorms. Windstorms are defined as sustained wind speeds of 40 mph or greater, lasting for at least one hour, or winds of 58 mph or greater lasting for any duration. There are a wide variety of windstorm events that can take place in Mercer County. These include but are not limited to:

- Straight-line wind
- Downdraft
- Macroburst
- Microburst
- Downburst
- Gust Front
- Derecho

Straight-line winds are the most common wind event and are different from tornadic winds. A downdraft is a small-scale column of air that rapidly sinks toward the ground. A macroburst is the outward burst of strong winds that are near or at the surface with horizontal dimensions greater than 2 ½ miles. Microbursts winds may begin over a smaller area and then spread out to an even wider area, sometimes producing damage similar to a tornado. On the other hand, microbursts are smaller outward bursts of strong winds near or at the surface. Microbursts are less than 2 ½ miles in horizontal dimension and are typically short-lived winds that last a maximum of ten minutes, with windspeeds reaching up to 100 mph. Microburst events can be wet or dry events. Wet microbursts are typically associated with heavy precipitation at the surface. Dry microbursts do not have precipitation associated with them and are commonly found in the western portion of the United States. A downburst is typically used to describe the macro and microbursts. A gust front is characterized by wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Derecho is a long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho contains various downbursts and microbursts. If the wind damage is more than 240 miles and includes wind gusts of at least 58 mph, the event would then be classified as a derecho.

4.3.10.2 Range and Magnitude

Each year tornadoes account for $1.1 billion in damages and cause over eighty deaths nationally. Thus far, 2011 was the second worst year on record for deadly tornadoes behind 1936. The number of tornado reports has increased by 14% since 1950. While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on Earth. The damage caused by a tornado is a result of the high-wind velocity and windblown debris, also accompanied by lightning or large hail. The most

violent tornadoes have rotating winds of 250 mph or more and are capable of causing extreme destruction and turning normally harmless objects into deadly projectiles.

Damage and deaths can be significant when tornadoes move through populated and developed areas. The destruction that can be caused by tornadoes can range minor to severe damage depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light-weight construction, such as mobile homes. The Enhanced Fujita Scale, also known as the "EF-Scale", measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the "F-Scale", that was published in 1971. These scales classify U.S. tornadoes into six intensity categories based upon the estimated maximum winds occurring within the wind vortex. This scale can be seen in *Table 43 – Enhanced Fujita Scale.* Although F-Scale has been used for many years, this scale has limitations associated with it. Limitations of the F-Scale include the lack of damage indicators (DI), no account of construction quality and variability, and no definitive correlation between damage and wind speeds. These limitations are what led to a more accurate scaling method of the EF-Scale. The EF-Scale became effective on February 1st, 2007. Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon damage to buildings and structures. Previously recorded tornadoes are reported with the older F-Scale values, but *Table 43 – Enhanced Fujita Scale* shows F-Scale categories with corresponding EF-Scale wind speeds.

Figure 18 – Pennsylvania Wind Zones identifies wind speed zones across the Commonwealth of Pennsylvania. The figure identifies wind speeds that could occur across the state to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. The majority of Pennsylvania falls within Zone III, meaning that design winds speeds for shelters and critical facilities should be able to withstand a three-second gust of up to 200 mph, regardless of whether the gust is a result of a tornado, hurricane, tropical storm, or windstorm incident. The western portion of the state falls within Zone IV, which indicates shelters can withstand up to 250 mph winds, while the eastern side falls within Zone II where shelters should be designed to withstand up to 160 mph. *Table 42 – Wind Zones and Counties Affected in Pennsylvania* identifies which county is located in specific wind zones throughout Pennsylvania. As shown in *Figure 18 and Table 42,* Mercer County is situated in Wind Zone IV.

Table 42 - Wind Zones and Counties Affected in Pennsylvania

Wind Zones and Counties Affected in Pennsylvania	
Wind Zones with Speed	**Counties Affected**
Zone I (130 mph)	N/A
Zone II (160 mph)	Berks, Bucks, Carbon, Chester, Delaware, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Monroe, Montgomery, Northampton, Philadelphia, Pike, Schuylkill, Wayne, York

Wind Zones and Counties Affected in Pennsylvania	
Wind Zones with Speed	**Counties Affected**
Zone III (200 mph)	Adams, Armstrong, Bedford, Cambria, Cameron, Centre, Clearfield, Clinton, Columbia, Cumberland, Dauphin, Elk, Fayette, Franklin, Fulton, Greene, Huntingdon, Indiana, Juniata, Jefferson, Lycoming, McKean, Mifflin, Montour, Northumberland, Perry, Potter, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Westmoreland
Zone IV (250 mph)	Allegheny, Beaver, Butler, Clarion, Crawford, Erie, Forest, Lawrence, **Mercer**, Venango, Warren, Washington
Source: NOAA, 2019	

Since Mercer County falls within Zone IV, shelters and critical facilities should be designed to withstand up to 250 mph winds, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. Additionally, these structures should be able to withstand the wind speeds experienced in an EF5 tornado event. While it is difficult to pinpoint the exact locations at the greatest risk of a tornado, the southeast, southwest, and northwest sectors of the commonwealth are more prone to tornadoes.

Tornadoes/windstorms of all types have caused the following problems in Mercer County:

- Power failures lasting four hours or longer.
- Loss of communications networks lasting four hours or more.
- Residents requiring evacuation or provision of supplies or temporary shelter.
- Severe crop loss of damage.
- Trees down or snapped off high above the ground/tree debris-fire fuel.
- Toppled high profile vehicles, including those containing hazardous materials.

Table 43 - Enhanced Fujita Scale

Enhanced Fujita Scale			
EF-Scale Number	**Wind Speed (MPH)**	**F-Scale Number**	**Description of Potential Damage**
EF0	65–85	F0-F1	**Minor damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	F1	**Moderate damage**: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111–135	F1-F2	**Considerable damage**: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136–165	F2-F3	**Severe damage**: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166–200	F3	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown, and small projectiles generated.
EF5	>200	F3-F6	**Extreme damage**: Strong frame houses leveled off foundations and swept away; automobile-sized projectiles fly through the air in excess of 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.
Source: NWS, 2007			

Most of the tornadoes that have struck Mercer County have occurred in the northern and central parts of the county. Historically tornadoes have occurred countywide in 1980, 1985, 1986, and 1992. In 1985, a total of twenty-three confirmed tornadoes touched down across Eastern Ohio, Southwestern New York, and Central/Western Pennsylvania. This outbreak remains the worst in recorded history for this area. Of these twenty-three tornadoes, eight were of violent intensity (F4 or F5) with estimated wind speeds over 200 mph.

4.3.10.3 Past Occurrence

Mercer County has experienced twenty-one reported tornado events since 1954 and twenty-two reported high wind incidents between 2004 and summer of 2021 as seen in *Table 44 – Mercer County Tornado History* and *Table 45 – Mercer County High Wind History*. Numerous sources provide information in regard to past occurrences and losses associated with tornadoes/windstorms in Mercer County and the commonwealth as a whole. Due to the number of sources available with information, specific number of events and losses could vary slightly between sources. Tornado data was only present until 2009, while windstorm data was only available until 2019, even though more recent events could have possibly occurred. Historically, the county has experienced both severe windstorms and tornadoes.

The most recent tornado impacted Lake Township on September 22nd, 2021. That tornado was an EF1 and caused no property damage, deaths, or injuries. The most recent windstorm or strong wind event occurred March 26th, 2021. This wind event caused approximately $50,000.00 in damages to property but resulted in no injuries or fatalities. Each one of these events can cause power outages on a localized scale or on a regional scale.

Table 44 - Mercer County Tornado History

Mercer County Tornado History					
Location	**Date**	**Magnitude (F/EF Scale)**	**Deaths**	**Injuries**	**Property Damage**
Mercer County	6/1/1954	F2	0	3	$ 2,500.00*
Mercer County	9/30/1954	F2	0	0	$ 25,000.00*
Mercer County	6/15/1964	F2	0	4	$ 250,000.00*
Mercer County	5/2/1972	F3	0	0	$ 25,000.00*
Mercer County	8/8/1977	Not Reported	0	1	$ 0.00*
Mercer County	9/24/1977	Not Reported	0	0	$ 250,000.00*
Mercer County	5/13/1978	Not Reported	0	0	$ 0.00*
Mercer County	8/2/1980	F1	0	1	$ 25,000.00*
Mercer County	5/31/1985	F4	0	5	$ 25,000,000.00*
Mercer County	5/31/1985	F5	0	0	$ 250,000.00*
Mercer County	5/31/1985	F5	8	60	$ 250,000.00*
Mercer County	10/3/1986	F2	0	0	$ 2,500,000.00*

Mercer County Tornado History					
Location	**Date**	**Magnitude (F/EF Scale)**	**Deaths**	**Injuries**	**Property Damage**
Mercer County	9/21/1992	F0	0	0	$ 25,000.00*
Sharon	4/28/2002	F0	0	0	$ 150,000.00*
Mercer	4/28/2002	F1	0	0	$ 750,000.00*
Sharpsville	11/10/2002	F2	1	19	$ 1,000,000.00*
New Lebanon	7/21/2003	F0	0	0	$ 15,000.00*
Mercer	5/1/2007	EF0	0	0	$ 20,000.00*
Shenango	6/6/2010	EF0	0	0	$ 100,000.00*
Greenfield	7/8/2014	EF1	0	0	$ 75,000.00*
Wheatland	5/31/2015	EF0	0	0	$ 20,000.00*
New Lebanon	1/8/2019	EF1	0	0	$ 5,000.00*
Sharon	6/16/2019	EF1	0	0	$ 0.00*
Lake Township	9/22/2021	EF1	0	0	$ 0.00*
Source: NOAA NCEI, 2021 Estimated Values are marked*					

Table 45 - Mercer County High Wind History

Mercer County High Wind History				
Location	**Date**	**Magnitude (knots)**	**Injuries**	**Property Damage**
Mercer County	10/30/1996	52	0	$ 20,000.00*
Mercer County	9/29/1997	Not Reported	0	$ 3,000.00*
Mercer County	1/10/2000	50	0	$ 4,000.00*
Mercer County	12/12/2000	61	0	$ 50,000.00*
Mercer County	2/25/2001	Not Reported	0	$ 5,000.00*
Mercer County	12/14/2001	50	0	$ 5,000.00*
Mercer County	3/9/2002	Not Reported	0	$ 10,000.00*
Mercer County	2/23/2003	55	0	$ 3,000.00*
Mercer County	3/8/2003	55	0	$ 0.00*
Mercer County	7/21/2003	52	0	$ 10,000.00*
Mercer County	11/12/2003	52	0	$ 5,000.00*
Mercer County	3/5/2004	50	0	$ 0.00*
Mercer County	2/17/2006	50	0	$ 5,000.00*
Mercer County	12/1/2006	55	0	$ 25,000.00*
Mercer County	1/30/2008	50	0	$ 50,000.00*
Mercer County	9/14/2008	50	0	$ 1,000,000.00*
Mercer County	2/12/2009	50	0	$ 75,000.00*

Mercer County High Wind History				
Location	**Date**	**Magnitude (knots)**	**Injuries**	**Property Damage**
Mercer County	12/9/2009	50	0	$ 0.00*
Mercer County	4/28/2011	50	0	$ 75,000.00*
Mercer County	2/24/2012	50	0	$ 10,000.00*
Mercer County	2/24/2019	55	0	$ 0.00*
Mercer County	3/26/2021	50	0	$ 50,000.00*
Source: NOAA NCEI, 2021 Estimated Values are marked*				

4.3.10.4 Future Occurrence

In the United States tornado activity has increased in variability with a general decrease in the number of days a year with activity but an increase in the number of tornadoes on those days. This is an increase in tornado outbreaks. The future probability of a disastrous tornado occurring in Mercer County is ranked as possible but not highly likely. According to the National Weather Service, the Commonwealth of Pennsylvania has an annual average of ten tornadoes with two related deaths. While the chance of being hit by a tornado in Mercer County is small, the damage that results when the tornado arrives can be devastating. An EF-5 tornado, with a 0.019% annual probability of occurring, can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a “wind load” that exceeds the design limits of most buildings. As the county’s population continues to grow and as residential and commercial construction continues, the number of people and properties will be greatly affected by tornadoes and windstorms as they increase accordingly.

Based on historic patterns, tornadoes are unlikely to remain on the ground for long distances, especially in areas of the country with hilly terrain. However, the high historical number of windstorms with winds at or over 50 knots indicates that the annual chance of a windstorm in the county is uniquely high. The annual tornado season has begun to lengthen, with the season starting earlier than it has historically and ending later. Pennsylvania had, for example, a record number of tornadoes in April and May of 2019 compared to any other April and May on record. Climate change is causing temperatures and air moisture to increase, and it is these changes that could result in an increase in the frequency and intensity of tornadoes and windstorms. There is a somewhat low confidence in these conclusions and there is still much uncertainty with the recurrence of tornadoes. Therefore, the number of future tornadoes and windstorm events could potentially increase due to many factors.

Based on historical incidents, there are three zones in Pennsylvania that can either experience less than one, one to four, or five to ten of EF-2 or above tornadoes per 3,700 square miles.

Communities in Mercer County are expected to have one to four tornadoes annually as a future occurrence. The approximation of one to four tornadoes annually assists with determining the rate of future tornado occurrences within Mercer County. Future tornadoes will be similar to those that affected the county in past events.

Windstorm events occur on a more frequent basis compared to tornadoes. Mercer County specifically experiences windstorm events more commonly than tornadoes, which causes power failure, loss of communication networks, and residents requiring temporary shelters and provision of supplies. Therefore, unlike tornadoes, this hazardous event has a highly likely probability for future events to occur within the county.

4.3.10.5 Vulnerability Assessment

Tornadoes can occur at any time of the year, though they are more likely during peak months, which are during the summer for the northern part of the United States, such as Pennsylvania. While the frequency of windstorms and minor tornadoes is expected to remain relatively constant, vulnerability increases in more densely developed areas. Factors that impact the amount of damage caused by a tornado are the strength of the tornado, the time of day, and the area of impact. Usually, such distinct funnel clouds are localized phenomena impacting a small area. However, the high winds of tornadoes make them one of the most destructive natural hazards. There can be many secondary impacts and cascading hazards of tornadoes and windstorms including but not limited to transportation accidents, hazardous material spills, flooding, and power outages. A proper warning system is vital for the public to be informed of what to do and where to go.

Dangers that accompany thunderstorms associated with tornadoes which increase the vulnerability of Mercer County:

- Flash floods – 146 deaths annually nationwide.
- Lightning – 75 to 100 deaths annually nationwide.
- Damaging straight-line winds – reaching 140 mph wind speed.
- Large hail – can reach the size of a grapefruit and can cause several million in damages annually to property and crops

The economy of Mercer County is highly vulnerable to tornadoes. While there may be limited impact on financial and commercial systems of the economy, these storms, and the damage they cause, can disrupt business for long term. The local economy is vulnerable due to the possibility of being crippled by tornadoes and windstorms and their secondary effects when buildings and supporting infrastructure are destroyed in the storm. Power outages can create work stoppages while transportation accidents and road closures can limit transportation of goods and services. Additionally, flooding cannot be discounted as it can destroy physical structures, merchandise, and equipment essential for business operation.

From a strictly motor vehicle perspective, tornadoes and windstorms can have an adverse effect on the approximately 60,962 registered vehicles in Mercer County reported by the Pennsylvania Department of Motor Vehicles (PA DMV) in 2021. Flooding can destroyed the ability of a car to operate if water enters mechanical areas of the vehicle. Hail and hail events related to tornadoes can damage every one of those approximately 61,000 vehicles, creating a large economic impact.

Mercer County's environment is also vulnerable to tornado events. However, since tornado events are typically localized, environmental impacts are rarely widespread. The impact of windstorms on the environment typically takes place over a large area. In either case, where these events occur, severe damage to plant species is likely. Mercer County has approximately $65,748,000.00 worth of agricultural products that would be adversely effected or destroyed by a tornado or windstorm event. A tornado or windstorm would negatively impact these fields and products due to uprooting or total destruction of trees and crops and an increased threat of wildfire in areas where dead trees are not removed. This information has been reported by the 2017 Census of Agriculture for Mercer County developed by the United States Department of Agriculture. Most notably, hazardous material spills can pollute ground water systems and vegetation. In the case of hazardous material spills, the local environment can be negatively impact and can cause extensive cleanup and mitigation efforts. Mercer County is considered a rural county that has a moderate amount of tourism that occurs in the surrounding hills, mountains, and state parks.

Mobile homes are vulnerable not just to hurricanes and tropical storms, but also tornado events. The number of mobile homes and trailers in Mercer County is approximately 1,943 mobile homes and 240 double-wide trailers. These locations are vulnerable to sustained winds because of a potential lack of tie down features and the mobile nature of the structure. Without proper tie down restraints, mobile homes are vulnerable due to a lack of foundation. A table breaking down the number of mobile homes per location in Mercer County can be found in *Table 31* of the vulnerability assessment for the Hurricane and Tropical Storm hazard profile (Section 4.3.4.5).

Not only is the environment at risk to tornadoes and windstorms, but hikers, tourists, and hunters are also at risk when out in the environment. Consequently, in the event of a tornado or severe storm, these tourists have limited emergency notification measures which result in high vulnerability. A storm potentially has the ability to destroy structures, damage private and public property, and injure citizens and tourists to the area. The elderly, disabled, special needs, and non-English speaking residents are at risk when faced with tornadoes. Without the assistance to evacuate and the difficulty understanding information, these at-risk populations may be unable to prepare themselves of their homes and other possessions to safely endure the storm.

High winds event may affect the entire county or small portions of the county at one time. Therefore, it is important to identify specific community lifeline and critical facilities and those assets that are most vulnerable to this hazard. Community lifeline and critical facilities are highly

vulnerable to high windstorms and tornado events. While many severe storms can cause exterior damage to structures, tornadoes can also complete destroy structures, along with their surrounding infrastructure and immediately halting function. Tornadoes are often accompanied by severe storms which can be threatening to critical facilities within the country. Many secondary effects from these disasters can jeopardize the operation of these critical facilities as well. Community lifeline and critical infrastructure facilities are particularly vulnerable to power outages which can leave facilities functionless, potentially crippling infrastructure supporting the population of the county. Due to their lightweight and often anchored design, commercial trailers and mobile homes are also extremely vulnerable to high winds/tornadoes and will generally sustain the most damage.

Table 46 - Pennsylvania Wind Zones Cont'd

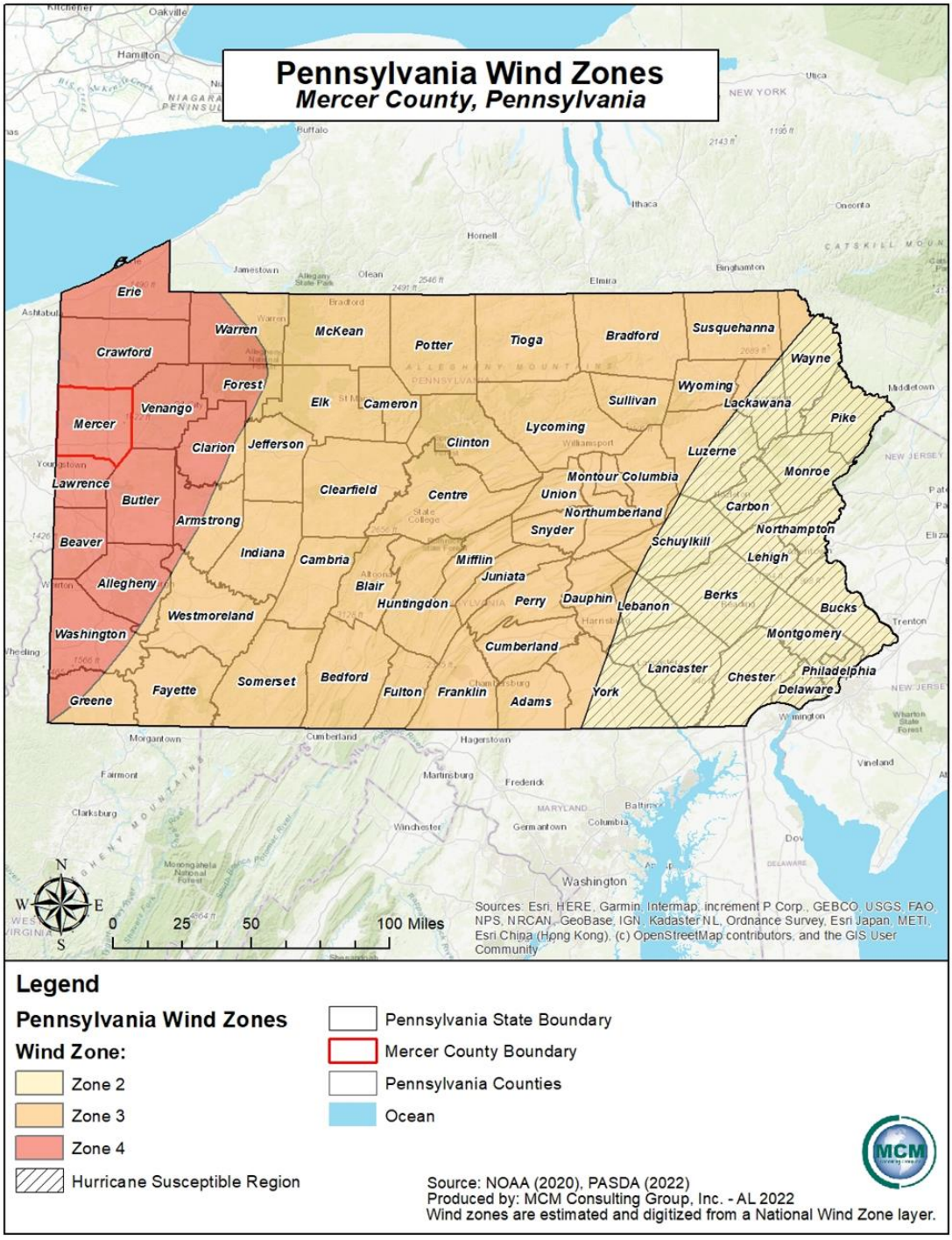


Table 47 - Past Tornado Occurrences in Mercer County

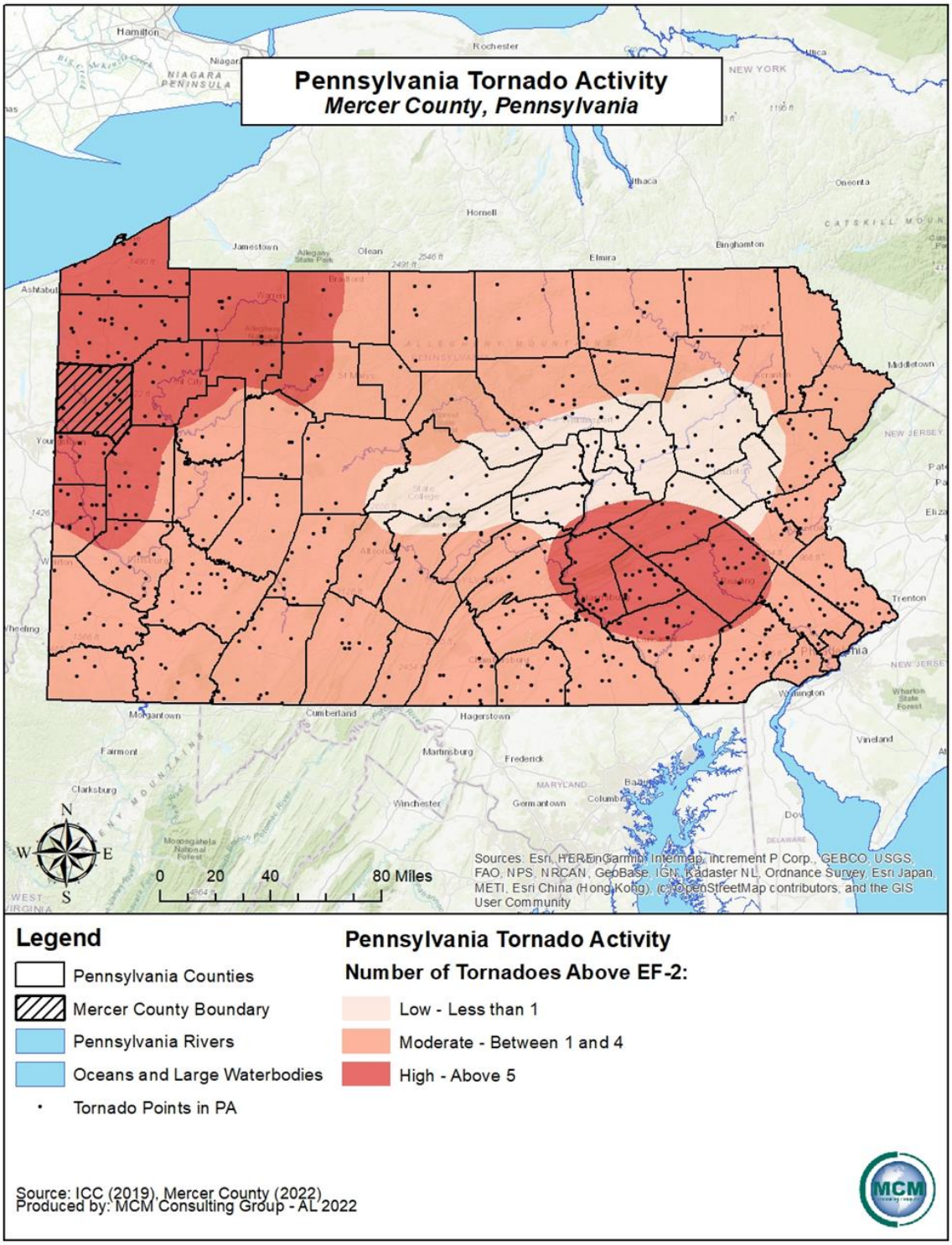
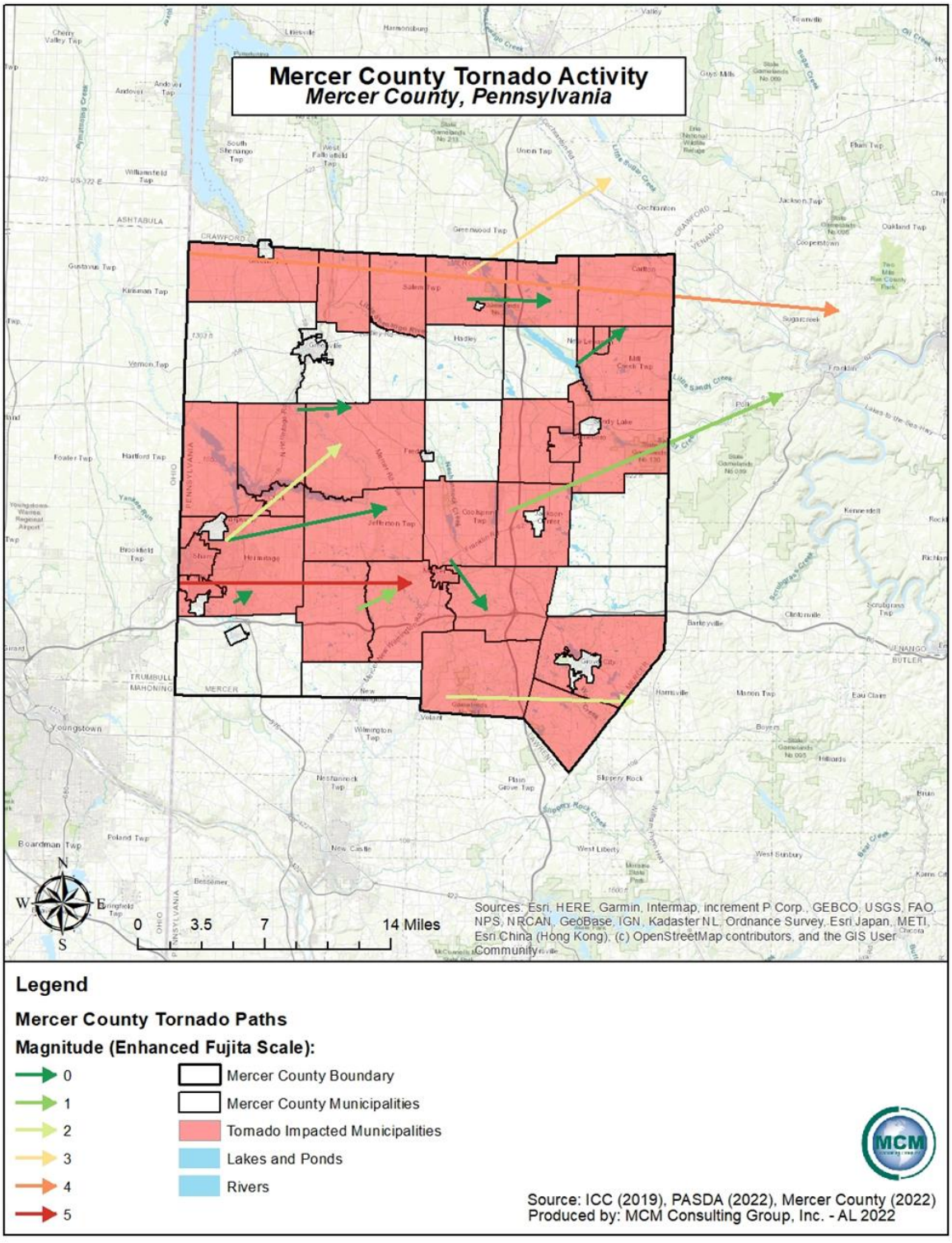


Table 48 - Tornado Activity in Mercer County



4.3.11. Wildfire

4.3.11.1 Location and Extent

The most prevalent causes of devastating wildfires are droughts, lighting strikes, arson, human carelessness, and in rare circumstances, spontaneous combustion. Most fires in Pennsylvania are caused by anthropogenic fires such as debris burns that spread and get out of control. A fire, started in somebody's backyard, could travel through dead grasses and weeds into bordering woodlands starting a wildfire. Major urban fires can cause significant property damage, loss of life, and residential or business displacement. While wildfires are a natural and essential part of many native Pennsylvania ecosystems (e.g., pitch pine and scrub oak woodlands), wildfires can also cause devastating damage if they are undetected and allowed to propagate unfettered. Wildfires most often occur in less developed areas such as open fields, grass, dense brush, or forests where they can spread rapidly by feeding off of vegetation and combustible fuels. Wildfires are most prevalent under prolonged dry and hot spells, or general drought conditions.

A large portion of Mercer County is covered by either farmland or forested areas, increasing the geographic extent of wildfire vulnerability in the county. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands. For recreational enjoyment, the county boasts several local parks and natural areas that include a series of trail systems – all of which are at risk for wildfires.

4.3.11.2 Range of Magnitude

Forested areas, croplands and properties that are at the interface between wild lands and human development are most at risk for being impacted by and causing wildfires. If an urban fire or wildfire is not contained, secondary impacts including power outages may result. Other negative impacts of wildfires can include death of people, livestock, fish, and wildlife, and destruction of valuable property, timber, forage, recreational and scenic values. Wildfires can also cause severe erosion, silting of stream beds and reservoirs, and flooding due to a loss of ground cover.

Almost all of the wildfires in the county occur in remote areas or areas away from residential structures. Unlike the wildland fires that occur in other parts of the country and affect vast areas of land and residential communities, most fires in Mercer County are contained before they cause damage or extensive property loss. However, the county recognizes that wildfires of some magnitude will continue to occur in Mercer County and will have more detrimental effects if development in and/or around the natural areas increases.

The United States Forest Service utilizes the Forest Fire Assessment System to classify the dangers of wildfire. *Table 49 – Wildland Fire Assessment System* identifies each threat classification and provides a description of the level.

Table 49 - Wildland Fire Assessment System

Wildland Fire Assessment System *(U.S. Forest Service)*	
Rank	**Description**
Low (L)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
Moderate (M)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H)	All fine dead fuels ignite readily, and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High (VH)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
Extreme (E)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes, or the fuel supply lessens.

4.3.11.3 Past Occurrence

The Pennsylvania Department of Conservation and Natural Resources (DCNR) has an extensive history of reported wildfires in its state forestry system and districts. Historically, Mercer County experiences between twenty and twenty-five of these types of fires annually with all fires being relatively small. However, due to the many acres of farmland, forested areas, and open space in

the county, under the right conditions the potential exists for a significant wildfire. Mercer County lies entirely in District 8 of the DCNR's Bureau of Forestry. This district encompasses the entirety of Armstrong, Beaver, Butler, Clarion, Jefferson, and Lawrence counties and the southern portion of Venango County. In 2021, there were a total of 149 wildfires in District 8 that were responsible for destroying 346.7 acres.

District 8 reports the following twenty-two-year wildfire summary based on observed and reported wildfires. *Table 50 – Annual Summary of Wildfire Events* illustrates the number of acres burned in a certain number of fires for District 8 from the year 2000 to the year 2021. Wildfire statistics for 2022 were not yet available at the time of this writing.

Table 50 - Annual Summary of Wildfire Events

Annual Summary of Wildfire Events			
Year	**Number of Fires**	**Acres**	**Increase or Decrease**
2000	47	358.3	-
2001	16	230.5	⇩
2002	6	161.5	⇩
2003	18	667.2	⇧
2004	4	25.9	⇩
2005	2	60.1	⇩
2006	22	239.6	⇧
2007	6	18.9	⇩
2008	7	83.3	⇧
2009	11	85.0	⇧
2010	8	274.4	⇩
2011	18	96.5	⇧
2012	73	103.0	⇧
2013	56	235.1	⇩
2014	141	377.5	⇧
2015	67	139.5	⇩
2016	59	182.9	⇩
2017	39	29.0	⇩
2018	85	116.3	⇧
2019	81	114.7	⇩
2020	96	171.4	⇧
2021	149	346.7	⇧
Source: PA DCNR, Forestry, 2022			

In recent years, the number of prescribed burns in Pennsylvania has been increasing. This corresponds to an understanding of the need for fire in many natural ecosystems and management strategies for reducing vulnerability to wildfire; it also improves hunting opportunities.

4.3.11.4 Future Occurrence

Annual occurrence of urban fires and wildfires in Mercer County are expected. Urban fires are most often the result of human errors, outdated wiring and occasionally, malintent (arson). The occurrence of large scale and intense wildfires is somewhat unpredictable and highly dependent on environmental conditions and human response. Weather conditions play a major role in the occurrence of wildfires, so in the event of drought conditions, wildfire caution should be heightened. Any fire without the quick response or attention of firefighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

Climate change is expected to bring an elongated wildfire season and more intense and long-burning fires (Pechony & Shindell, 2010). In some regions of the United States, this is a very real concern. Northern California has experienced unprecedented devastating wildfires in 2017, 2018, 2019, 2020, 2021, and 2022. The fires that have been occurring in California are thought to be burning faster and hotter due to worsening drought conditions caused by increased climate change (Cvijanovic et al., 2017). Wildfire conditions in Pennsylvania are not nearly as severe as in Northern California, but the intensification is a signal that the changes brought by climate change are relevant to wildfires. In Pennsylvania, higher air temperatures and earlier warming in the spring are expected to continue, resulting in more wildfire prone conditions in the summer and fall (Shortle et al., 2015).

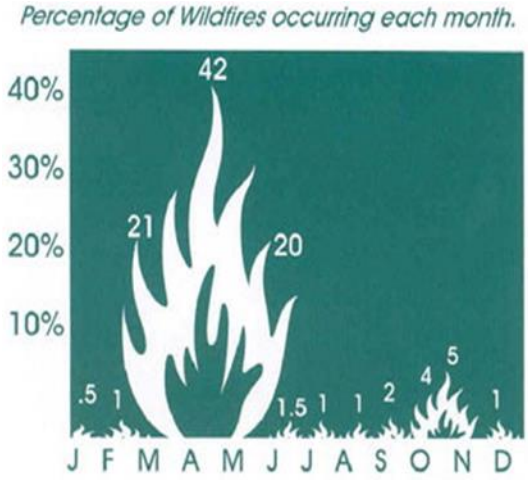
4.3.11.5 Vulnerability Assessment

The size and impact of a wildfire depends on its location, climate conditions, and the response of firefighters. If the right conditions exist, these factors may often mitigate the effects of wildfires; however, during a drought, wildfires can be devastating. The highest risk for wildfires in Pennsylvania occurs during the spring (March to May) and the fall (October to November) months and 99% of all wildfires in Pennsylvania are caused by people. Approximately 83% of all Pennsylvania wildfires occur in the months outlined above. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris and increasing wildfire vulnerability. In the fall, the surplus of dried leaves is fuel for fires. *Figure 30 – Seasonal Wildfire Percentage* shows the wildfire percentage occurrence during each month in Pennsylvania.

Firefighters and other first responders can encounter life-threatening situations due to forest and wildfires. Traffic accidents during a response and the impacts of fighting the fire once on scene are examples of first responder vulnerabilities.

The Wildland Urban Interface (WUI) was nationally mapped by a United States Department of Agriculture Forest Service effort in 2015 that used data from 1990-2010 to develop a robust dataset that related housing density and vegetative density. The dataset provides a way to identify locations where larger numbers of people are living in or near natural areas that could be at risk in the event of a wildfire. The WUI defines two types of communities – interface and intermix. Intermix refers to areas where housing and wildland vegetation intermingle, and interface refers to areas where housing is in the vicinity of a large area of dense wildland vegetation. The WUI was the fastest-growing land use type in the United States between 1990 and 2010. Factors behind the growth include population shifts, expansion of cities into the wildlands, and the expansion of new vegetation growth. The primary cause has been the migration of people, not vegetation growth.

Figure 30 - Seasonal Wildfire Percentage



Pennsylvania is among the states with the largest WUI and the most housing units in a WUI designated area. Pennsylvanians desire the proximity of natural beauty in their daily lives, and the growth in WUI housing noted above illustrates this. *Figure 31 – Wildland Urban Interface* shows the extent of Mercer County and the critical infrastructure facilities, functional needs facilities, and fire stations. Wildfire hazard is defined by conditions that affect wildfire ignition and/or behavior such as fuel, topography, and local weather. The many addressable structures in the Wildland Urban Interface and Intermix zones are broken up by assessed parcel use codes.

There are twenty-five fire department stations that serve Mercer County, a list of which can be seen in *Table 65* of the emergency services profile. Each fire department conducts its own schedule of in-house training sessions for its members.

The response of firefighters is integral to the containment of wildfires in the county. There is a potential for fire stations and services to close, which affects response to a wildfire in Mercer County**.** *Figure 32 – Fire Stations Locations* illustrates the position of fire stations and the location of state game lands, state forests, and natural areas within Mercer County. It is recommended that each municipality assess vulnerabilities to department closures by building a

relationship with their local providers and planning accordingly for if a local service were to close.

At the time of the writing of this plan, it is possible that the continuing emergency services shortages across the Commonwealth of Pennsylvania will impact the availability of firefighters and their response times. Many fire departments have created and begun to enforce new regulations regarding responding to emergencies during the pandemic.

Crops and farmland are at an increased risk of wildfires within Mercer County. As previously discussed, Mercer County has a large market share in agricultural production, and these economic income streams could be negatively impacted by a wildfire, or destroyed outright. Many in Mercer County (approximately 156,397 acres) are at an increased vulnerability. Few critical infrastructure facilities and community lifelines are at an increased risk from wildfires, as most of the critical infrastructure or community lifelines in Mercer County can be found in more urban, or densely populated, areas. Wildfires occur most frequently in rural areas, so the areas of vulnerability do not directly overlap. Based on Wildland Urban Interface values, there are 1,561 address points in Mercer County that are in areas of high density interface classification. Also, there are 108 address points that are in areas of high density intermix classification. These 1,669 address points are at an increased vulnerability to wildfire due to their close proximation to vegetation, which could become fuel for a potential wildfire in Mercer County.

Figure 31 - Wildland Urban Interface

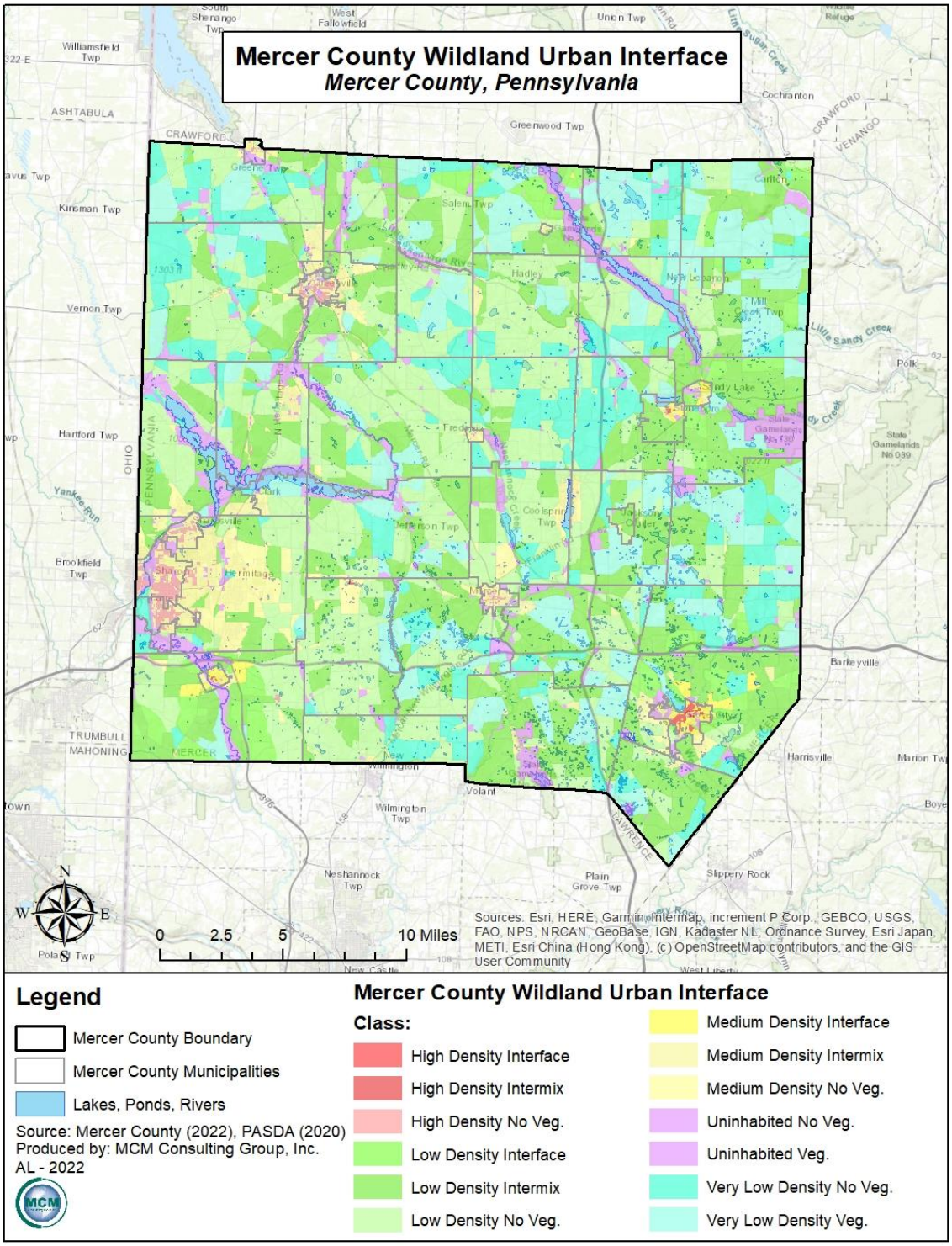
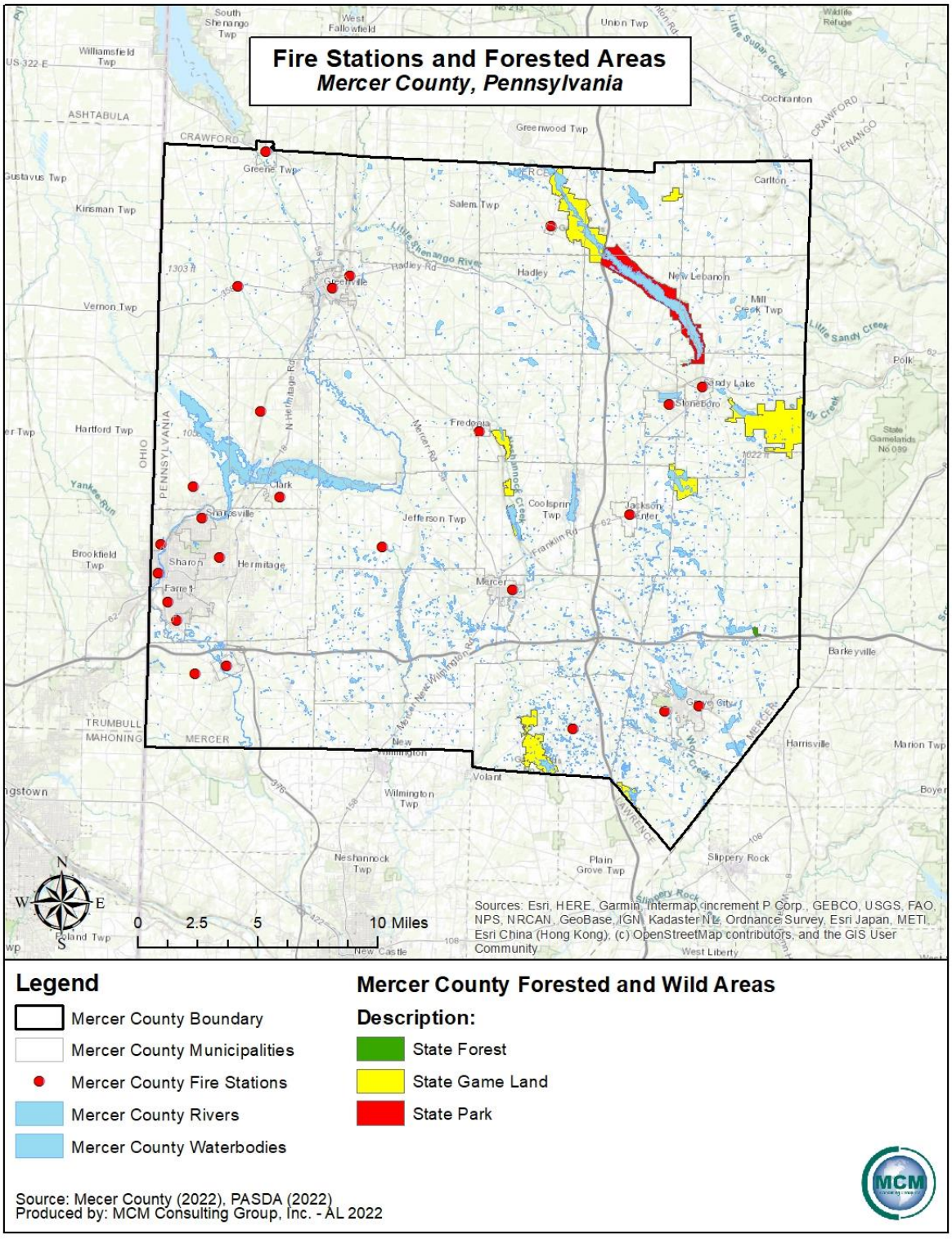


Figure 32 - Fire Station Locations



4.3.12. Winter Storm

4.3.12.1 Location and Extent

Most severe winter storm hazards include heavy snow (snowstorms), blizzards, sleet, freezing rain, and ice storms. Since most extra-tropical cyclones (mid-Atlantic cyclones locally known as Northeasters or Nor'easters), generally take place during the winter weather months, these hazards have also been grouped as a type of severe winter weather storm. According to the Pennsylvania State Hazard Mitigation Plan (PA HMP), winter storms are frequent events for the Commonwealth and occur from late October until mid-April. These types of winter events or conditions are further defined below.

- **Heavy Snow:** According to the National Weather Service (NWS), heavy snow is generally snowfall accumulating to four inches or more in depth in twelve hours or less; or snowfall accumulating to six inches or more in depth in twenty-four hours or less. A snow squall is an intense but limited duration, period of moderate to heavy snowfall, also known as a snowstorm, accompanied by strong, gusty surface winds and possibly lightning.
- **Blizzard:** Blizzards are characterized by low temperatures, wind gusts of thirty-five miles per hour (mph) or more and falling and/or blowing snow that reduces visibility to 1/4-mile or less for an extended period of time (three or more hours).
- **Sleet of Freezing Rainstorm:** Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground and other hard surfaces. Freezing rain is rain that falls as a liquid but freezes into glaze upon contact with the ground.
- **Ice Storm:** An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous and can create extreme hazards to motorists and pedestrians.
- **Extra-Tropical Cyclone:** Sometimes called mid-latitude cyclones, are a group of cyclones defined as synoptic scale, low pressure, weather systems that occur in the middle latitudes of the Earth. These storms have neither tropical nor polar characteristics and are connected with fronts and horizontal gradients in temperature and dew point otherwise known as "baroclinic zones". Extra-tropical cyclones are everyday weather phenomena which, along with anticyclones, drive the weather over much of the Earth. These cyclones produce impacts ranging from cloudiness and mild showers to heavy gales and thunderstorms. Tropical cyclones often transform into extra-tropical cyclones at the end of their tropical existence, usually between 30˚ and 40˚ latitude, where there is insufficient force from upper-level shortwave troughs riding the westerlies (weather systems moving west to east) for the process of extra-tropical transition to begin. A

shortwave trough is a disturbance in the mid or upper part of the atmosphere which induces upward motion ahead of it. During an extra-tropical transition, a cyclone begins to tilt back into the colder air mass with height, and the cyclone's primary energy source converts from the release of latent heat from condensation to baroclinic processes.

4.3.12.2 Range of Magnitude

The magnitude or severity of a severe winter storm depends on several factors including a region's susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (e.g., weekday versus weekend), and time of season. The extent of a severe winter storm can be classified by meteorological measurements, such as those above, and by evaluating its societal impacts.

The Northeast Snowfall Impact Scale (NESIS) categorizes snowstorms in this manner. Unlike the Fujita Scale (tornado) and Saffir Simpson Scale (hurricanes), there is no widely used scale to classify snowstorms. NESIS was developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service and rank high impact, northeast snowstorms. These storms have large areas of ten-inch snowfall accumulations and greater. NESIS has five ranking categories: Notable (1), Significant (2), Major (3), Crippling (4), and Extreme (5). These ranking can be seen in *Table 51 – NESIS Winter Storm Rankings*. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact of northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

Table 51 - NESIS Winter Storm Rankings

NESIS Winter Storm Rankings			
Category	**Description**	**NESIS Range**	**Definition**
1	Notable	1.0 – 2.49	These storms are notable for their large areas of 4-inch accumulations and small areas of 10-inch snowfall.
2	Significant	2.5 – 3.99	Includes storms that produce significant areas of greater than 10-inch snows while some include small areas of 20-inch snowfalls. A few cases may even include relatively small areas of very heavy snowfall accumulations (greater than 30 inches).
3	Major	4.0 – 5.99	This category encompasses the typical major Northeast snowstorm, with large areas of 10-inch snows (generally between 50 and 150 x 103 mi^2 –

NESIS Winter Storm Rankings			
Category	**Description**	**NESIS Range**	**Definition**
			roughly one to three times the size of New York State with significant areas of 20-inch accumulations.
4	Crippling	6.0 – 9.99	These storms consist of some of the most widespread, heavy snows of the sample and can be best described as crippling to the northeast U.S, with the impact to transportation and the economy felt throughout the United States. These storms encompass huge areas of 10-inch snowfalls, and each case is marked by large areas of 20-inch and greater snowfall.
5	Extreme	10+	The storms represent those with the most extreme snowfall distributions, blanketing large areas and populations with snowfalls greater than 10, 20, and 30 inches. These are only storms in which the 10-inch accumulations exceed 200 X 103 mi^2 and affect more than 60 million people.
Source: Kocin and Uccellini, 2004			

The climate of Pennsylvania is marked by abundant snowfall. Winter weather can reach Pennsylvania as early as October and is usually in full force by late November with average winter temperatures between 20- and 40-degrees Fahrenheit. Mercer County receives an average of 29.6 inches of snowfall a year. Most areas of Mercer County experience the effects of winter storms frequently. The general indication of the average annual snowfall map shows areas that are subject to a consistent risk for large quantities of snow. *Figure 34 - Pennsylvania Annual Snowfall 1981 – 2010* illustrates the long-term trends for snowfall accumulation in Pennsylvania over three decades.

4.3.12.3 Past Occurrences

Figure 33 – Winter Storm Events by County in Pennsylvania shows the number of winter storm events from 1950 – 2013 for the Commonwealth of Pennsylvania. Mercer County had nineteen such events. *Table 53 – Mercer County Recent Annual Snowfall Estimates* shows recent annual snowfall measurements as stated by NOAA. Overall, Mercer County has experienced a decrease of the annual estimated average of snowfall. On average, the annual snowfall totals have decreased in the time periods from 2017 to 2021. Additional data averages from 2021 to 2022 are not yet available. A list of additional Mercer County winter storms, and other related events

is outlined in *Table 52 – Mercer County Winter Storm History and Table 54 – Mercer County Winter Weather History*.

Table 52 - Mercer County Winter Storm History

Mercer County Recent Annual Snowfall Estimates			
Location	**Type**	**Date**	**Injuries**
Mercer County	Winter Storm	01/02/1999	0
Mercer County	Winter Storm	01/08/1999	0
Mercer County	Winter Storm	01/13/1999	0
Mercer County	Winter Storm	02/17/2000	0
Mercer County	Winter Storm	12/13/2000	0
Mercer County	Winter Storm	03/25/2002	0
Mercer County	Winter Storm	02/01/2008	0
Mercer County	Winter Storm	02/12/2008	0
Mercer County	Winter Storm	03/07/2008	0
Mercer County	Winter Storm	01/06/2009	0
Mercer County	Winter Storm	01/27/2009	0
Mercer County	Winter Storm	02/09/2010	0
Mercer County	Winter Storm	02/04/2014	0
Mercer County	Winter Storm	01/12/2018	0
Mercer County	Winter Storm	01/18/2019	0
Mercer County	Winter Storm	12/01/2020	0
Mercer County	Winter Storm	12/24/2020	0
Mercer County	Winter Storm	01/16/2022	0
Mercer County	Winter Storm	02/03/2022	0
Source: NOAA, 2022			

Table 53 - Mercer County Recent Annual Snowfall Estimates

Mercer County Recent Annual Snowfall Estimates			
Time Span	**Snowfall Estimates (inches)**	**Time Span**	**Snowfall Estimates (inches)**
2000-2001	24.2	2011-2012	12.5
2001-2002	18.9	2012-2013	36.8
2002-2003	Data Unavailable	2013-2014	47.7
2003-2004	55.3	2014-2015	46.1
2004-2005	30.6	2015-2016	6.6
2005-2006	22.0	2016-2017	37.9
2006-2007	26.5	2017-2018	26.6

Mercer County Recent Annual Snowfall Estimates			
Time Span	**Snowfall Estimates (inches)**	**Time Span**	**Snowfall Estimates (inches)**
2007-2008	30.7	2018-2019	28.8
2008-2009	20.6	2019-2020	10.9
2009-2010	27.0	2020-2021	Data Unavailable
2010-2011	41.0	2021-2022	Date Unavailable
Source: NOAA, 2021			

Table 54 - Mercer County Winter Weather History

Mercer County Winter Weather History		
Location	**Date**	**Event Type**
Mercer County (Entire County)	11/13/1997	Ice Storm
Mercer County (Entire County)	02/04/1998	Ice Storm
Mercer County (Entire County)	01/02/1999	Heavy Snow
Mercer County (Entire County)	01/06/1999	Heavy Snow
Mercer County (Entire County)	03/06/1999	Heavy Snow
Mercer County (Entire County)	11/22/2000	Heavy Snow
Mercer County (Entire County)	12/25/2002	Heavy Snow
Mercer County (Entire County)	01/11/2003	Heavy Snow
Mercer County (Entire County)	12/06/2003	Heavy Snow
Mercer County (Entire County)	01/14/2004	Heavy Snow
Mercer County (Entire County)	02/03/2004	Ice Storm
Mercer County (Entire County)	02/06/2004	Ice Storm
Mercer County (Entire County)	03/16/2004	Heavy Snow
Mercer County (Entire County)	12/20/2004	Heavy Snow
Mercer County (Entire County)	01/05/2005	Ice Storm
Mercer County (Entire County)	01/11/2005	Ice Storm
Mercer County (Entire County)	01/22/2005	Heavy Snow
Mercer County (Entire County)	03/01/2005	Heavy Snow
Mercer County (Entire County)	04/03/2005	Heavy Snow
Mercer County (Entire County)	12/15/2005	Ice Storm
Mercer County (Entire County)	02/13/2007	Heavy Snow
Mercer County (Entire County)	12/13/2007	Ice Storm
Mercer County (Entire County)	01/01/2008	Heavy Snow
Mercer County (Entire County)	10/28/2008	Winter Weather
Mercer County (Entire County)	11/20/2008	Heavy Snow
Mercer County (Entire County)	01/09/2009	Heavy Snow
Mercer County (Entire County)	01/16/2009	Extreme Cold/Wind Chill

Mercer County Winter Weather History		
Location	**Date**	**Event Type**
Mercer County (Entire County)	01/17/2009	Heavy Snow
Mercer County (Entire County)	12/13/2009	Winter Weather
Mercer County (Entire County)	01/07/2010	Heavy Snow
Mercer County (Entire County)	02/05/2010	Heavy Snow
Mercer County (Entire County)	12/05/2010	Heavy Snow
Mercer County (Entire County)	12/13/2010	Heavy Snow
Mercer County (Entire County)	01/31/2011	Ice Storm
Mercer County (Entire County)	02/01/2011	Ice Storm
Mercer County (Entire County)	03/10/2011	Heavy Snow
Mercer County (Entire County)	02/25/2012	Winter Weather
Mercer County (Entire County)	12/26/2012	Heavy Snow
Mercer County (Entire County)	11/26/2013	Heavy Snow
Mercer County (Entire County)	01/05/2014	Extreme Cold/Wind Chill
Mercer County (Entire County)	11/22/2014	Winter Weather
Mercer County (Entire County)	12/02/2014	Winter Weather
Mercer County (Entire County)	02/01/2015	Heavy Snow
Mercer County (Entire County)	02/14/2015	Extreme Cold/Wind Chill
Mercer County (Entire County)	02/19/2015	Extreme Cold/Wind Chill
Mercer County (Entire County)	02/24/2015	Extreme Cold/Wind Chill
Mercer County (Entire County)	02/15/2016	Heavy Snow
Mercer County (Entire County)	12/09/2016	Winter Weather
Mercer County (Entire County)	12/11/2016	Winter Weather
Mercer County (Entire County)	12/29/2016	Winter Weather
Mercer County (Entire County)	01/29/2018	Winter Weather
Mercer County (Entire County)	02/07/2018	Winter Weather
Mercer County (Entire County)	03/08/2018	Winter Weather
Mercer County (Entire County)	03/21/2018	Heavy Snow
Mercer County (Entire County)	11/14/2018	Winter Weather
Mercer County (Entire County)	01/30/2019	Extreme Cold/Wind Chill
Mercer County (Entire County)	02/20/2019	Winter Weather
Mercer County (Entire County)	11/12/2019	Winter Weather
Mercer County (Entire County)	12/01/2019	Winter Weather
Mercer County (Entire County)	01/18/2020	Winter Weather
Mercer County (Entire County)	02/07/2020	Winter Weather
Mercer County (Entire County)	02/12/2020	Winter Weather
Mercer County (Entire County)	11/01/2020	Winter Weather
Mercer County (Entire County)	12/16/2020	Winter Weather
Mercer County (Entire County)	01/31/2021	Winter Weather

Mercer County Winter Weather History		
Location	**Date**	**Event Type**
Mercer County (Entire County)	02/01/2021	Winter Weather
Mercer County (Entire County)	02/13/2021	Winter Weather
Mercer County (Entire County)	02/15/2021	Winter Weather
Mercer County (Entire County)	12/27/2021	Winter Weather
Mercer County (Entire County)	01/23/2022	Winter Weather
Mercer County (Entire County)	01/24/2022	Winter Weather
Mercer County (Entire County)	02/24/2022	Winter Weather
Mercer County (Entire County)	03/11/2022	Winter Weather
Source: NOAA NCEI, 2022		

4.3.12.4 Future Occurrence

Winter storm hazards in Pennsylvania are guaranteed yearly since the state is located at a relatively high latitudes resulting in winter temperatures that range between 0- and 32-degrees Fahrenheit for a good deal of the fall through early spring season (later October until mid-April). In addition, the state is exposed to large quantities of moisture from both the Great Lakes and the Atlantic Ocean. While it is almost certain that a number of significant winter storms will occur during the winter and fall season, what is not easily determined is how many such storms will occur during that time frame. Based on historical snow related disaster declaration occurrences, the Commonwealth of Pennsylvania can expect a snowstorm of disaster declaration proportions, on average, once every three to five years. Similarly, for ice storms, based on historical disaster declarations, it is expected that on average, ice storms of disaster proportions will occur once every seven to ten years within the state.

4.3.12.5 Vulnerability Assessment

Severe winter storms are of significant concern to Mercer County because of their frequency and magnitude in the region. Additionally, they are of significant concern due to the direct and indirect costs associated with these events; delays caused by the storms and impacts on the people and facilities of the region related to snow and ice removal, health problems, cascade effects such as utility failure and traffic accidents, and stress on community resources.

Every year, winter weather indirectly and deceptively kills hundreds of people in the United States, primarily from automobile accidents, over exertion, and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, drifting snow, extreme cold temperatures, and dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. Heavy accumulations of ice can bring down trees and powerlines, disabling electrical power and communications for days or weeks. Heavy snow can immobilize a region and

paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services. The economic impact of winter weather each year is quite large, with costs for snow removal, damage, and loss of business in the millions each year. Heavy snow can immobilize and strand commuters as well as stopping the flow of supplies through an area or transportation corridor. In rural areas, homes and farms may be isolated for days and unprotected livestock may be lost. Bridge and overpasses are particularly dangerous because they freeze before other transportation surfaces. For the purposes of this Hazard Mitigation Plan, the entire population of Mercer County (110,652) is exposed to severe winter storm events. The elderly are considered the most susceptible to this hazard due to their increased risk of injury and death from falls, overexertion, and or attempts to clear ice and snow. The elderly population is also more vulnerable to utility outages in winter, especially when they are paired with winter storm events. *Table 55 – Utility Outages in Mercer County in Winter* shows the number of power outages, phone outages, and 911 outages, that have occurred in the county during winter months. Vulnerable populations within Mercer County may not have access to housing or their housing may be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply). The unsheltered populations of an area are at most risk to winter storm events.

Table 55 - Utility Outages in Mercer County in Winter

Utility Outages in Mercer County in Winter		
Location	**Date**	**Event**
Mercer County (Entire County)	12/15/2018	Wires / Pole Down
Mercer County (Entire County)	02/25/2019	Operating System Down
Mercer County (Entire County)	05/31/2019	Power Outage
Grove City	10/31/2020	AHN Grove City Power Issues
Source: Mercer County EMA Information, 2022		

The table below illustrates the number of citizens per municipality over the age of 65 years of age who are at increased vulnerability to winter storms, and cascading hazards from winter storms:

Population per Municipality 65 Years or Older		
Municipality	**Number of People 65 years or older**	**Percent of Population**
City of Farrell	925	21.4%
City of Hermitage	4,362	26.8%
City of Sharon	2,209	16.7%
Clark Borough	155	22.2%

Population per Municipality 65 Years or Older		
Municipality	**Number of People 65 years or older**	**Percent of Population**
Coolspring Township	545	27.1%
Deer Creek Township	109	21.5%
Delaware Township	500	23.4%
East Lackawannock Township	315	16.3%
Fairview Township	137	14.8%
Findley Township	357	11.2%
Fredonia Borough	73	22.1%
French Creek Township	118	19.5%
Greene Township	249	23.3%
Greenville Borough	693	12.4%
Grove City Borough	1,104	14%
Hempfield Township	951	25.4%
Jackson Township	317	29.8%
Jackson Center Borough	37	21.4%
Jamestown Borough	130	20.6%
Jefferson Township	361	22.8%
Lackawannock Township	610	24.8%
Lake Township	79	9.8%
Liberty Township	404	26.7%
Mercer Borough	354	19.6%
Mill Creek Township	197	24.2%
New Lebanon Borough	38	20.9%
New Vernon Township	134	32%
Otter Creek Township	123	23.5%
Perry Township	311	24%
Pine Township	1,006	20.8%
Pymatuning Township	597	19%
Salem Township	154	19.5%
Sandy Creek Township	190	22.5%
Sandy Lake Borough	85	12.2%
Sandy Lake Township	340	27.6%

Population per Municipality 65 Years or Older		
Municipality	**Number of People 65 years or older**	**Percent of Population**
Sharpsville Borough	990	23.2%
Sheakleyville Borough	14	9%
Shenango Township	1,292	36.3%
South Pymatuning Township	564	21.3%
Springfield Township	383	19.4%
Stoneboro Borough	168	20.3%
Sugar Grove Township	218	24.5%
West Middlesex Borough	218	18.8%
West Salem Township	1,323	40.6%
Wheatland Borough	143	25.6%
Wilmington Township	248	21.8%
Wolf Creek Township	132	22.6%
Worth Township	152	16.6%
TOTAL	**24,114**	**-**
Source: American Community Survey, United States Census Bureau, 2021		

The entire general building stock inventory in Mercer County is exposed and vulnerable to the severe winter storm hazard. In general, structural impacts include damage to rood and building frames, rather than building content. There was no historic information available that identified property damages within Mercer County due to a single severe winter storm event. Current modeling tools are not available to estimate specific losses for this hazard. A specific area that is vulnerable to the severe winter storm hazard is the floodplain. At risk general building stock and infrastructure in floodplains are presented in the flood profile due to snow and ice melt. Generally, losses from flooding associated with severe winter storms should be less than that associated with a 100-year or 500-year flood.

Full functionality of critical facilities such as police, fire, and medical facilities is essential for response during and after a severe winter storm event. These critical facility structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage from severe winter storm events. Backup power is recommended critical infrastructure and facilities due to the potential for power interruption. Infrastructure at risk for this hazard includes roadways that could be damaged due to the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall

requires infrastructure to clear roadways and alert citizens to dangerous conditions. In spring, this type of roadway damage must be repaired. Additionally, freezing rain and ice storms impact utilities (i.e., power lines and overhead utility wires) causing power outages for hundreds to thousands of residents.

The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain local financial resources. However, because severe winter storms are a regular occurrence in this area, Mercer County is generally well-prepared for snow and ice removal each season.

Figure 33 - Winter Storm Events by County in Pennsylvania

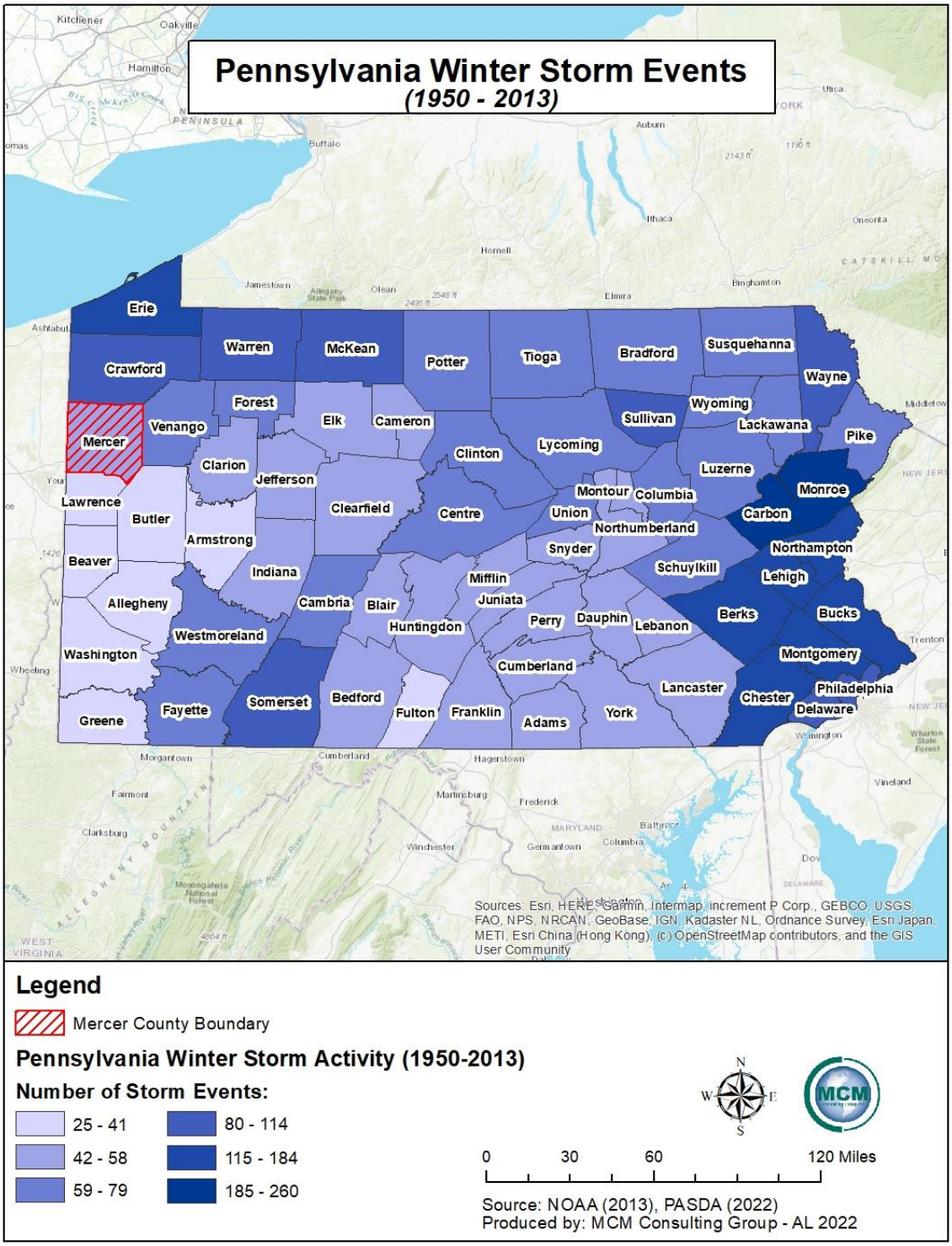
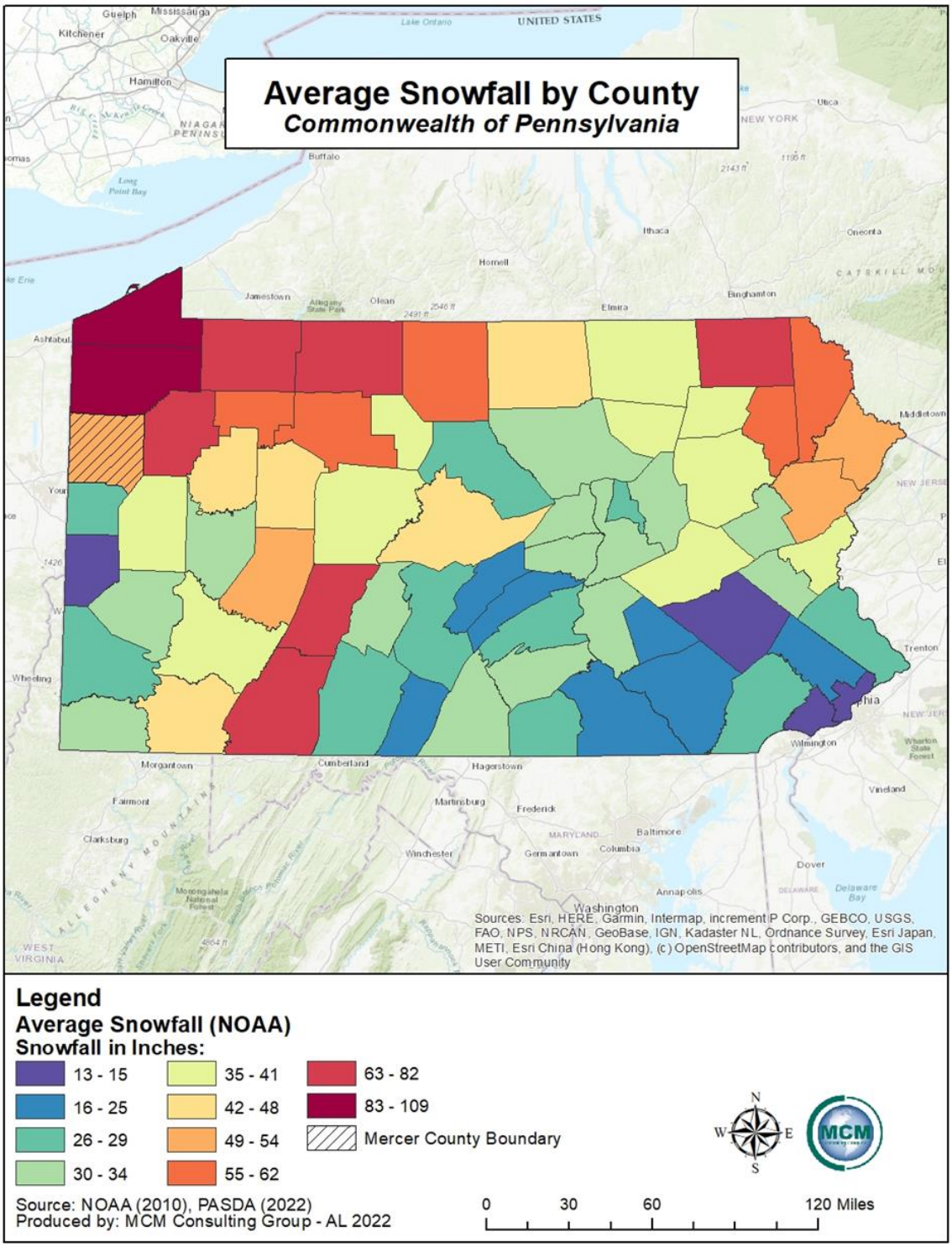


Figure 34 - Pennsylvania Annual Snowfall 1981 – 2010



4.3.13. Civil Disturbance

4.3.13.1 Location and Extent

Civil disturbance refers to mass acts of disobedience where participants can become hostile to authority and there is a threat to maintaining public safety and order. Such disturbances can often be forms of protest in the face of socio-political problems. Riots have not been frequent occurrences throughout the history of the Commonwealth, however when they occur, they can cause significant property damage, injury and even loss of life. The scale and scope of civil disturbance events varies widely. Government facilities, local landmarks, prisons, and universities are common sites where crowds and mobs may gather.

Criminal activity refers to all criminality, including enemy attack, sabotage, physical or information break of security, workplace or school violence, harassment, discrimination, and other crimes. Criminal activity is a very broad hazard category and similar to civil disturbance, the scale and scope of incidents or events vary widely.

4.3.13.2 Range of Magnitude

Civil disturbances can take the form of small gatherings or large groups blocking or impeding access to a building or disrupting normal activities by generating noise and intimidating people. They can range from a peaceful sit-in to a full-scale riot, in which a mob burns or otherwise destroys property and terrorizes individuals. Even in its more passive forms, a group that blocks roadways, sidewalks, or buildings interferes with public order. There are two types of large gatherings typically associated with civil disturbances: a crowd and a mob. A crowd may be defined as a casual, temporary collection of people without a strong, cohesive relationship. Crowds can be classified into four categories:

Casual Crowd: A casual crowd is merely a group of people who happen to be in the same place at the same time. Violent conduct does not occur.

Cohesive Crowd: A cohesive crowd consists of members who are involved in some type of unified behavior. Members of this group are involved in some type of common activity, such as worshipping, dancing, or watching a sporting event. Although they may have intense internal discipline, they require substantial provocation to arouse to action.

Expressive Crowd: An expressive crowd is one held together by a common commitment or purpose. Although they may not be formally organized, they are assembled as an expression of common sentiment or frustration. Members wish to be seen as a formidable influence. One of the best examples of this type is a group assembled to protest.

Aggressive Crowd: An aggressive crowd is comprised of individuals who have assembled for a specific purpose. This crowd often has leaders who attempt to arouse the members or motivate them to action. Members are noisy and threatening and will taunt authorities.

They may be more impulsive and emotional and require only minimal stimulation to arouse violence. Examples of this type of crowd could include demonstrators and strikers, though not all demonstrators and strikers are aggressive.

A mob can be defined as a large disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent, and lawless. Similar to crowds, mobs have different levels of commitment and can be classified into four categories:

Aggressive Mob: An aggressive mob is one that attacks, riots, and terrorizes. The object of violence may be a person, property, or both. An aggressive mob is distinguished from an aggressive crowd only by lawless activity. Examples of aggressive mobs are the inmate mobs in prisons and jails, mobs that act out their frustrations after political defeat, or violent mobs at political protests or rallies.

Escape Mob: An escape mob are those groups which attempt to flee from something such as a fire, bomb, flood, or other catastrophe. Members of escape mobs are generally difficult to control and can be characterized by unreasonable terror.

Acquisitive Mob: An acquisitive mob is one motivated by a desire to acquire something. Riots caused by other factors often turn into looting sprees. This mob exploits a lack of control by authorities in safeguarding property.

Expressive Mob: An expressive mob is one that expresses fervor or revelry following some sporting event, religious activity, or celebration. Members experience a release of pent-up emotions in highly charged situations.

In the event of a significant civil disturbance or criminal activity incident, local government operations and the delivery of services in the community may experience short-term disruptions. The greatest secondary effect is the impact on the economic and financial conditions of the affected community, particularly in relation to the property, facilities, and infrastructure damaged as a result of the disturbance. More serious acts of vandalism may result in limited power failure or hazardous material spills, leading to a possible public health emergency. Altered traffic patterns may increase the probability of a transportation accident.

Mercer County's greatest likelihood for civil disturbance is in the city of Hermitage, the largest municipality in the county. Citizens, property, and infrastructure could be affected if a large-scale disorder were to take place. Typically, government facilities, landmarks, prisons, and universities are common sites where crowds or mobs may gather. Mercer County is home to four universities and four post-secondary education centers, including: Butler County Community College (Mercer County), Grove City College, Thiel College, Pennsylvania State University Shenango Campus, Laurel Technical Institute, Mercer County Career and Technical Center, Penn State Cosmetology Academy, and the Sharon Regional Health System Schools of Nursing and Radiology.

4.3.13.3 Past Occurrence

The county has not experienced any *significant* civil disturbance events.

Following the death of African-American George Floyd in Minneapolis, Minnesota in May 2020 at the hands of law enforcement, civil unrest erupted across the nation. There were multiple protest events recorded by the county and these occurred within two months of George Floyd's death in May of 2020. These dates are: June 3rd, 2020, June 6th, 2020, June 7th, 2020, June 12th, 2020, June 13th, 2020 and August 17th, 2020.

There have been minor and infrequent incidences in the prisons and penitentiaries of Mercer County. In 2008, three or four inmates attempted to restrict access to their housing unit in the Mercer County Jail. During the same incident, there was a second housing unit door that required deputy intervention. There have been no incidences of note or on record for the State Correctional Institution – Mercer, located in Findley Township, with a total capacity of 1,087.

4.3.13.4 Future Occurrence

While unlikely, civil disturbances may occur in Mercer County, and it is difficult to accurately predict the probability of future occurrence for civil disturbance events over the long-term. However, *Table 56 - Civil Disturbance Events Reported to PEMA 2012-2018*, depicts the range of potential civil disturbances in Pennsylvania and gives the county some background for consideration of future occurrences.

Table 56 - Civil Disturbance Events Reported to PEMA 2012-2018

Table 4.3.18-2 Civil disturbance events reported to PEMA-KC, 2012-2018 (PEMA, 2018).							
EVENT TYPE	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Demonstration	1	3	9	3	3	3	3
Juvenile Detention Center	0	0	0	0	0	0	1
Prison Disturbance	0	2	0	0	0	1	0
Detainee Escape	2	4	3	4	0	2	1
Protest	4	24	49	35	64	78	13
Large Crowd Gathering	0	1	0	4	2	3	2
Riot	0	0	0	1	0	0	0
School Threat	1	2	0	2	0	2	0
Assault	2	8	2	2	3	4	0
Gun/Bomb Incident	3	15	3	7	2	3	0
Civil Disorder - totals	***13***	***59***	***66***	***58***	***74***	***96***	***20***
**Events totaled through 2018*							

According to the Pennsylvania State Hazard Mitigation Plan, from 2012 to 2018, the commonwealth experienced an average of fifty-five civil disturbance events each year. While that number is relatively low and the occurrences in Mercer County are rare, the local planning team (LPT) decided civil disturbance should be regarded as a high-risk hazard due to the current political trends and frictions across the country.

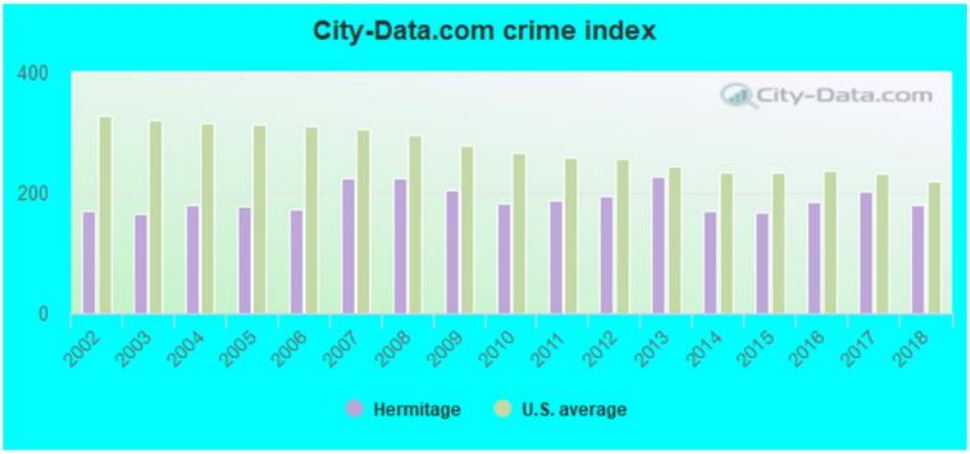
Like civil disturbance, it is extremely difficult to predict when criminal activity may take place in Mercer County and throughout the Commonwealth of Pennsylvania. According to the City-Data.com crime index, the 2018 crime rate in the City of Hermitage (the county's highest population center) is 1.5 times lower than the U.S. average. It was higher than in 65% of U.S. cities. The 2018 City of Hermitage crime rate fell by 11% compared to 2017. In the last five years, the City of Hermitage has seen decreasing violent crime and increasing property crime.

This data is limited to 2018 and is the last year that information was reported to City-Data.com Crime Index. As of the time of this writing, this is a data limitation with this data source. In order to fill in this gap in information see *Table 57 – Reported Offenses for Mercer County*. This information is reported from the Pennsylvania State Police Uniform Crime Reporting System from 2022. As seen in the data, the number of reported offenses in Mercer County has decreased steadily over the past five years, with the understanding that the data for calendar year 2022 is not yet final at the time of this writing.

Table 57 - Reported Offenses in Mercer County

Offenses Reported in Mercer County					
Offense Type	**2022****	**2021**	**2020**	**2019**	**2018**
Murder and Nonnegligent Manslaughter	0	2	4	2	6
Manslaughter by Negligence	0	0	0	0	0
Rape	20	36	35	51	46
Robbery	10	21	14	32	33
Aggravated Assault	147	251	216	200	209
Other Assaults – Simple	297	509	513	446	479
Burglary	97	157	165	255	338
Larceny – Theft	637	801	970	1132	1351
Motor Vehicle Theft	48	58	44	50	58
Arson	0	11	8	6	17
Human Trafficking	0	0	0	0	0
Total:	**1,256**	**1,846**	**1,969**	**2,174**	**2,537**
Source: PSP UCR System, Nov. 2022 **2022 data not complete as of compiling report.					

Figure 35 - City-Data.com Crime Index



4.3.13.5 Vulnerability Assessment

All municipalities in Mercer County can be vulnerable to civil disturbance and criminal activity; however. the anticipated impact from such events is minimal. These events may be sparked for varying reasons and the seriousness of the event may well be exacerbated by how authorities handle the crowd. At the writing of this plan, the political temperature of the country as a whole continues to run high, making this hazard vulnerability one for consistent monitoring by public safety officials.

4.3.14. Dam and Levee Failure

4.3.14.1 Location and Extent

Dams

A dam restricts the flow of water or underground streams and often creates reservoirs for water storage. The reservoirs created by these barriers not only suppress floods but also provide water for activities such as irrigation, human consumption, industrial use aquaculture, and navigability.

Dam failures occur usually as a secondary effect of massive amounts of rainfall and flooding, causing too much water to enter the spillway system. This type of failure occurs with little to no warning. Spring thaws, severe thunderstorms, and heavy rainfall are also contributing factors to potential dam failures. Depending on the size of the body of water where the dam is constructed, additional water may come from distant upstream locations. Water contributions may also come from dam failures in adjoining counties that are along the same riverine or water features.

FEMA considers the following to be the most frequent causes of dam failures:

- Overtopping caused by floods that exceed the capacity of the dam
- Deliberate acts of sabotage
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate maintenance and upkeep

Poor engineering or poor maintenance may also cause dam failure. The Pennsylvania Department of Environmental Protection (PA DEP) and the United States Army Corps of Engineers (USACE) awards permits for dams and also share inspection responsibilities. Inspection results are characterized as either safe or unsafe.

The National Inventory of Dams (NID) is a registry that captures information about structures that are greater than or equal to 25 feet in height or impound 50-acre-feet or more of water (an acre-foot is equal to 325,851 gallons of water); it includes structures above 6 feet in height where failure would potentially cause damage downstream. The dams are classified in terms of hazard potential as “High”, “Significant”, or “Low”, with high-hazard dams requiring emergency action plans (EAPS) There are fourteen high-hazard and low-hazard dams in Mercer County that are both publicly and privately owned and are registered with the USACE in the NID. There are also three dams with a hazard classification as significant. There are twelve dams within the county that are high-hazard and require an emergency action plan. *Table 59 – Mercer County Dam Inventory* illustrates the dams located in Mercer County. *Table 58 – High-Hazard Dams Municipal Summary* summarizes the high-hazard dams in Mercer County by municipality. The municipalities not listed do not have high-hazard dams. *Table 60 – Dam Name and Purpose* lists

the dams located in Mercer County and their purpose code, and the description of purpose based on the Pennsylvania DEP codes.

Table 58 - High-Hazard Dams Municipality Summary

High-Hazard Dams – Municipal Summary (PA DEP)	
Municipality	**Number of High-Hazard Dams**
Cool Spring Township	1
Fairview Township	1
Hempfield Township	2
City of Hermitage	1
Perry Township	1
Sandy Creek Township	1
Sandy Lake Township	2
Sharpsville Borough	1
Sugar Grove Township	1
Total:	

Table 59 - Mercer County Dam Inventory

Mercer County Dam Inventory (NID, 2022)						
Dam Name	**River**	**Owner Name**	**Year Completed**	**Drain Area**	**Hazard**	**EAP**
Unnamed Dam	Bluff Run	Ken George	1963	N/A	L	NR
Barmore Lake	Barmore Run	Barmore Country Club	1903	1.2	L	NR
Buhl Park	Thornton Run	Buhl Farm Trust	1919	0.38	H	Y
Clark Mills	Calvin Clark Run	Mercer County Commissioners	1971	3.29	H	Y
Cresswell Lower	Tributary Morrison Run	Jeff L. Cresswell	2002	0.33	S	N
Cresswell Upper	Tributary Morrison Run	Jeff L. Cresswell	2002	0.33	S	N
Crooked Creek	Crooked Creek	Mercer County Commissioners	1994	39.9	H	Y
Hadley	Morrison Run	Mercer County Commissioners	1968	4.6	H	Y
Lake Latonka	Cool Spring Creek	Lake Latonka P.O. A	1966	12.7	H	Y

Mercer County Dam Inventory (NID, 2022)						
Dam Name	**River**	**Owner Name**	**Year Completed**	**Drain Area**	**Hazard**	**EAP**
Lake Wilhelm	Sandy Creek	Pennsylvania DCNR	1969	56.5	H	Y
Looney Lake	Tributary Lackawannock Creek	Mark and Wendy Fagan	1952	0.67	S	Y
Mathay	Mathay Run	Mercer County Commissioners	1962	1.4	H	Y
Oak Tree	Oak Branch	Oak Tree Country Club	1967	1.27	L	NR
Pine Run	Pine Run	Mercer County Commissioners	1970	1.64	H	Y
Saul Run	Saul Run	Mercer County Commissioners	1963	`	H	Y
Shenango Dam	Shenango River	CELRP	1965	589	H	Y
Stoneboro	Sawmill Run	Mercer County Commissioners	1966	1.56	H	Y

Table 60 - Dam Name and Purpose

Mercer County Dams and Purposes (PA DEP 2019 & NID 2022)		
Dam Name	**Purpose Code**	**Purpose Code Description**
Unnamed Dam	R	Recreation
Barmore Lake	R	Recreation
Buhl Park	R	Recreation
Clark Mills	C	Flood Control
Cresswell Lower	O	Farm Pond
Cresswell Upper	O	Farm Pond
Crooked Creek	C	Flood Control
Hadley	C	Flood Control
Lake Latonka	R	Recreation
Lake Wilhelm	C,R	Flood Control, Recreation
Looney Lake	R	Recreation
Mathay	C	Flood Control
Oak Tree	R	Recreation
Pine Run	C	Flood Control
Saul Run	C	Flood Control

Mercer County Dams and Purposes (PA DEP 2019 & NID 2022)		
Dam Name	**Purpose Code**	**Purpose Code Description**
Shenango Dam	C,R	Flood Control, Recreation
Stoneboro	C	Flood Control

The Pennsylvania Department of Environmental Protection defines a high-hazard dam as "Any dam so located as to endanger populated areas downstream by its failure". High-hazard dams receive two inspections each year, once by a professional engineer on behalf of the owner and once by a PA DEP inspector (DEP, 2008).

Levees

Levee failures have the potential to place large numbers of people and property at risk. Unlike dams, levees are built parallel to a river or another body of water to protect the population and structures behind it from risks of damage during a flooding event. Levees do not serve a purpose beyond flood protection, unlike dams, which can serve to store water or generate energy in addition to protecting areas from flooding. The National Levee Database (NLD), like its counterpart of the National Inventory of Dams (NID), is maintained by the USACE and tracks levees across the United States. Mercer County is home to two levee areas, which are detailed in *Table 61 – Mercer Name Levee Inventory*.

Table 61 – Mercer County Levee Inventory

Mercer County Levee Inventory (National Levee Database, 2022)					
Name	**Levee Type**	**Levee Length**	**Levee Area (square miles)**	**Sponsor**	**FEMA Accreditation Rating**
Otter Creek Levee	Earthen Levee	0.13	0.0062	N/A	N/A
Pine Run Levee	Earthen Levee	0.12	0.0050	N/A	N/A

4.3.14.2 Range of Magnitude

Dams

Dam failures can pose a serious threat to communities located downstream from major dams. The impact of a dam failure is dependent on the volume of water impounded by the dam and the amount of population or assets located downstream. Catastrophic failures are characterized by the sudden, rapid, and uncontrolled release of impounded water from a dammed impoundment or

water body. *Figure 36 – Mercer County Dams* shows the location of dams within Mercer County as well as their hazard designation.

Levees

Levee failure can be caused by a number of factors, and they can also cause catastrophic effects. Damage to the area beyond a levee, if it fails, could be more significant than if the levee was not present. Levees are designed to provide a specific level of protection, so flooding events could overtop the levees if these events exceeded the levee specifications. Additionally, levees can also fail if they are allowed to deteriorate or decay. Regular maintenance of levees is critical. *Figure 37 – Mercer County Levee Locations* illustrates areas protected by the Mercer County levee systems. The figures following *Figure 37 – Mercer County Levee Locations* illustrate areas around the City of Hermitage and Mercer Borough that are heavily protected by levees. They are *Figure 38 – Levee Locations – Hermitage* and *Figure 39 – Levee Locations - Mercer*.

A Levee failure of breach causes flooding in landward areas adjacent to the structure. The failure of a levee or other flood protection structure could be devastating, depending on the level of flooding for which structure is designed and the amount of landward development present. Large volumes of water may be moving at high velocities, potentially causing severe damage to buildings, infrastructure, trees, and other large objects. Levee failures are generally worse when they occur abruptly with little warning and result in deep, fast-moving water through highly developed areas.

4.3.14.3 Past Occurrence

Dams

There have been no past occurrences of dam failure or major incidence occurring at the locations of dams within Mercer County. Smaller incidences have occurred but have not had significant impacts in the county.

There have been a few historically destructive dam failures in Pennsylvania over the course of the past two hundred years. The most destructive dam failure in United States history took place in Johnstown, Pennsylvania (Cambria County) in 1889, claiming 2,209 lives. Another significant dam failure took place in Austin, Pennsylvania (Potter County) in 1911, claiming seventy-eight lives. Similarly, a dam failure in West Taylor Township, Pennsylvania (Cambria County) claimed the lives of forty people when the Laurel Run Dam, No. 2 failed during the Johnstown Flood in the early morning hours of July 20th, 1977.

Levees

The National Levee Database (NLD) lists no occurrence of levee failures or major incidents occurring in Mercer County.

Some of the worst levee failures in the history of the United States have occurred in the American South, along parts of the Mississippi River delta. Levee failures in New Orleans, Louisiana during Hurricane Katrina from August 23 to August 31, 2005 resulted in an enormous amount of property damage and loss of lives. There were approximately fifty-three levee failures in constructed levees around the City of New Orleans. Hurricane Katrina precipitated the creation of more strict levee requirements for inspection and construction on the local, state, and federal level.

4.3.14.4 Future Occurrence

Dams

Although dam failures can occur at any time, given the right circumstances, the likelihood of a dam failure in Mercer County is considered to be unlikely.

The presence of structural integrity and inspection programs significantly reduces the potential for major dam failure events to occur. The PA DEP inventories and regulates all the dams that meet or exceed the following criteria (PA, DEP, 2008):

- Impound water from a drainage area of greater than 100 acres
- Have a maximum water depth greater than 15 feet
- Have a maximum storage capacity of 50 acre-feet or greater

The construction, operation, maintenance, and abandonment of dams is reviewed and monitored by the PA DEP Division of Dam Safety. Dams are evaluated based on those categories such as slope stability, undermining seepage, and spillway adequacy. With more strict construction and design procedures in place, the future occurrence of a dam failure is increasingly small. The new procedures and rules protect public safety and both public and private property. Newly constructed dams are thoroughly examined by professional engineers to prevent future dam failure events.

Levees

Although levee failures can occur at any time, given the right circumstances, the future occurrence of levee failures in Mercer County can be considered unlikely. Most levees are designed to meet a specified level of flooding. While FEMA focuses on mapping levees that will reduce the risk of a 1% annual chance flood, other levees may be designed to protect against both smaller and larger floods.

4.3.14.5 Vulnerability Assessment

Dams

Property and populations located downstream from any dams are vulnerable to dam failures. The Pennsylvania Code (§105.91 Classification of dams and reservoirs) classifies doth dams by size

and the amount of loss of life and economic loss expected in a failure event. *Table 62 – Dam Classification* displays the dam classification guide for the Commonwealth of Pennsylvania. Although the size of a dam may result in varying impacts, the hazard potential classification of category one dams is a more important indicator, since that will indicate the level of potential substantial loss of life and excessive economic loss.

Table 62 - Dam Classification

Dam Classification (PA Code 1980)		
Dam Size Classification		
Class	**Impoundment Storage (Acre-Feet)**	**Dam Height (Feet)**
A	Equal to or greater than 50,000	Equal to or greater than 100
B	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
C	Equal to or less than 1,000	Equal to or less than 40
Dam Damage Classification		
Category	**Loss of Life**	**Economic Loss**
1	Substantial	Excessive
2	Few	Appreciable
3	None Expected	Minimal

Dam failures can cause significant environmental effects, as the resulting flood from a dam failure is likely to disperse debris and hazardous materials downstream that can damage local ecosystems. Debris carried downstream can block roads, cause traffic accidents, disrupt traffic patterns, and delay the delivery of essential services along major traffic corridors. Debris flow can also cause landslides along steep slopes and embankments with low slope stability. The economic and financial impact from damage and recovery ranges from minimal to severe, depending on the magnitude of damage and scale of failure event.

Emergency action plans are developed by the owners of high-hazard dams. These plans are then disseminated to first responders and other planning partners within the county. Vulnerable populations are those residents and businesses located downstream from a high-hazard dam within the inundation area. The emergency action plan identifies a call list to notify downstream at-risk populations. Emergency action plan exercises are held every five to seven years depending on local policy.

The characteristics of the eleven high-hazard dams in Mercer County vary greatly. Of the eleven high-hazard dams, the Shenango Dam has the largest drainage area with a total drainage area of 589 acres. The dams that were constructed most recently include the Cresswell Lower and the Cresswell Upper Dams, which were both constructed in 2002. The oldest dam construction in the county is the Barmore Lake Dam, which was constructed in 1903. The largest owner of dams in Mercer County is the Mercer County Conservation District which owns and operates the Clark Mills Dam, the Crooked Creek Dam, the Hadley Dam, the Mathay Dam, the Pine Run Dam, the Salt Run Dam, and the Stoneboro Dam. The county owned dams are distributed evenly throughout the county and are all high-hazard dams.

The failure or partial failure of a High-Hazard Potential Dam can have impacts that affect many different jurisdictions across Mercer County and counties adjacent to Mercer County. A failure at any of the dams in Mercer County would result in some inundation in at least those municipalities adjacent to the dam in question. A more comprehensive examination of risk inundation areas from High-Hazard Potential Dams can be conducted in future iterations of the Mercer County Hazard Mitigation Plan. This dataset was not readily accessible at the time of this writing. However, each of this municipalities that could be affected by the failure of a High-Hazard Potential Dam could result in the inundation of police stations and fire departments, critical infrastructure facilities, and community lifeline locations like medical facilities, power and energy facilities, and schools, nursing homes, and senior care and long term care facilities.

Mercer County is at risk when high-hazard potential dams are considered. There are three types of risk related to high-hazard potential dams and they are listed below:

Table 63 - High-Hazard Potential Dams Risk Type

High-Hazard Potential Dams Risk Types	
Type of Risk	**Description**
Incremental Risk	The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or misoperation, where the consequences considered are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.
Non-Breach Risk	The risk in the reservoir pool area and affected downstream floodplain due to 'normal' dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios.

High-Hazard Potential Dams Risk Types	
Type of Risk	**Description**
Residual Risk	The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as "risk remaining at any time" (FEMA, 2015, p A-2). It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.
Source: "Rehabilitation of High Hazard Potential Dams Grant Program Guidance," June 2020	

At this time, insufficient information is available to conduct a substantive analysis of incremental, non-breach and residual risk relative to Mercer County's high hazard potential dams. However, it is acknowledged that incremental risk is "the risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or misoperation, where the consequences considered are over and above those that would occur without dam breach;" non-breach risk is "the risk in the reservoir pool area and affected downstream floodplain due to 'normal' dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios;" and residual risk) is "the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue" (FEMA, 2020 Rehabilitation of High Hazard Potential Dams Grant Program Guidance)

The risk of high-hazard potential dams in Mercer County is present but at the time of this writing, there is insufficient data to identify in exact detail the vulnerable populations and assets in inundation areas for the high-hazard potential dams. The areas downstream from the high-hazard potential dams are more vulnerable to inundation than areas that are upstream from said dams. There are current datasets to address high-hazard potential dam impacts in greater detail, but these datasets are still in development from the Pennsylvania Department of Environmental Protection, Pennsylvania Emergency Management Agency, the United States Army Corp of Engineers, and the Federal Emergency Management Agency. Once these datasets have been published and inundation data is easier to acquire, this information will be used to develop more details risk assessment and vulnerability assessments for dam failure at the high-hazard potential dams.

Levees

Each levee that is located in Mercer County is of different length and each protects areas from a different section of waterway and flood way. Otter Run Levee is the largest in Mercer County with a length of .13 miles. The Pine Run Levee is the smallest in length in Mercer County with a length of .12 miles. Both levee systems are close in length.

The entire leveed areas for Mercer County protect a total of forty structures within the county. There are no community lifeline facilities that are protected by levee areas in Mercer County. Community lifeline facilities are defined as municipal buildings, hospitals, police/fire/EMS locations, schools, childcare centers, and nursing homes /long term care facilities. Each levee in Mercer County is a mainline levee and protects along a variety land features. A failure of levee in the urban areas in Mercer County would be catastrophic to life and property.

There are a large number of community lifeline facilities within the levee protection areas for the levees around Mercer County. *Table 64 – Number of Vulnerable Structures within Leveed Areas* shows the number of addressable structures and facility type points in the largest levee protection areas within Mercer County based on NLD information from 2022. The features included in the table are particularly vulnerable to levee failure because they are protected by the system. Should the levee systems fail, the structures would be at an increased risk by their flood sources.

Table 64 - Number of Vulnerable Structures within Leveed Areas

Number of Vulnerable Structures within Leveed Areas		
Leveed Area Name	**Addressable Structures in Leveed Area**	**Facility Type Points in Leveed Area**
Pine Run	38	0
Otter Run	2	0
Totals:	**40**	**0**

Figure 36 - Mercer County Dams

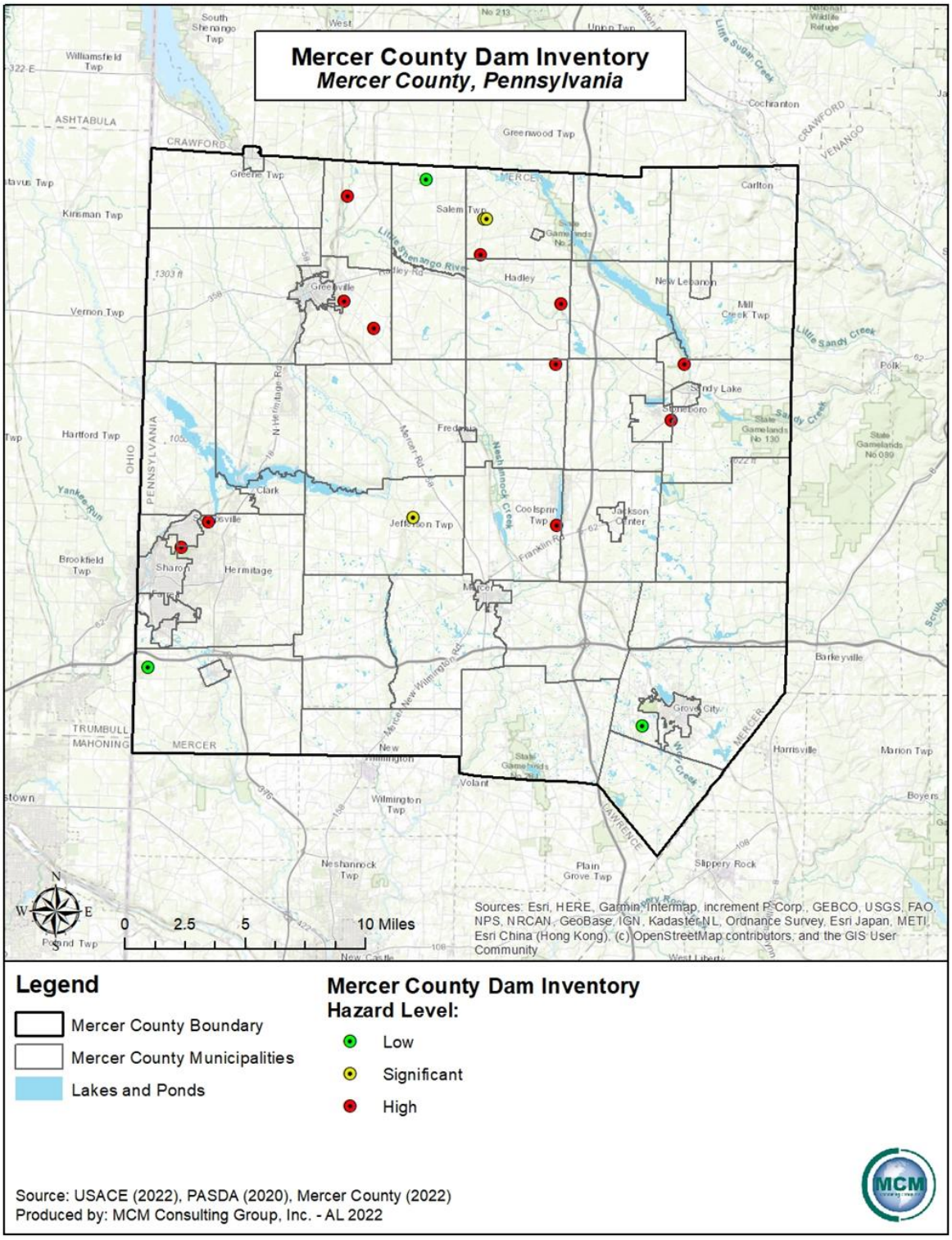


Figure 37 - Mercer County Levee Locations

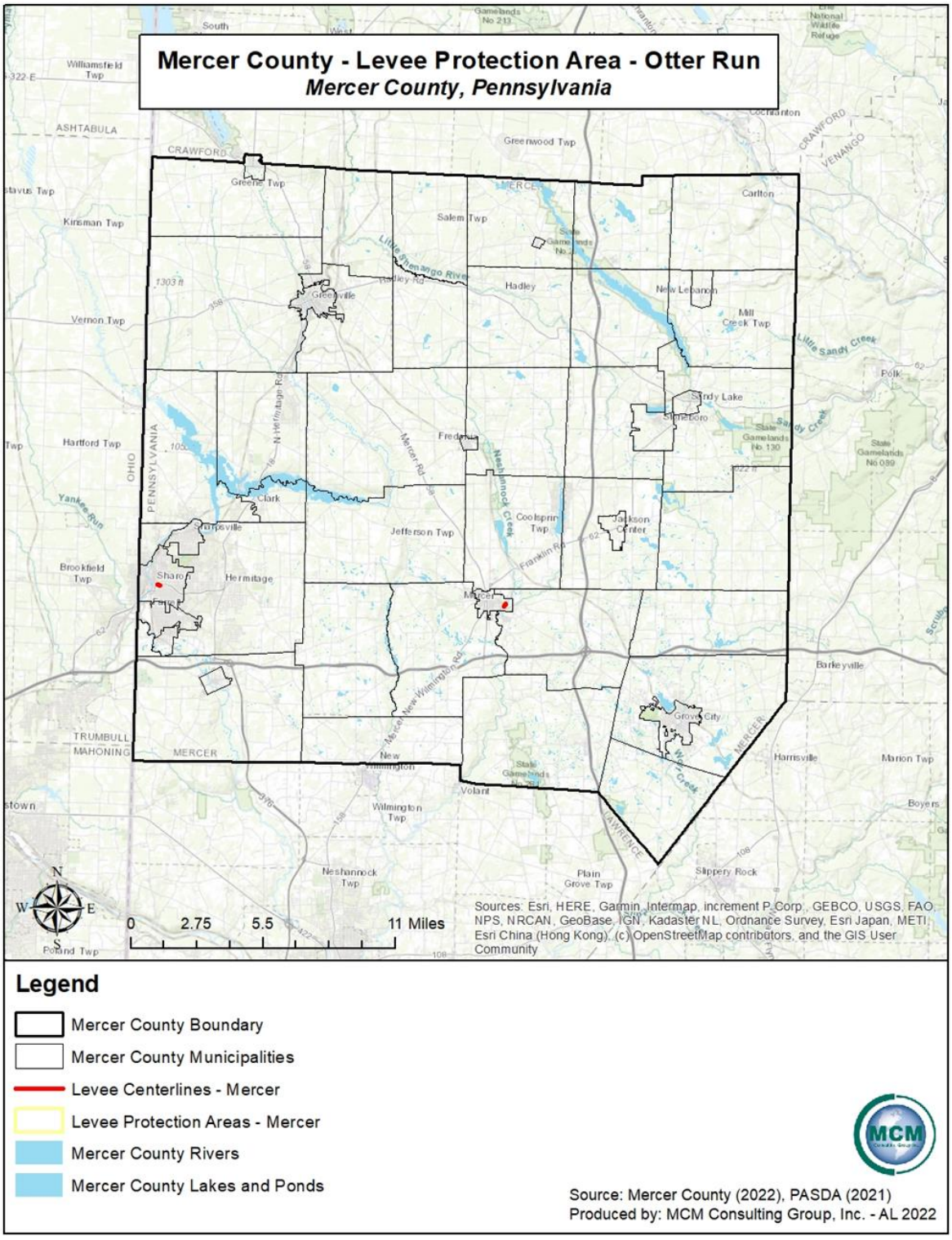


Figure 38 - Levee Locations – Hermitage

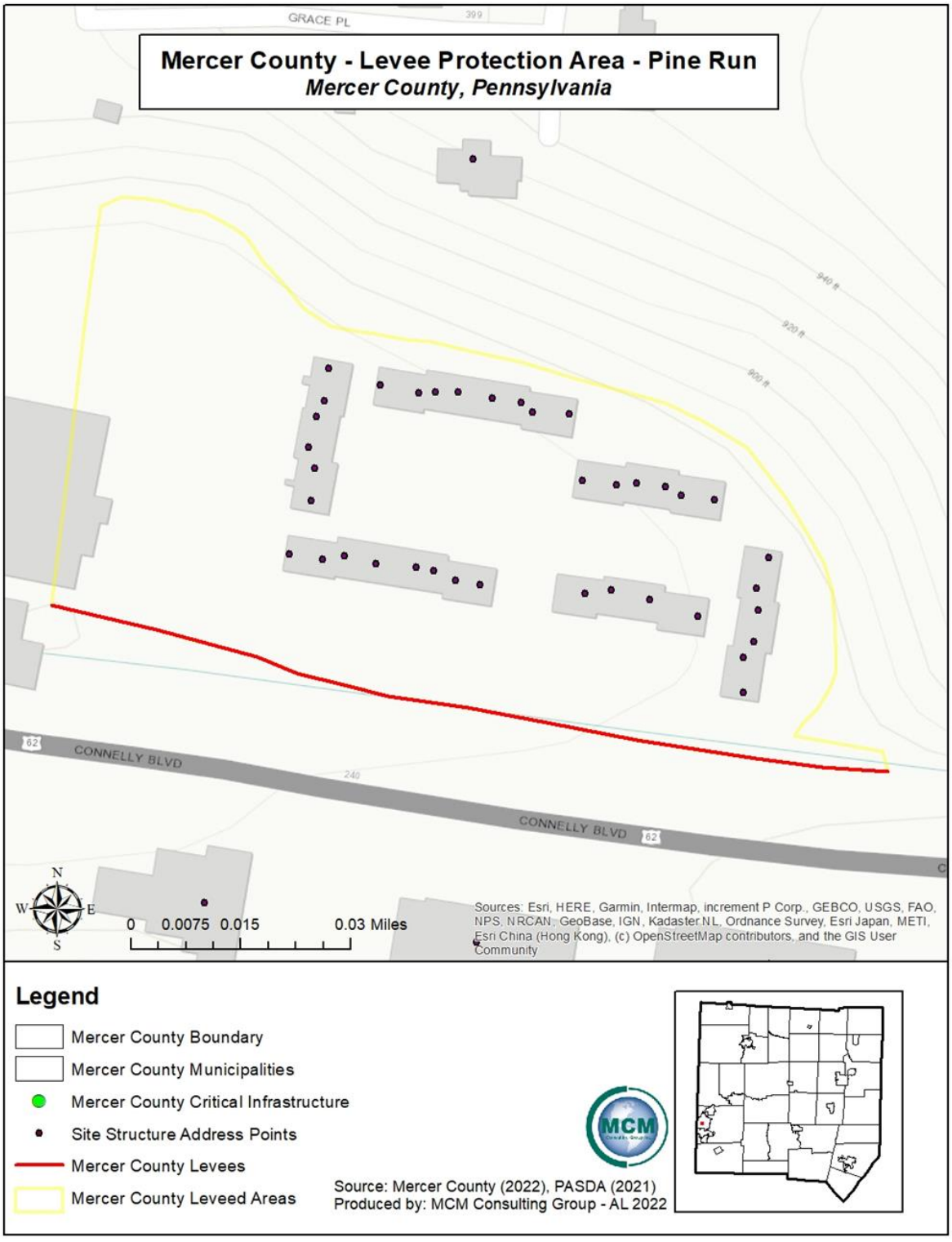
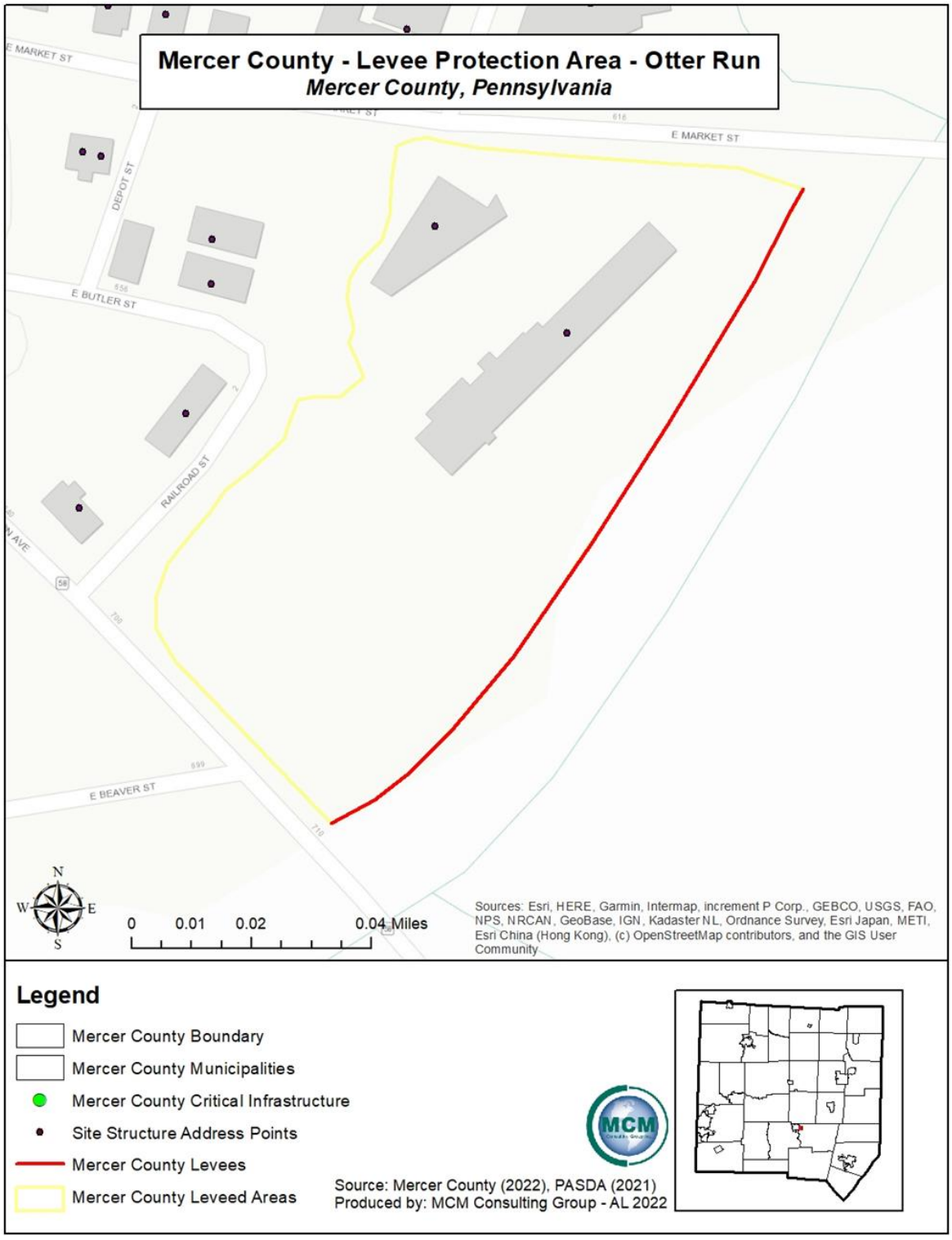


Figure 39 - Levee Locations - Mercer



4.3.15. Emergency Services

4.3.15.1 Location and Extent

Fire, emergency medical services (EMS), local emergency management coordinators (LEMC), and law enforcement service agencies are defined per municipality in Mercer County. In addition to the local services, the county hosts numerous special teams. Regional and state-wide services are also available.

With the exception of law enforcement, most areas are served by volunteers instead of career personnel, which increases response time due to volunteer availability. Volunteers provide emergency services above separately from their regular careers. Often agencies struggle with the availability of skilled personnel and resources at certain times of the day. The number of responders in general has decreased, in part due to issues including funding and retention of personnel.

Additionally, the time and expense obligations of required training are a factor in the decrease in number of responders. The initial training time for fire, EMS, and law enforcement can take several months to complete. Emergency medical services, requires a regular schedule of continued education to maintain certification. In the fire service, after the initial training, there are specialty courses offered, which are recommended, but not required. For law enforcement, skills such as firearms proficiency must be maintained, and updates to new laws and regulations continues throughout the officer's career.

4.3.15.2 Range of Magnitude

Finances, changing political climates, leadership, or a significant high-profile event can trigger a system to be declared as "success" or "failure". In some cases, a combination of these factors can create a perfect storm. Unfortunately, many "failed" systems are measured by recent events, no matter how successful they may have been in the past. Although financial problems are often blamed on poor leadership, they may have many root causes. Labor rates, benefits, poor productivity, operational design, insurance reimbursements, and market regulation all have a significant direct impact on the financial viability of an organization.

Two fundamental, yet misunderstood, topics are the financial and economic variables that drive emergency service systems. These systems typically generate revenue through tax subsidies, memberships, direct sales, diversification into other lines of business, grants, or fundraising. They spend most of these revenues on direct and indirect labor, and benefits. The remaining dollars go into infrastructure, fuel, medical supplies, insurances, fleet maintenance, dispatch, and other essential items, with hopefully, some left over for recapitalization or fund balance development. The range of the issues related to emergency service shortages are felt across the entire United States of America and the Commonwealth of Pennsylvania. Mercer County has felt

emergency shortages and these shortages have had adverse effects on emergency response in the county.

4.3.15.3 Past Occurrence

There have been no official records kept on shortages to emergency services. However, there has been a decrease in the number of new volunteers in the fire service for several years. Most agencies are private organizations that lack local funding and exist based on tax dollars, fund raising, and donations received from their community. The need for fund raising adds to availability issues of volunteers. Most services past practices are not sustaining the current needs for funding and manpower. Without financial support from the communities, services may not be able to remain in operation to serve those same communities. Recruitment and personnel retention are a key to success.

Mercer County has had multiple events that were caused by emergency service shortages, most significantly from 2020 to 2022, exacerbated by the COVID-19 pandemic. Mercer County has a limited number of ambulance services and these services each cover the entirety of Mercer County. Some of the ambulance services also only have one ambulance available for transportation on any given day. This can result in increased response times if certain ambulance companies are committed to a response call, and another emergency occurs in that area. However, this shortage has not been caused exclusively by the COVID-19 pandemic and was occurring before the pandemic across Mercer County and the Commonwealth of Pennsylvania.

4.3.15.4 Future Occurrence

Historically, it has been difficult for small communities to have a paid fire or EMS service, therefore requiring volunteers. Fewer volunteers to perform the tasks associated with fire, medical, and rescue operations, can negatively affect a service's ability to respond to emergencies. Additionally, operational needs are impacted if there are fewer volunteers to raise funds. Without fundraising and community support these fire departments and volunteer EMS agencies will experience broader challenges. Municipalities can help offset some of the financial burdens to their local fire company with a fire tax.

There are also challenges for individuals who volunteer, including dedicating time beyond their current employment, family, and community commitments to dedicate to training, responding, and fundraising. Training is essential to provide for the general knowledge and safety of volunteers. Becoming certified as a volunteer firefighter requires hundreds of hours of training. With a decrease in the numbers of new volunteers, many current volunteers are aging and unable to perform at the same levels they once were.

Fire departments and EMS agencies, often are tasked with responding to a variety of emergencies, including not only fire and medical emergencies, but also incidents requiring

rescue, containment of hazardous materials, or assistance to law enforcement. Volunteers need to be well trained and able to respond to different scenarios as needed.

The future occurrence of emergency service shortages is likely to continue in Mercer County and across the Commonwealth of Pennsylvania. With a lack of new recruits and officers for emergency services, response will continue to be hindered and response times will continue to be high. Institutional change is the most efficient way to decrease the likelihood of emergency service shortages in Mercer County, but that type of change is slow and often long-term.

4.3.15.5 Vulnerability Assessment

The possibility that EMS agencies and fire services could fail creates a vulnerability to all Mercer County communities. Occasionally, residents of communities mistakenly think that their local fire department is a paid service. Most municipal fire departments are volunteer agencies and need the support of their communities to maintain their departments.

Personnel shortages have been occurring in law enforcements for several reasons. More students are pursuing other professional careers instead of becoming public safety professionals than previously. This trend could be an effect of the recent changes in the social climate toward law enforcement, the increased number of college students pursuing graduate school degrees, or many other factors. As with any profession, becoming a law enforcement officer requires a commitment of time and money for training at local, state, or federal levels. The selection of law enforcement officers includes not only physical and mental aptitudes, but also a comprehensive physiological screening.

If any current public service agency fails to provide enough personnel to perform their required duties, then those duties must be provided for by another service agency that may be many miles away, creating an increased response time. An increased response time could lead to additional or greater severity in injury or property damage. Many communities in Pennsylvania have already experienced the closure of emergency response agencies.

It is recommended that each municipality assess their own vulnerabilities by maintaining and building relationships with their local providers and working with them to make to plan accordingly for if a local service were to close its operations. Consolidation of services is a possible solution for agencies that are struggling to maintain operations. Statistics, response times, and all times associated with units dispatched are easily obtainable from the county 911 center. Municipalities should research all of the factors which would be part of a consolidation of emergency services with neighboring communities.

The emergency services departments in Mercer County need to be supported to create and or discover new ways to not only recruit but to retain volunteers. If left unattended, the issue will continue and the lack of response will grow, leaving communities more vulnerable to loss of life and loss of property. Community education is a key factor in the maintenance of emergency

response agencies. In addition, continued support, and efforts to inform legislature could all prove to be important in assuring that these services remain in operation into the future. At the time of the writing of this plan, a number of bills has been introduced in both the House of Representative and the Senate as a result of a two-year study initiated by Senate Resolution 6 (SR6). The final report can be found here: http://pehsc.org/wp-content/uploads/2014/05/SR-6-REPORT-FINAL.pdf.

Emergency response agencies that currently provide services within Mercer County are identified in the following tables, *Table 65 – Mercer County Fire Departments* identifies the municipalities served. Of the twenty-five fire departments in Mercer County, three fire departments are paid departments, one department is a combination of paid and volunteer, and twenty-one departments are fully volunteer. *Table 66 – Mercer County EMS Agencies* identifies each emergency medical service agency and the municipalities served. *Table 67 – Mercer County Law Enforcement Agencies* identifies each police department to include the Pennsylvania State Police (PSP) and the municipalities served. This information was provided by the Mercer County Department of Public Safety.

Table 65 - Mercer County Fire Departments

Mercer County Fire Departments	
Station name	Municipalities covered
Station 72 – Wheatland	Wheatland Borough
Station 73 – West Salem	West Salem Township
Station 74 – West Middlesex	West Middlesex Borough, portion of Lackawannock Township
Station 75 – Transfer	Pymatuning Township, portion of Delaware Township
Station 76 – Stoneboro	Stoneboro Borough, Lake Township
Station 77 – Springfield	Springfield Township
Station 78 – South Pymatuning	South Pymatuning
Station 79 – Shenango	Shenango Township
Station 81 – Sheakleyville	Sheakleyville Borough, Perry Township, Deer Creek Township, Sandy Creek Township, Salem Township, Otter Creek Township, New Vernon Township
Station 82 – Sharpsville	Sharpsville Borough
Station 83 – Sharon	City of Sharon
Station 84 – Sandy Lake	Sandy Lake Borough, Sandy Lake Township, Mill Creek Township, New Lebanon Borough
Station 85 – Pine	Pine Township, portion of Liberty Township, portion of Wolf Creek Township
Station 86 – Patagonia	Patagonia section of City of Hermitage

Mercer County Fire Departments	
Station name	Municipalities covered
Station 87 – East End (Mercer Borough)	Mercer Borough, Coolspring Township, Findley Township, portion of East Lackawannock Township
Station 88 – Jefferson	Jefferson Township
Station 89 – Jamestown	Jamestown Borough, Greene Township, Shenango Township
Station 92 – Jackson Center	Jackson Center Borough, Jackson Township, Worth Township
Station 93 – Hermitage	City of Hermitage, Sugar Grove Township
Station 94 – Hempfield	Hempfield Township, Sugar Grove Township
Station 95 – Grove City	Grove City Borough
Station 96 – Greenville	Greenville Borough
Station 97 – Fredonia	Fredonia Borough, portion of Delaware Township, portion of Fairview Township
Station 98 – Farrell	City of Farrell
Station 99 – Clark	Clark Borough

Table 66 - Mercer County EMS Agencies

Mercer County EMS Agencies	
Agency name	Coverage
Elite EMS	Northern Portion of Mercer County
Life Force of Western PA, Inc.	Northern Portion of Mercer County (Now a part of EmergyCare)
McGonigle Ambulance Service	Middle Portion of Mercer County including cities and Sharpsville Borough
Shenango Fire Department	Shenango Township
Superior Ambulance Service	Eastern Side of Mercer County including Jackson Center Borough and Grove City Borough

Table 67 - Mercer County Law Enforcement Agencies

Mercer County Police Departments	
Station name	Coverage
Station 100 – Sharon	City of Sharon
Station 200 – Farrell	City of Farrell
Station 300 – Hermitage	City of Hermitage, Clark Borough, Wheatland Borough
Station 400 – Sharpsville	Sharpsville Borough

Mercer County Police Departments	
Station name	Coverage
Station 500 – Greenville	Grenville Borough, West Salem Township
Station 600 – Shenango	Shenango Township, West Middlesex Borough
Station 700 – Pymatuning	Pymatuning Township
Station 800 – Mercer	Mercer Borough
Station 900 – Grove City	Grove City Borough
Station 1100 – Hempfield	Hempfield Township, Sugar Grove Township
Station 1300 – Jamestown	Jamestown Borough
Station 1400 – Jefferson	Jefferson Township
Station 1500 – Sandy Lake	Sandy Lake Borough
Station 1600 – South Pymatuning	South Pymatuning Township
Station 1700 – Stoneboro	Stoneboro Borough
Station 2200 – Penn State	Penn State Shenango Campus
Station 2500 – Thiel	Thiel College Campus
Station 3100 – UPMC Shenango	UPMC Shenango
Station 3200 – UPMC Greenville	UPMC Greenville

4.3.16. Environmental Hazards/Hazardous Materials

4.3.16.1 Location and Extent

Transportation

Environmental hazards are most commonly due to hazardous materials incidents occurring when such materials are manufactured, used, stored, or transported. Most hazardous materials incidents are unintentional, however hazardous materials could also be released in a criminal or terrorist act. A release, whether it is intentional or accidental, can result in injury or death and may contaminate air, water and/or soils. Hazardous materials incidents can be generally broken down into the subcategories of transportation and fixed facility. This section will focus on environmental hazards and how they relate to transportation of hazardous materials.

Tanker trucks, tractor trailers, and rail cars often are used to transport hazardous materials. When there are transportation incidents involving these types of vehicles, hazardous materials can be released in significant quantities. *Figure 42 – Environmental Hazard Transportation Vulnerability* shows major transportation routes through Mercer County, including Interstate 80, Interstate 79, Interstate 376, United States Route 18, United States Route 19, and United States Route 62.

Fixed Facility

Hazardous materials incidents can be broken down into the subcategories of transportation and fixed facility. This section of the report focuses on environmental hazardous materials at fixed facilities.

In Pennsylvania, facilities that use, manufacture, or store hazardous materials must comply with Title III of the federal Superfund Amendments and Reauthorization Act (SARA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. There are thirty-eight SARA Title III facilities in Mercer County. These facilities listed as SARA sites should not be considered an exhaustive and comprehensive list of all locations where hazardous materials reside in the county. *Figure 41 – Hazardous Waste Locations* identifies SARA Title III facilities as well as several other locations that consume, store, or release potentially hazardous materials and wastes.

Fixed facilities are also monitored by the Environmental Protection Agency (EPA). The EPA has identified hazardous materials sites, not regulated by SARA Title III, and are known as Toxic Releases Inventory (TRI) sites. Facilities which employ ten or more full time employees, and which manufacture or process more than 25,000 pounds (or use more than 10,000 pounds) of any SARA Section 313-listed toxic chemical in the course of a calendar year are required to report TRI information to the EPA. The EPA is the federal enforcement agency responsible for SARA

Title III and PEMA classifications. As of 2022, there are twenty-eight TRI facilities in Mercer County, all located around urban areas, boroughs, and highly populated municipalities.

Oil and gas extraction facilities can also be sources of hazardous material release. Most wells in the county are active, but there are also many inactive and abandoned wells. *Figure 40 – Oil & Gas Well Locations* shows the location of all oil and gas wells in the county along with their proximity to surface waters.

4.3.16.2 Range of Magnitude

Transportation

While often accidental, releases can occur because of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, environmental hazards are known as secondary events. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, or hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

Hazardous material release can contaminate air, water, and soil, and can possibly cause injuries, poisonings, or deaths. Hazardous materials fall into nine hazards classes. These hazard classes are as follows:

- Class #1: Explosives
- Class #2: Gases (flammable, non-flammable, non-toxic, and toxic)
- Class #3: Flammable and Combustible Liquids
- Class #4: Flammable Solids (spontaneously combustible and dangerous when wet materials/water reactive substances)
- Class #5: Oxidizing substances and organic peroxides
- Class #6: Toxic Substances and Infectious Substances
- Class #7: Radioactive Materials
- Class #8: Corrosive Substances
- Class #9: Miscellaneous Hazardous Materials / Substances

All nine hazard classes can be found in transportation incidences.

Fixed Facility

All nine hazard classes can be found at fixed facilities. Certain conditions can exacerbate release incidents and these events include fixed facilities:

- Micrometeorological effects of buildings and terrain which alters the dispersion of hazardous materials.
- Proximity to surface water and ground water resources.

- Compliance with applicable codes (e.g., building or fire codes) and maintenance failures (e.g., fire protection and containment features can substantially increase the damage to the facility itself and to surrounding buildings.

The type of material released, distance, and related response time of emergency responders also significantly impact severity and scope of hazardous material releases and clean-up efforts. Areas most proximal to the release are usually at the greatest level of risk, but depending on the material, a release can travel great distances or remain present in the environment for long periods of time (centuries or millennia for some radioactive materials) resulting in chronic and extensive impacts on people and the environment.

Oil and gas well drilling can have a variety of effects on the environment. Abandoned oil and gas wells, not properly plugged can contaminate groundwater and consequently drinking water wells. Surface waters and soil are sometimes polluted by brine, a salty wastewater product of oil and gas well drilling, and from oil spills occurring at the drilling site or from a pipeline breach. A pipeline breach or an accidental dispersal can spoil public drinking water supplies and can be particularly detrimental to vegetation and aquatic animals, making water safety an important factor in oil and gas extraction. In some cases, associated with hydraulic fracturing (fracking), methane has been found contaminating drinking water in surrounding areas.

Natural gas fires occur when natural gas is ignited at the well site. Often, these fires erupt during drilling when a spark from machinery or equipment ignites the gas. The initial explosion and resulting flames have the potential to seriously injure or kill individuals in the immediate area. These fires are often difficult to extinguish due to the intensity of the flame and the abundant fuel source.

4.3.16.3 Past Occurrence

Transportation

In the past, deaths have resulted from transportation accidents in and around the major highways of Mercer County. More recent events are recorded in the county reporting software and are summarized in *Table 68 – Hazardous Material Incidents*. Transportation accidents that involved hazardous materials were included in the table below.

Table 68 - Hazardous Material Incidents

Hazardous Material Incidents			
Primary Location	**Date**	**Event**	**Information**
Mercer County	12/06/2018	Natural Gas Release	Gas Well Leak
Mercer County	01/16/2019	Flammable liquid & solids	Fuel Spill
Mercer County	02/02/2019	Chemical Spill	NRC#1236958

Hazardous Material Incidents			
Primary Location	**Date**	**Event**	**Information**
Mercer County	04/15/2019	Flammable liquid & solids	Motor Oil Spill
Mercer County	04/26/2019	Bio-Hazardous Waste	Wastewater Plant Overflow
Mercer County	06/11/2019	Flammable liquid & solids	Diesel Leak
Mercer County	06/13/2019	Bio-Hazardous Waste	Sewage Leak
Mercer County	06/14/2019	Chemical Release	NRC#1248880
Mercer County	07/24/2019	Flammable liquid & solids	Diesel Fuel Spill
Mercer County	09/11/2019	Chemical Release	NRC#1257871
Mercer County	09/11/2019	Flammable liquid & solids	NRC#1257884
Mercer County	10/31/2019	Chemical Spill	Fuel Spill
Mercer County	11/09/2019	Flammable liquid & solids	Fuel Leak
Mercer County	05/19/2020	Natural Gas Leak	NRC#1277677
Mercer County	07/17/2020	Chemical Release	Creek Contamination
Mercer County	10/04/2020	Pipeline Break	Natural Gas Leak
Mercer County	11/02/2020	Flammable liquid & solids	Fuel Leak
Mercer County	11/03/2020	Natural Gas Release	Gas Leak in Apartment
Mercer County	05/29/2021	Chemical Release	NRC#1306384
Mercer County	06/21/2021	Chemical Spill	HazMat
Mercer County	07/11/2021	Chemical Spill	Transformer Leak
Mercer County	07/30/2021	Chemical Spill	Tractor Trailer Rollover
Mercer County	08/25/2021	Chemical Release	NRC#1314719
Mercer County	09/27/2021	Flammable liquid & solids	Diesel Spill
Mercer County	10/29/2021	Chemical Release	NRC#1320736
Mercer County	11/06/2021	Chemical Release	NRC#1321322
Mercer County	11/11/2021	Flammable liquid & solids	NRC#1321751
Mercer County	12/08/2021	Chemical Release	Milk Truck Accident
Mercer County	02/11/2022	Chemical Release	NRC#1328683
Mercer County	02/13/2022	Natural Gas Release	NRC#1328898
Mercer County	03/25/2022	Chemical Release	NRC#1331947
Mercer County	03/27/2022	Chemical Release	NRC#1222060
Mercer County	04/03/2022	Chemical Release	Fuel Spill
Mercer County	05/06/2022	Chemical Release	HazMat Spill
Mercer County	07/05/2022	Chemical Release	NRC#1340643
Mercer County	07/08/2022	Flammable liquid & solids	Fuel Spill
Mercer County	08/06/2022	Flammable liquid & solids	Fuel Spill
Mercer County	08/17/2022	Flammable liquid & solids	Gasoline Spill
Mercer County	08/29/2022	Pipeline Break	Gas Well Leak
Mercer County	10/05/2022	Flammable liquid & solids	Vehicle Fire
Source: County Reporting System, 2022			

Hazardous materials can be transported by air, sea, and land (over the road or through pipelines). Transportation accidents along roadways is a regular occurrence and a large number of hazardous materials are transported by roadway every day.

A past event for an environmental hazard incident involving transportation of hazardous materials that resulted in a large impact was a train derailment of a Norfolk Southern train transporting hazardous materials near East Palestine, Ohio, located in Columbiana County, Ohio on February 3rd, 2023. The train was carrying volatile organic compounds (VOCs) including vinyl chloride and butyl acrylate. Roads and areas around East Palestine were closed, and roads into Pennsylvania were closed for travel. As a result of the derailment, state officials and emergency crews conducted a control burn of the chemicals to release the chemicals, so they did not explode and cause more damage.

This burn resulted in the evacuation of Ohio and Pennsylvania citizens within a 1-by-2 mile area of the site. The derailment resulted in a release of chemicals into the soil and Norfolk Southern began clean-up efforts. The chemical spill has killed an estimate of 3.500 small fish and aquatic animals near the accident location and has raised concerns about exposure to the chemicals involved. Ohio officials continue to work with the Environmental Protection Agency (EPA), the Federal Emergency Management Agency (FEMA) and Norfolk Southern for continued cleanup, remediation, and analysis at the time of this writing. East Palestine is approximately 26 miles from the southwestern tip of Mercer County.

Fixed Facility

There have been a number of hazardous material incidents in Mercer County in the past but few of those events have been related to fixed facilities in the county. More recent events are recorded in county reporting software and are summarized in *Table 68 – Hazardous Material Incidents*.

The EPA tracks the management of hazardous materials in facilities that handle significant amounts of hazardous materials. The twenty-eight TRI facilities in Mercer County as of 2022 are summarized in *Table 69 – TRI Facilities*. Production-related waste managed is a collective term to refer to how much of a chemical is recycled, combusted for energy recovery, treated for destruction, or disposed of, or otherwise released on and off site.

Table 69 - TRI Facilities

Toxic Release Inventory Facilities				
Name	**Address**	**Industry Sector**	**Chemical**	**Production-related Waste Managed (lbs)**
AMER IND	1 American Way	Transportation Equipment	Lead	206.91
ANCHOR AN OLDCASTLE CO	97 Main Street	Nonmetallic Mineral Product	Lead compounds	0.1
CCL CONTAINER AEROSOL DIV	1 Llodio Road	Fabricated Metals	Naphthalene	18841
CHAMPION CARRIER CORP.	2755 Kirila Road	Transportation Equipment	Manganese	23489.3
COMBINED SYSTEMS INC	388 Kinsman Road	Fabricated Metals	Lead and Lead Compounds	3.4
COMPONENT INTERTECHNOLOGIES INC	2426 Perry Highway	Computers and Electronic Products	Copper	0
CRONIMET SPECIALTY METALS USA INC	209 Reynolds Industrial Park Drive	Other	Nickel	5
DBA RSI METAL LITHO GREENVILLE	242 Reynolds Industrial Park Drive	Fabricated Metals	1,2,4-Trimethylbenzene	3379
DFA DAIRY BRANDS FLUID LLC DBA DEAN DAIRY	1858 Oneida Lane	Food	Nitric acid	15593
ELLWOOD CRANKSHAFT & MACHINE	2727 Freedland Road	Fabricated Metals	Nickel	28864
ELLWOOD CRANKSHAFT GROUP SHARON FORGE	1161 N Sharpsville Avenue	Fabricated Metals	Nickel	21788.1
GE TRANSPORTATION GROVE CITY UX PLANT	660 BARKEYVILLE RD	Machinery	Nickel	290041
GREENVILLE METALS INC	850 Crestview Drive	Primary Metals	Lead compounds	627.8
HODGE FOUNDRY INC.	42 Leech Road	Primary Metals	Manganese	5343.19
INTERSTATE CHEMICAL CO INC	2797 Freedland Road	Chemical Wholesalers	Certain glycol ethers	36.81
JAMESTOWN COATING TECHNOLOGIES	108 Main Street	Chemicals	Certain glycol ethers	8618
JONES PERFORMANCE PRODUCTS INC.	1 Jones Way	Transportation Equipment	Styrene	37025
MERCER PLANT	1210 Perry Highway	Petroleum	Polycyclic aromatic compounds	0.0034

Toxic Release Inventory Facilities				
Name	**Address**	**Industry Sector**	**Chemical**	**Production-related Waste Managed (lbs)**
NLMK PENNSYLVANIA LLC	15 Roemer Boulevard	Primary Metals	Mercury and Mercury Compounds	12.45
PENNEX ALUMINUM CO LLC	93 Werner Road Building A	Primary Metals	Copper and Copper Compounds	835.65
PINE INSTRUMENT CO	101 Industrial Drive	Electrical Equipment	Lead	0.49
SALEM TUBE INC.	951 Fourth Street	Primary Metals	Trichloroethylene	34775118.6
SHARON COATING LLC	277 Sharpsville Avenue	Fabricated Metals	Zinc compounds	2102491
SSAB WEAR SOLUTIONS ASTRALLOY	251 Wheeler Pl.	Fabricated Metals	Lead	56
WABTEC US RAIL INC	1503 W Main Street Ext.	Machinery	Manganese	8627
WOLF CREEK MACHINE	180 Lincoln Avenue	Fabricated Metals	Chromium and Chromium Compounds (except for chromite ore mined in the Transvaal Region)	52922
ZEKELMAN INDUSTRIES CO DBA WHEATLAND TUBE CO-COUNCIL	1 Council Avenue	Primary Metals	Manganese And Manganese Compounds	15414.2
ZEKELMAN INDUSTRIES SHARON TUBE DIVISION-CHURCH ST	20 Church Street	Primary Metals	Zinc compounds	90387
Source: EPA, 2022				

As of 2022, Mercer County is home to 1,669 active natural gas wells.

4.3.16.4 Future Occurrence

Transportation

While many incidents involving hazardous material releases have occurred in Mercer County in the past, they are generally difficult to predict. The nature of traffic accidents is that there is little

to no warning for their occurrence, and they can have disastrous results. An occurrence is largely dependent upon the accidental or intentional actions of a person or group.

Fixed Facility

Hazardous material release incidents are generally difficult to predict, but the presence of such dangerous materials warrants preparation for accidental or intentional release events. Emergency response agencies in Mercer County should be prepared to handle the types of hazardous materials housed and used the SARA Title III facilities, TRI facilities, and oil and gas wells that are located within the county. The Federal Superfund Amendments and Reauthorization Act (SARA) is also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the Local Emergency Planning Committees (LEPCs) are designed by EPCRA to ensure that state and local communities are prepared to respond to potential chemical accidents.

4.3.16.5 Vulnerability Assessment

Transportation

Quick response to transportation accidents involving hazardous materials minimizes the volume and concentration of hazardous materials that are transported and dispersed through the air, water, and soil. Every municipality within Mercer County is vulnerable to a hazardous materials incident caused along a transportation route. These incidents can occur along highways, railways, and pipelines. *Figure 42 – Environmental Hazard Transportation Vulnerability* identifies the 2,000-foot hazard corridor for all major highways in Mercer County. *Figure 43 – Annual Truck Traffic Percentages* identifies the annual truck traffic percentages for all of the roadways in Mercer County.

Fixed Facility

Populations, critical infrastructure, and natural habitats within 1.5 miles of SARA Title III and Toxic Release Inventory sites are vulnerable to hazardous material incidents.

Private water suppliers such as domestic drinking water wells in the vicinity of oil and gas wells are at risk of contamination from brine and other pollutants, including methane, which can pose a fire and explosive hazard. Ideally, vulnerability of private drinking well owners would be established by comparing the distance of drinking water wells to known oil and gas well locations, but this extensive detailed data is not readily available. Private drinking water is largely unregulated and information on these wells is voluntarily submitted to the Pennsylvania Topographic and Geologic Survey by water well drillers, and the existing data is largely incomplete and/or not completely accurate. West Salem Township contains the most oil and gas wells. Pine Township contains the most drinking water wells, meaning that Pine Township is most vulnerable to water contamination from oil and gas wells. *Table 70 – Oil and Gas Wells &*

Drinking Water Wells illustrates the type of well and the local domestic drinking water wells for each municipality.

Table 70 - Oil and Gas Wells & Drinking Water Wells

Oil & Gas Wells in Mercer County (2022)				
Municipality	**Type of Well**			**Domestic Drinking Water Wells**
	Active	**Abandoned**	**Proposed**	
City of Farrell	3	0	0	0
City of Hermitage	34	0	38	152
City of Sharon	7	0	0	3
Clark Borough	0	0	1	35
Coolspring Township	6	0	8	122
Deer Creek Township	88	0	22	62
Delaware Township	67	0	8	201
East Lackawannock Township	25	0	3	120
Fairview Township	45	0	5	91
Findley Township	12	0	1	100
Fredonia Borough	0	0	0	1
French Creek Township	115	0	19	73
Greene Township	93	0	11	89
Greenville Borough	3	0	0	14
Grove City Borough	0	0	0	9
Hempfield Township	61	0	6	183
Jackson Township	7	0	3	109
Jackson Center Borough	0	0	0	15
Jamestown Borough	0	0	0	4
Jefferson Township	11	0	21	136
Lackawannock Township	31	0	9	86
Lake Township	74	0	4	80
Liberty Township	0	0	0	118
Mercer Borough	1	0	0	4
Mill Creek Township	44	0	9	99
New Lebanon Borough	12	0	2	22
New Vernon Township	106	0	5	43
Otter Creek Township	45	0	4	65
Perry Township	112	1	6	127
Pine Township	20	0	2	245

Oil & Gas Wells in Mercer County (2022)				
Municipality	**Type of Well**			**Domestic Drinking Water Wells**
	Active	**Abandoned**	**Proposed**	
Pymatuning Township	1	1	14	85
Salem Township	58	0	1	70
Sandy Creek Township	46	0	2	70
Sandy Lake Borough	0	0	0	3
Sandy Lake Township	7	0	6	159
Sharpsville Borough	2	0	0	0
Sheakleyville Borough	0	0	0	14
Shenango Township	67	0	6	132
South Pymatuning Township	44	0	8	145
Springfield Township	56	0	6	138
Stoneboro Borough	0	0	0	5
Sugar Grove Township	80	0	2	79
West Middlesex Borough	3	0	0	7
West Salem Township	245	3	27	230
Wheatland Borough	3	0	0	4
Wilmington Township	14	0	2	81
Wolf Creek Township	11	0	1	95
Worth Township	10	0	0	136
Total:	**1,669**	**5**	**256**	**3,861**

Figure 40 - Oil and Gas Well Locations

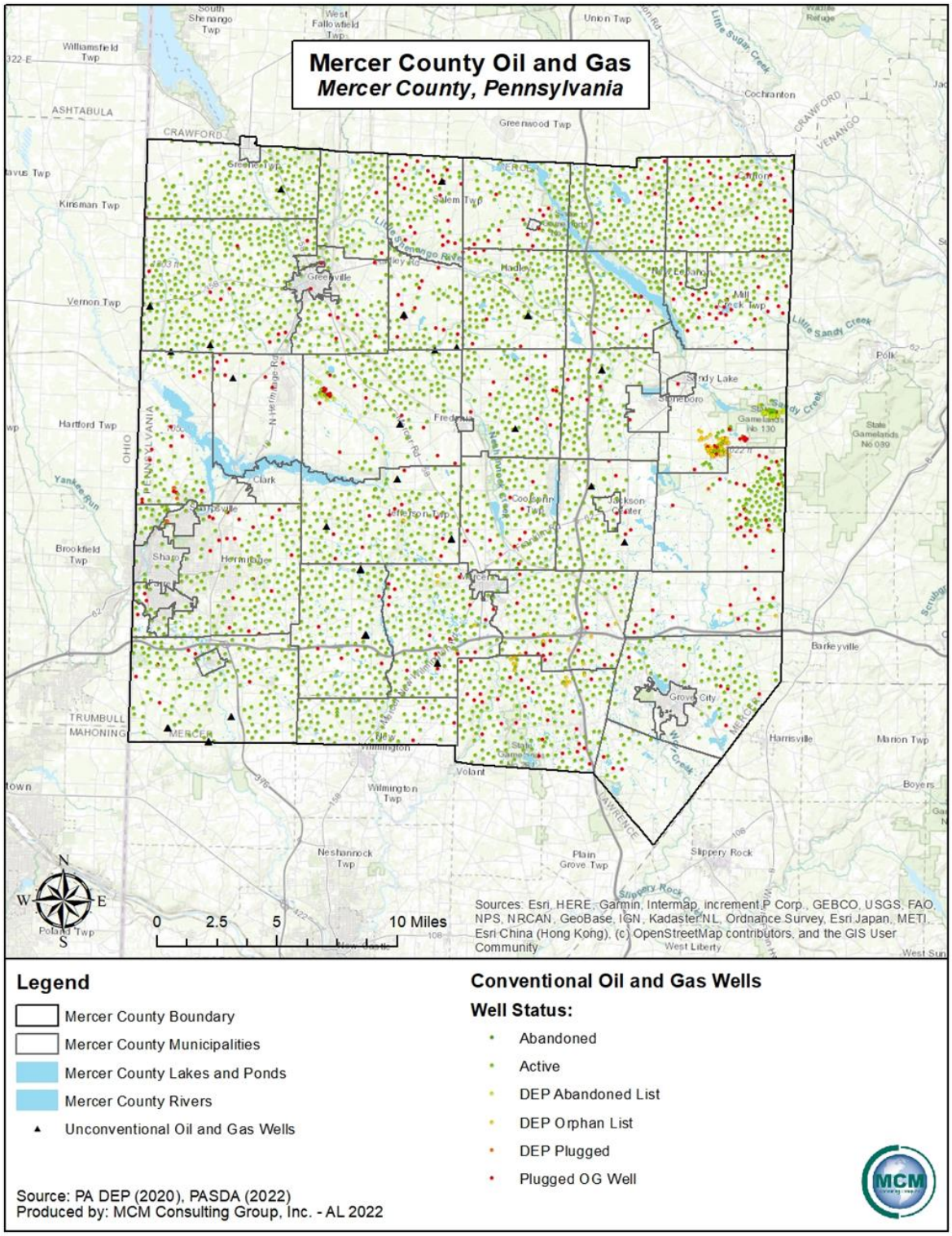


Figure 41 - Hazardous Waste Locations

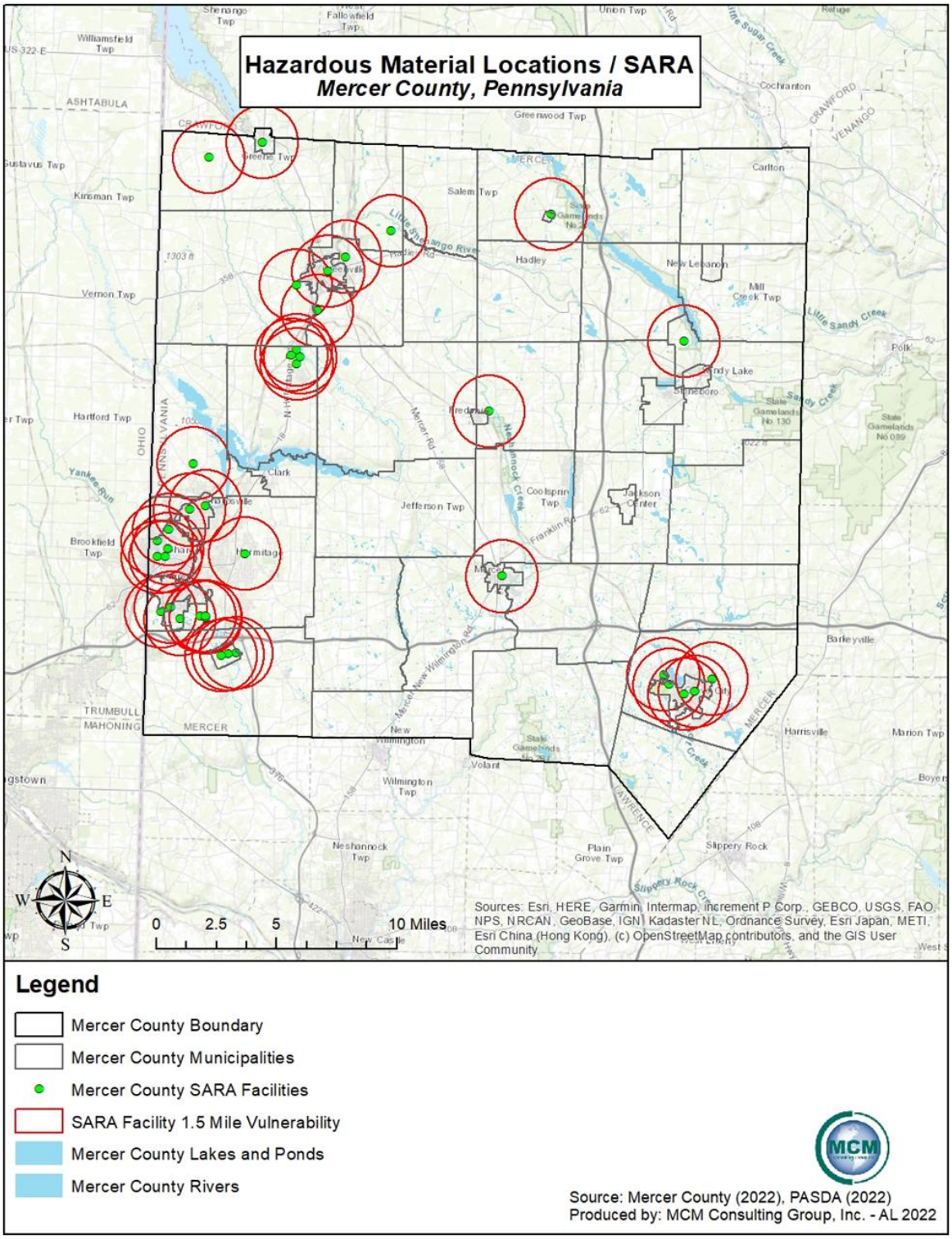


Figure 42 - Environmental Hazard Transportation Vulnerability

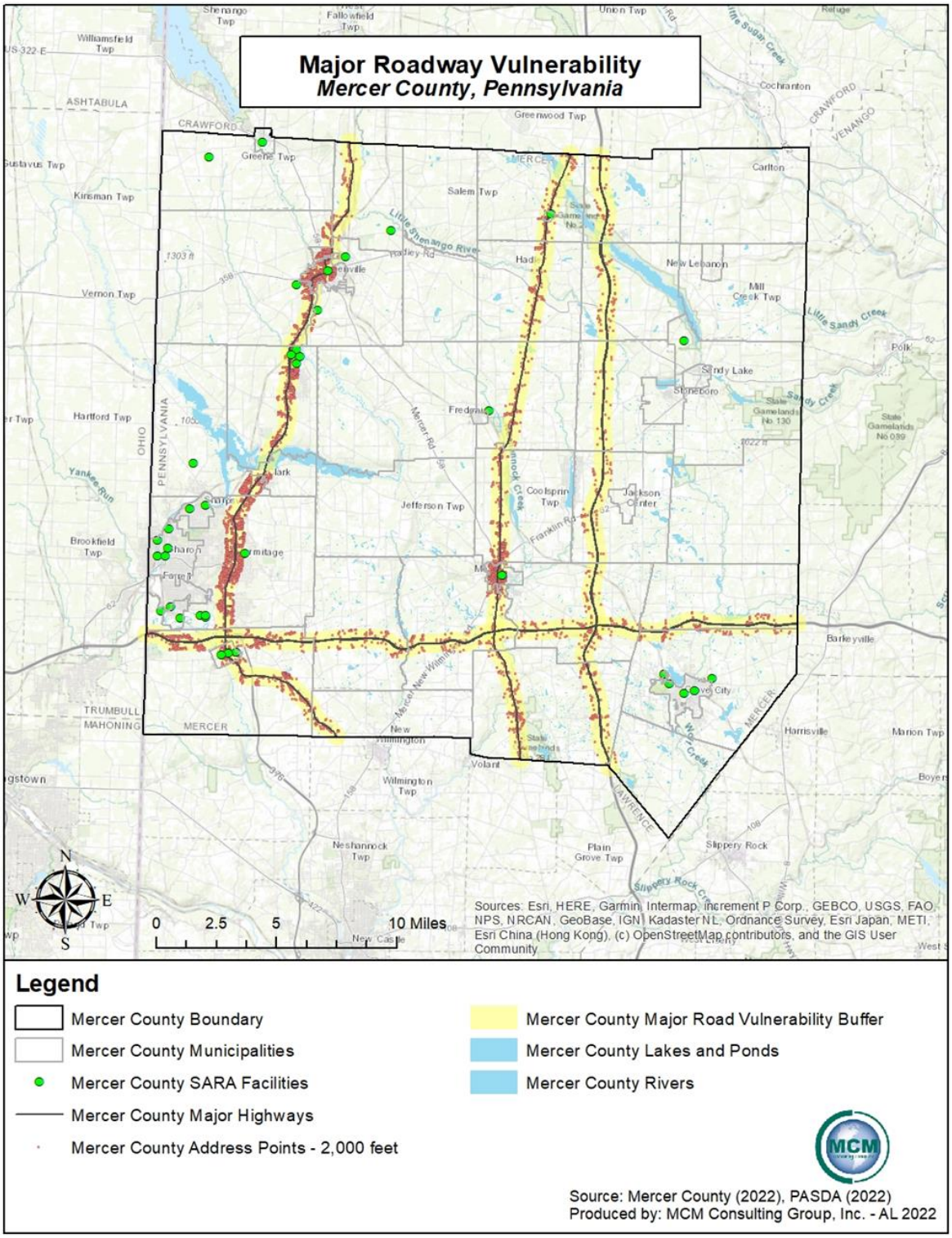
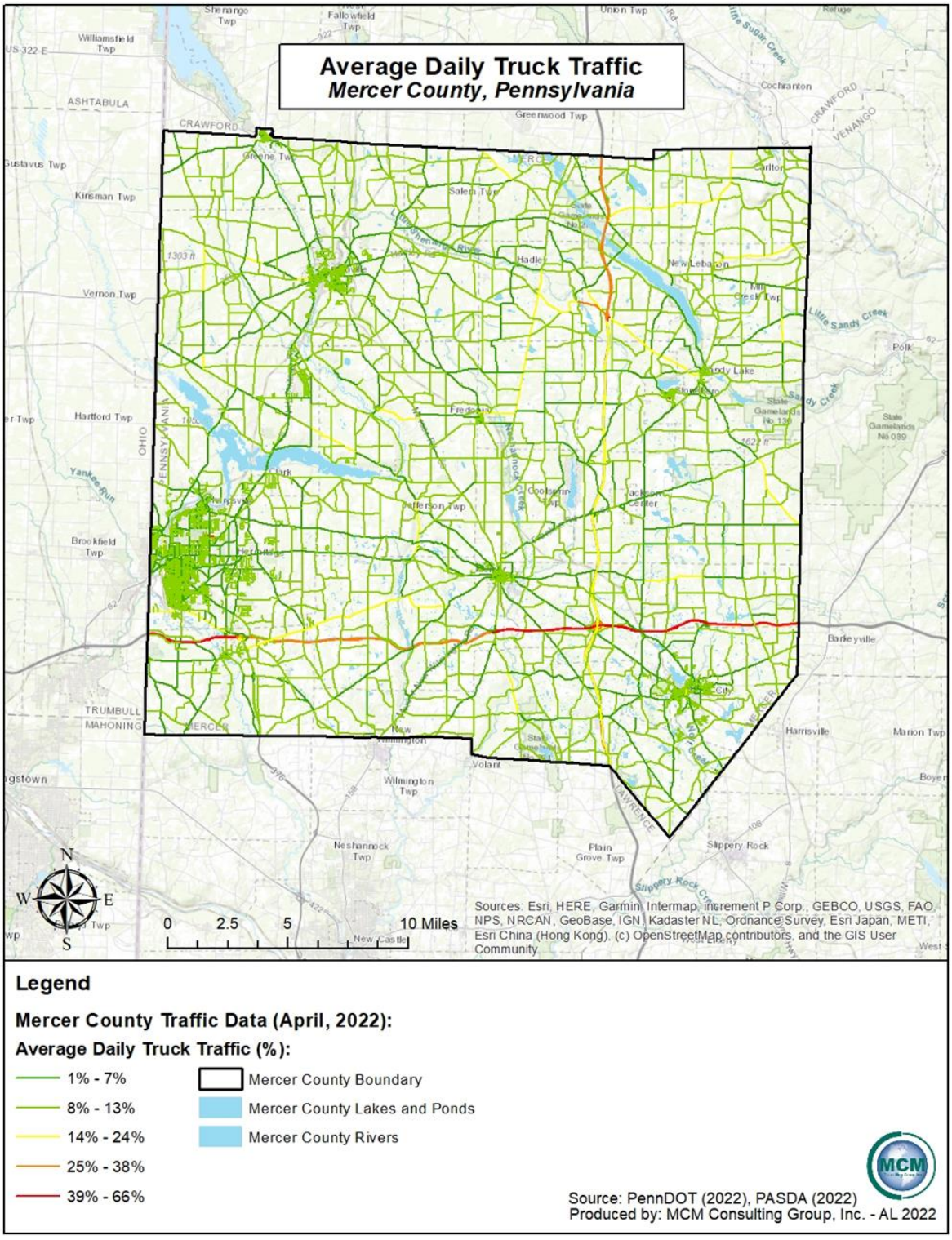


Figure 43 - Annual Truck Traffic Percentages



4.3.17. Nuclear Incidents

4.3.17.1 Location and Extent

Nuclear hazards and incidents generally refer to incidents involving (1) a release of significant levels of radioactive materials or (2) exposure of workers or the general public to radiation. Primary concerns following a nuclear incident or accident are:

- the impact on public health from direct exposure to a radioactive plume
- inhalation of radioactive materials
- ingestion of contaminated food, water, and milk
- long-term exposure to deposited radioactive materials in the environment that may lead to acute health effects (e.g., death, burns, severe impairments), chronic health effects (e.g., cancer), and psychological effects

Nuclear accidents/incidents can be placed into three categories:

1. Criticality accidents which involve loss of control of nuclear assemblies or power reactors
2. Loss-of-coolant accidents which result whenever a reactor coolant system experiences a break or opening large enough that the coolant inventory in the system cannot be maintained by the normally operating make-up system
3. Loss-of-containment accidents which involve the release of radioactivity

A nuclear power facility makes electricity by continuously splitting uranium atoms. Within the Commonwealth of Pennsylvania, there are five nuclear power stations. These are:

- Beaver Valley Power Station, Beaver County;
- Limerick Generating Station, Montgomery County;
- Peach Bottom Atomic Power Station, York County;
- Susquehanna Steam Electric Station, Luzerne County; and,
- Three Mile Island Nuclear Generating Station, Dauphin County. (This station's license expired in 2019 and its owners have begun the decommissioning process; at the time of the writing of this plan, the station was for sale, but it must still adhere to many of the tenets of federal and state emergency response plans.)

Only one of the nuclear power stations are within fifty miles of the Mercer County border: Beaver Valley Power Station located in Shippingport, PA. See *Figure 45 – Mercer County Municipalities in the 50-Mile Ingestion Exposure Pathways.*

Nearly half of the county is within the fifty-mile planning zone of Beaver Valley Power Station. The other four Commonwealth nuclear facilities are more than fifty miles away from Mercer

County and considered minimal threats. In the event of an emergency, evacuees from distant EPZs may seek shelter in Mercer County or pass through the county and use local services.

4.3.17.2 Range of Magnitude

The Nuclear Regulatory Commission encourages the use of Probabilistic Risk Assessments (PRAs) to estimate quantitatively the potential risk to public health and safety considering the design, operations, and maintenance practices at nuclear power plants. PRAs typically focus on accidents that can severely damage the core and that may challenge containment. The Federal Emergency Management Agency (FEMA), the Pennsylvania Emergency Management Agency (PEMA), and county governments have formulated Radiological Emergency Response Plans that include a Plume Exposure Pathway Emergency Planning Zone (EPZ) with a radius of about ten miles from each nuclear power facility and an Ingestion Exposure Pathway EPZ with a radius of about fifty miles from each facility. See *Table 71 - Emergency Planning Zones*. The exact size and configuration of the EPZ may vary in relation to local emergency response capabilities, topography, road networks, and political boundaries.

Table 71 - Emergency Planning Zones

Emergency Planning Zones	
EPZ	**Description**
Plume Exposure Pathway (PEP)	Has a radius of about 10 miles from each reactor site. Predetermined protective action plans are in place and include sheltering, evacuation, and the use of potassium iodide where appropriate.
Ingestion Exposure Pathway (IEP)	Has a radius of about 50 miles from each reactor site. Predetermined protective action plans are in place and are designed to avoid or reduce dose from potential ingestion of radioactive materials. These actions include a ban of contaminated food and water.
Source: U.S. Nuclear Regulatory Commission http://www.nrc.gov/about-nrc/emerg-preparedness/about-emerg-preparedness/planning-zones.html	

The magnitude of a nuclear incident differs for those within the Plume Exposure Pathway EPZ and those within the Ingestion Exposure Pathway EPZ. The Plume Exposure Pathway refers to whole-body external exposure to gamma radiation from a radioactive plume and from deposited materials and inhalation exposure from the passing radioactive plume. The duration of primary exposures could range in length from hours to days. The Ingestion Exposure Pathway refers to

exposure primarily from ingestion of water or foods such as milk and fresh vegetables that have been contaminated with radiation.

Fixed facility incidents are not the only types of incidents that could affect Mercer County. Other types of incidents such as transportation or terrorism could also pose a hazard. Any local army depots located within the county borders could pose a significant threats as terrorism targets.

In the event of a nuclear disaster, radioactive fallout would be the main danger of an incident within a fifty-mile radius. Invisible gamma rays from this fallout can cause radiation sickness due to physical and chemical changes in the cells of the body. If a person would receive a large dose of radiation, that person would die in a very short time. Non-lethal doses in varying degrees would cause radiation sickness among the survivors. Depending on the location of the event all of Mercer County could be in the Ingestion Exposure Pathway.

The Nuclear Regulatory Commission uses four classification levels for nuclear incidents:

1. Unusual Event: Events are in process or have occurred which indicate potential degradation in the level of safety of the plant. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.
2. Alert: Events are in process or have occurred which involve an actual or potential substantial degradation in the level of safety of the plant. Any releases of radioactive material from the plant are expected to be limited to a small fraction of the EPA Protective Action Guides (PAGs).
3. Site Area Emergency: Involves events in process or which have occurred that result in actual or likely major failures of plant functions needed for protection of the public. Any releases of radioactive material are not expected to exceed the EPA PAGs except near the site boundary.
4. General Emergency: Involves actual or imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity. Radioactive releases during a general emergency can reasonably be expected to exceed the EPA PAGs for more than the immediate site area.

The nuclear industry has adopted predetermined, site-specific Emergency Action Levels (EALs). The EALs provide the framework and guidance to observe, address, and classify the severity of site-specific incidents and conditions that are communicated to off-site emergency response organizations (Nuclear Regulatory Commission, 2008). There are additional EALs that specifically deal with issues of security, such as threats of airborne attack, hostile action within the facility, or facility attack. These EALs ensure that appropriate notifications for the security threat are made in a timely manner. Each facility is also equipped with a public alerting system, which includes several sirens to alert the public located in the Plume Exposure Pathway EPZ.

This alerting system is activated by the counties of each specific EPZ. Emergency notifications and instructions are communicated to the public via the Emergency Alert System as activated by the Commonwealth Resource Coordination Center (formerly Pennsylvania State Emergency Operations Center). State officials also have the capability to send emergency messages as text messages to mobile devices.

During and after a nuclear incident, the primary concern is the effect on the health of the population near the incident. The duration of primary exposure could range in length from hours to months depending on the proximity to the point of radioactive release. External radiation and inhalation and ingestion of radioactive isotopes can cause acute health effects (e.g., death, severe health impairment), chronic health effects (e.g., cancers) and psychological effects.

Potential environmental impacts specific to the fifty-mile Ingestion Exposure Pathway EPZ, and therefore of most concern to Mercer County, include the long-term effects of radioactive contamination in the environment and in agricultural products. Mercer County can expect some radioactive contamination in very small amounts in the case of a nuclear incident at the facility near the county (Beaver Valley Power Station). This is not a significant concern in terms of external exposure and immediate health risks, but even a small amount of radiation will require the protection of the food chain, particularly milk supplies. Small amounts of radiation ingested over time could lead to future health issues. As a result, in the case of a nuclear incident, foodstuffs, crops, milk, livestock feed and forage, and farm water supplies will need to be protected from and tested for contamination. Additionally, spills and releases of radiologically active materials from accidents can result in the contamination of soil and public water supplies. Areas underlain by limestone and some types of glacial sediments are particularly susceptible to contamination.

The worst-case scenario for Mercer County would be a General Emergency at Beaver Valley Power Station that leaked sufficient radiation to create longer-term damage in the form of contaminated water, soil, and food supplies.

4.3.17.3 Past Occurrence

Nuclear incidents rarely occur, but the incident at Three Mile Island in Dauphin County is the worst fixed nuclear facility accident in U.S. history. The resulting contamination and state of the reactor core led to the development of a 14-year cleanup and scientific effort. Additionally, the *President's Commission on the Accident at Three Mile Island* examined the costs of the accident, concluding that "the accident at Three Mile Island on March 28, 1979, generated considerable economic disturbance. Some of the impacts were short term, occurring during the first days of the accident. Many of the impacts were experienced by the local community; others will be felt at the regional and national levels." The report concluded: "It appears clear that the major costs

of the TMI Unit 2 accident are associated with the emergency management replacement power and the plant refurbishment or replacement. The minimum cost estimate of nearly one billion dollars supports the argument that considerable additional resources can be cost effective if spent to guard against future accidents."

Despite the severity of the damage, no injuries due to radiation exposure occurred. However, numerous studies were conducted to determine the measurable health effects related to radiation and/or stress. More than a dozen epidemiological and stress-related studies conducted to date have found no discernible direct health effects on the population in the vicinity of the plant. However, one study conducted by the Pennsylvania Department of Health's *Three Mile Island Health Research Program* did find evidence of psychological stress, "lasting in some cases for five to six years." According to the program chief, "the people suffering from stress perceived their health as being poorer than it actually was when the health department checked the medical records."

The accident at Three Mile Island had a profound effect on residents, the emergency management community, government officials, and nuclear industry, not only in Pennsylvania, but nationwide. There were minimal requirements for off-site emergency planning for nuclear power stations prior to the accident. Afterward, comprehensive, coordinated, and exercised plans were developed for the state, counties, school districts, special facilities (hospitals, nursing homes, day care centers, and detention facilities) and municipalities to ensure the safety of the populations. Costs associated with an incident at one of the Commonwealth's nuclear facilities, be it real or perceived, are significant. The mitigation efforts put in place immediately following the 1979 accident continue until today. The Commonwealth's nuclear/radiological plan, which is a successor of the original "Annex E," is a result of the Commonwealth's efforts to address the many components of mitigation planning. The comprehensive planning involving its five nuclear facilities is an ongoing effort. Plans are reviewed and amended on an annual basis.

Another incident occurred at Three Mile Island on February 7, 1993, when an individual drove his car through a chain-link fence and then slammed into a roll-up garage door leading into the facility's turbine building. Plant officials, fearing the worst, immediately declared a Site Area Emergency. Fortunately, the person who crashed the gate was found and apprehended. Other than property damage caused by the forcible entry through physical structures, there was no lasting damage to the facility.

Mercer County has not been affected by a fixed nuclear facility incident from any of the two local or other state facilities. The county has not been affected by any type of nuclear incident.

4.3.17.4 Future Occurrence

Pennsylvania is the site of the only nuclear power plant in the country with an incident rated as a General Emergency. Since the Three Mile Island incident, nuclear power has become significantly safer and is one of the most heavily regulated industries in the nation. Despite the knowledge gained since then, there is still the potential for a similar accident to occur again at any of the nuclear generating facilities nearest the county. The Nuclear Energy Agency of the Organization for Economic Co-Operation and Development notes that studies estimate the chance of a breach of protective barriers in a modern nuclear facility at less than one in 100,000 per year (Nuclear Energy Agency, 2005). Nuclear incident occurrences may also happen because of intentional actions, but these terrorist acts are rare. Nuclear incidents in or near Mercer County should be considered unlikely.

4.3.17.5 Vulnerability Assessment

In addition to the areas of Mercer County facing direct contamination risk, the entire county could also be affected on some level by incidents from any of the other nearby nuclear facilities, including the facilities that are farther away. Evacuation of residents from these areas could lead to increased population or through-traffic in the county. County residents could be negatively impacted through the psychological effects of a nuclear incident as the effects and likelihood of radiation contamination are not always well understood by the public.

Thirty of Mercer County's forty-eight municipalities fall wholly or partially within the fifty-mile EPZ of Beaver Valley Power Station. According to the 2020 U.S. Decennial Census, this represents a population of 87,818 and covers the bulk of Mercer County's agricultural land cover. This accounts for approximately 79.4% of the county's total population. These jurisdictions include the southern half of the county.

The county's primary vulnerability to nuclear incidents comes in the form of food, soil, and water contamination. In terms of vulnerable land, the majority of the 156,397 acres of farmland held in Mercer County's 1,168 farms are vulnerable to radiological contamination in a nuclear incident. In 2017, the market value of all agricultural products of these farms was nearly $65.75 million.

Water contamination is also a concern in nuclear incidents. There are several public water suppliers that operate in or provide water to the county; the largest of them are: Aqua PA Lake Latonka, Aqua PA Shenango, Greenville Municipal Water Authority, Grove City Borough Water Authority, Pine Township Waterworks, Reynolds Water Company, Sandy Lakes Municipal Waterworks, Sharpsville Borough Water Authority, St. Paul's Home, and Stoneboro Municipal Waterworks. These water supplies, coupled with the county's 3,861 estimated domestic drinking water wells, are all vulnerable to the effects of a nuclear incident.

While unlikely that all agricultural products would be lost in the event of a nuclear incident, the county could expect some portion of that $65.75 million to be lost. Time of year also impacts the vulnerability and losses estimated for a nuclear incident. An incident that occurs during the prime growing and harvesting season will have a larger impact on the county. For example, the incident at Three Mile Island occurred in the off-season; as a result, the Pennsylvania Department of Agriculture estimated that agricultural losses for the entire Commonwealth were not more than $1 million.

Figure 44 - Pennsylvania Nuclear Power Stations

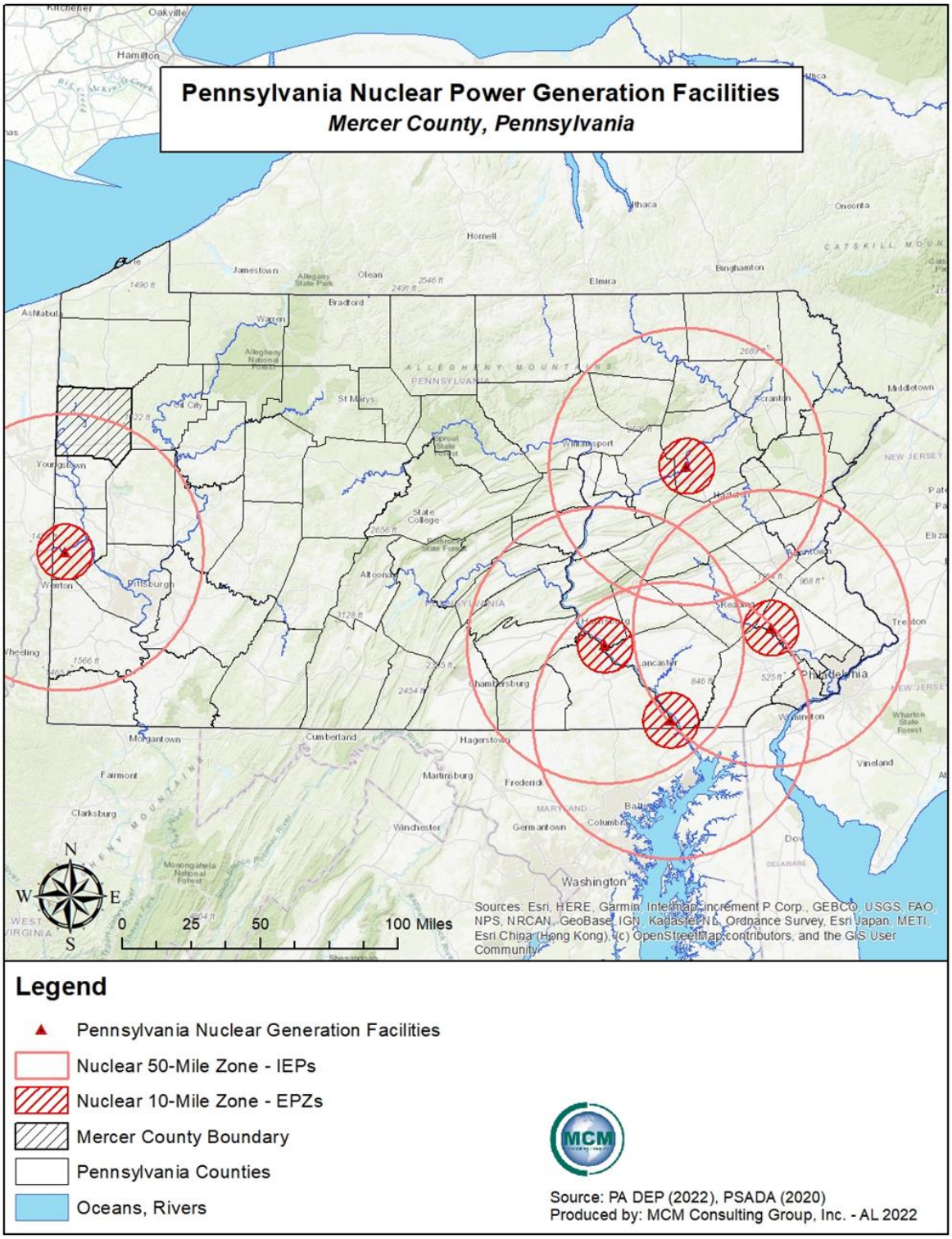
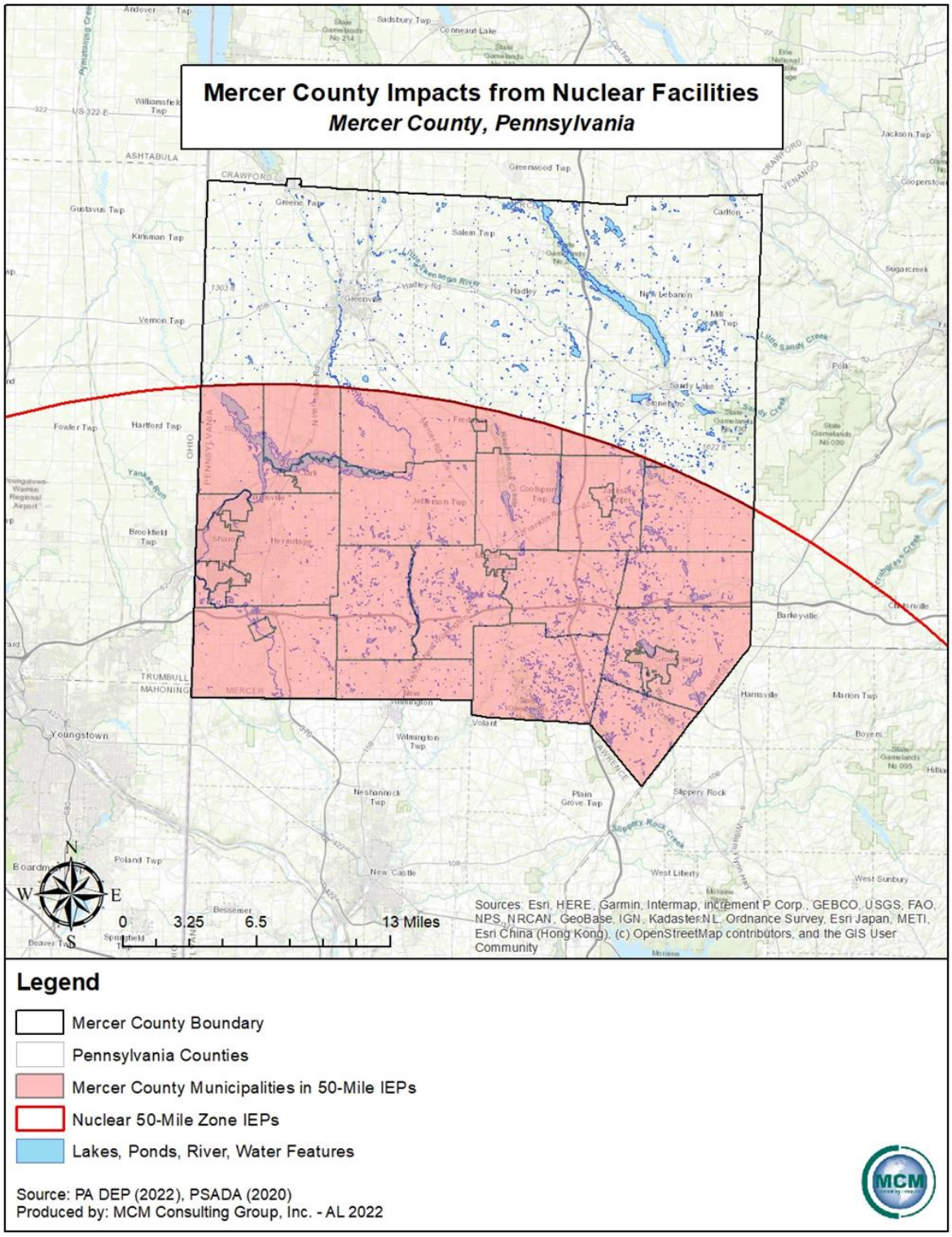


Figure 45 - Mercer County Municipalities in the 50-Mile Ingestion Exposure Pathways



4.3.18. Opioid Epidemic

4.3.18.1 Location and Extent

Pennsylvania and the United States at large have been experiencing an epidemic of opioid drug abuse. According to the Pennsylvania Department of Health, the opioid overdose epidemic is the worst public health crisis in Pennsylvania. It affects Pennsylvanians across the state, from big cities to rural communities. Opioid addiction has increased drastically over the last year due to the hardships faced from the COVID-19 pandemic. Opioid use has increased since the beginning of the COVID-19 pandemic which is being attributed to the uncertainty people are feeling due to the pandemic.

Opioids, mainly synthetic opioids (other than methadone), are currently the main driver of drug overdose deaths. According to the Center for Disease Control and Prevention (CDC), 72.9% of opioid-involved overdose deaths involved synthetic opioids. Opioid addiction occurs when an individual becomes physically dependent on opioids. Opioids are a class of drug that reduces pain by interacting with receptors on nerve cells in the body and brain. The use of opioids is a broad term and includes opiates, which are drugs naturally extracted from certain types of poppy plants, and narcotics. Opioids can also be synthetically made to emulate opium. Opioid drugs are highly addictive and typically result in increasing numbers of overdose deaths both prescribed (e.g. fentanyl) and illicit (e.g. heroin) opioids. Overdose deaths from opioids occur when a large dose slows breathing, which can occur when opioids are combined with alcohol or antianxiety drugs. While generally prescribed with good intentions, opioids can be over-prescribed, resulting in addiction.

According to the Drug Enforcement Administration (DEA), opioids come in various forms such as tablets, capsules, skin patches, powder, chunks in various colors from white to brown/black, liquid form for oral or injection use, syrups, suppositories, and lollipops. The Centers for Disease Control and Prevention (CDC) defines the following as the three most common types of opioids:

- **Prescription Opioids**: Opioid medication prescribed by doctors for pain treatment. These can be synthetic oxycodone (OxyContin), hydrocodone (Vicodin), or natural (morphine).
- **Fentanyl**: A powerful synthetic opioid that is 50 to 100 times more powerful than morphine and used for treating severe pain; illegally made and distributed fentanyl is becoming more prevalent.
- **Heroin**: An illegal natural opioid processed from morphine which is becoming more commonly used in the United States.

Opioids are highly addictive. They block the body's ability to feel pain and can create a sense of euphoria. Additionally, individuals often build a tolerance to opioids, which can lead to misuse and overdose.

While other addictive substances such as methamphetamines and alcohol can be problematic for the health of individuals in Mercer County, this profile focuses on opioid drugs and the opioid epidemic. The opioid crisis was declared to be a public health emergency on October 26, 2017. While the declaration provides validation for the scope and severity of the problem, it was not accompanied by any release of funding for mitigating actions. On January 10, 2018, Governor Tom Wolf declared the opioid epidemic to be a statewide public health disaster emergency for Pennsylvania. The declaration is intended to enhance response and increase access to treatment.

4.3.18.2 Range of Magnitude

Opioid addiction can lead to overdose, which can be fatal. This type of addiction can affect others that are not the user themselves. The most dangerous side effect of an opioid overdose is depressed breathing. The lack of oxygen to the brain causes permanent brain damage, leading to organ failure, and eventually death. Signs and symptoms include respiratory depression, drowsiness, disorientation, pinpoint pupils, and clammy skin. Opioid addiction can also be passed from mother to child in the womb. This condition, known as neonatal abstinence syndrome, has increased five-fold, according to the National Institute on Drug Abuse (NIDA). This results in an estimated 22,000 babies in the United States born with this condition. First responders such as paramedics, police officers, and firefighters are also affected by the opioid addiction crisis. First responders face exposure risk due to an increase in emergency calls due to an increase in the crisis, particularly to synthetic fentanyl. Two to three milligrams of fentanyl can cause an induced respiratory depression, arrest, and possibly death to occur. Since fentanyl is indistinguishable from several other narcotics and powdered substances, first responders must take extra precaution when dealing with calls related to drug abuse. A worst-case scenario with the opioid epidemic in Mercer County would be a high number of overdoses between residents and/or first responders throughout the county.

According to the Center for Disease Control and Prevention (CDC), more than 192 Americans die every day from an opioid overdose. In 2021, a total of 5,343 deaths related to opioid use occurred in Pennsylvania. From February 2020 to February 2021, there has been a 3.34% increase across the commonwealth of Pennsylvania. This could indicate an increase in opioid overdoses in Pennsylvania. Heroin and fentanyl are the two drugs most often found in overdose deaths, and they are considered to be highly available and nearly ubiquitous in Pennsylvania.

4.3.18.3 Past Occurrence

In 2021, there was an estimated total of 107,622 drug-related overdose deaths in the United States. This is the highest number of overdose deaths ever recorded in a 12-month period, according to the recent provisional date from the CDC. Mercer County experienced a total of 274 drug related deaths from 2015 – 2021. There was a total of fifteen overdose deaths in 2015, twenty-eight deaths in 2016, thirty-eight deaths in 2017, forty-nine deaths in 2018, thirty-seven deaths in 2019, forty-four deaths in 2020, and sixty-three deaths in 2021. Data related to final numbers for 2022 was not completed at the time of this writing and numbers for 2020, 2021, and 2022 are not peer reviewed but are reported on the PA government dashboard for opioid overdose deaths. In Mercer County the overdose rate of males is greater than the overdose rate of females. The most used opioid in Mercer County are fentanyl, heroin, cocaine, benzodiazepines, and Rx opioids.

Table 72 - Drugs Present in 2020 Pennsylvania Overdose Deaths

Drugs Present in 2020 PA Overdose Deaths (DEA, 2020)	
Drug Category	**Percent Reported Among 2020 Decedents**
Cannabis	25%
Cocaine	20%
Heroin	15%
Fentanyl	14%
Methamphetamine	10%
Prescription Opioids	5.5%
Cathinones	5.5%
Benzodiazepines	5%

4.3.18.4 Future Occurrence

Both Mercer County, and Pennsylvania as a whole, have seen a steady rise in opioid related deaths over the last several years, with drug-related death rates increasing at a high percentage. Future occurrences of opioid addiction and overdose are unclear as the state moves forward with overdose prevention initiatives through the use of Naloxone, alternative pain treatments, improvement of tools for families and first responders, and expansion of treatment access. The Wolf Administration has taken various approaches to help with the prevention of mass future occurrences across the Commonwealth. To help prevent future drug abuse and protect individual health among communities in Pennsylvania, the Pennsylvania's Prescription Drug Monitoring Program (PA PDMP) collects information on all filled prescriptions for controlled substances.

This information helps health care providers safely prescribe controlled substances and helps patients get correct treatment. The PA PDMP also has drug take-back boxes located in the counties for an easy, convenient location where anyone can dispose of their unused, expired, or unwanted prescriptions to help lower potential drug overuse. In Mercer County, there are thirteen drug take-back boxes located throughout the county. The drug take-back box locations include Borough of Grove City Police Department, the State Police Troop D in Mercer, The Medicine Shoppe in Mercer, The Mercer County Sherriff's Office, the Mercer Pharmacy, the City of Hermitage Police Department, The Medicine Shoppe (Hermitage), Sharon Pharmacy, SBW Pharmacy, Inc., the Greenville-West Salem Police Department The Medicine Shoppe (Greenville), Care-Fill Pharmacy, and the Jamestown Pharmacy. These locations help reduce future occurrences of opioid use from occurring.

In the event of an opioid overdose, death can sometimes be prevented with the use of the drug naloxone. Pennsylvania Secretary of Health, Dr. Rachel Levine, previously signed updated standing order prescriptions of naloxone. The updated standing orders include the 2mg dose auto injector which has recently become available. Naloxone is a medication that can reverse an overdose that is caused by an opioid drug (i.e., prescription pain medication or heroin). Naloxone is used to block the effects of opioid and is sold under the brand name of Narcan. When administered during an overdose, naloxone blocks the effects of opioids on the brain and restores breathing within two to eight minutes. Naloxone has been used safely by medical professionals for more than 40 years and has only one function to reverse the effects of opioids on the brain and respiratory system in order to prevent death. Emergency medical responders have access to the treatment, and as of 2015, naloxone is available without a prescription in Pennsylvania. Also, with the January 10, 2018 disaster declaration, emergency medical technicians (EMTs) are now allowed to leave naloxone behind at a scene, further increasing the distribution and accessibility of the lifesaving medication. According to a study published in September 2018, drug users reported that users often have multiple overdoses in the course of their drug use, and availability of naloxone has saved many lives. While the introduction of naloxone has been a significant benefit to the fight against opioid abuse, efforts to prevent future overdoses are still underway. Naloxone is another way to reduce future occurrences of the opioid epidemic from occurring in Mercer County.

Opioid drugs have been a problematic and addictive method for patients to deal with pain. Employing alternative approaches to pain management could prevent patients from ever being introduced to addictive opioids, especially considering the most common overdose drugs in Mercer County have been prescription opioids. A possible alternative pain treatment comes from hemp extracted cannabidiol, or CBD. Unlike THC (the psychoactive constituent of cannabis), CBD is non-psychoactive and does not have the same intoxicating effect as THC; however, CBD

can provide relief from pain, inflammation, anxiety, and even psychosis. CBD is legal without a prescription throughout the United States of America.

4.3.18.5 Vulnerability Assessment

Opioid overdoses have resulted in many tragic deaths in Pennsylvania and many people have been affected by the epidemic through the loss of either a family member, a close friend, or member of their community. Opioid addiction is a direct detriment to the personal wellbeing of addicts, a burden to their families and communities, and a strain to the emergency response system that cares for overdose victims. In general, jurisdictions that are more densely populated are more vulnerable to opioid addiction threats as access to the drugs increases. However, rural communities in general experience larger per-capita opioid-related deaths. Jurisdictional losses in the opioid addiction crisis stem from lost wages, productivity, and resources rather than losses to buildings or land. Many counties across the Commonwealth, including Mercer County, have seen an increase of time and resources devoted to the opioid epidemic as overdose and response increase.

The vulnerability in the county depends on the number of additional risk factors on the vulnerable population such as genetic, psychological, and environmental factors that play a role in addiction. The known risk factors of opioid misuse and addiction include poverty, unemployment, family and/or personal history of substance abuse, history of criminal activity, history of severe depression or anxiety, and prior drug/alcohol rehabilitation. In addition, women have a unique set of risk factors for opioid addiction. Women are more likely than men to have diagnosed chronic pain. Compared with men, women are also more likely to be prescribed opioid medications, to be given higher doses, and to use opioids for longer periods of time. Women may also have biological tendencies to become dependent on prescription pain relievers more quickly than men. Therefore, if the county were to have a population with a great amount of these risk factors, the county would be very vulnerable to the opioid epidemic.

The COVID-19 pandemic and its periods of quarantine caused vulnerability in opioid users throughout Mercer County. It is likely that the emergence of COVID-19 and subsequent disruptions in health care and social safety nets combined with social and economic stressors has fueled the opioid epidemic. The COVID-19 pandemic has challenged vulnerable populations, including those with opioid use disorders. The opioid epidemic and COVID-19 pandemic are intersecting and presenting unprecedented challenges for families and communities. Opioid use affects respiratory and pulmonary health which may make those with opioid use disorders more susceptible to COVID-19. In addition, chronic respiratory disease is already known to increase overdose mortality risk among people taking opioids, and decreased lung capacity from COVID-19 could lead to similar health effects. Secondary impacts from the COVID-19 pandemic,

including disruptions of treatment and recovery services, limited access to mental health services and peer support, disrupted routines, loss of work, and stress, may lead to increased opioid use and risk of relapse for those in recovery. Risk factors also arise from indirect factors including housing instability and incarceration. Those with opioid use disorders are at higher risk for housing insecurity, homelessness, and incarceration. Congregate living facilities such as homeless shelters, jails, and prisons are high-risk environments for coronavirus transmission, and there are challenges in implementing recommendations from the CDC such as social distancing and quarantine. Additionally, the pandemic took away the attention from the media, from legislators, and from public health agencies that was being focused on the opioid crisis. The opioid epidemic in Pennsylvania increased 22.9% since the beginning of the pandemic.

Additionally, first responders and medical personnel are also a very vulnerable population when dealing with the opioid epidemic. Fentanyl and related substances are hazardous materials, which cause the environment and the people around the substance to be vulnerable. Contact with fentanyl can impact first responders and others that are related to the opioid user. Depending on the potency of the drug, it can take as little as the equivalent of few grams of table salt to cause health complications. There have been several reports nationally of first responders accidentally overdosing on fentanyl through brief skin contact or the drug becoming airborne. It is best for first responders to err on the side of caution to avoid any potential exposure. The American College of Medical Toxicology (ACMT) and the American Academy of Clinical Toxicology (AACT) suggest that nitrile gloves provide sufficient protection for handling fentanyl, and for "exceptional circumstances where the drug particles or droplets suspended in the air, an N95 respirator provides sufficient protection". Other environmental structures such as streams, rivers, and lakes have been known to contain traces of opioids and other drugs within them. These traces come from human urine, feces, or medications that have been discarded in the bathroom. The Environmental Protection Agency (EPA) suggests that while the risks of pharmaceuticals found in wastewater, ambient water, and drinking water are low, further research is needed. State facilities are not at risk to the opioid crisis, but there are some occupation-specific risks that may make some employees more vulnerable. State employees working in direct patient care are vulnerable to fentanyl exposure. However, the physical plant and facilities of the Commonwealth and Mercer County are not likely to experience losses from the opioid addiction crisis. Absenteeism associated with an opioid addiction in state facilities located in high-risk areas could lead to economic loss through lost productivity and increased medical costs. *Figure 46 – Opioid Overdose Deaths in Pennsylvania 2020* and *Figure 47 – Opioid Overdose Deaths in Pennsylvania 2021* illustrate the number of deaths per county in the state of Pennsylvania.

Figure 46 - Opioid Overdose Deaths in Pennsylvania 2020

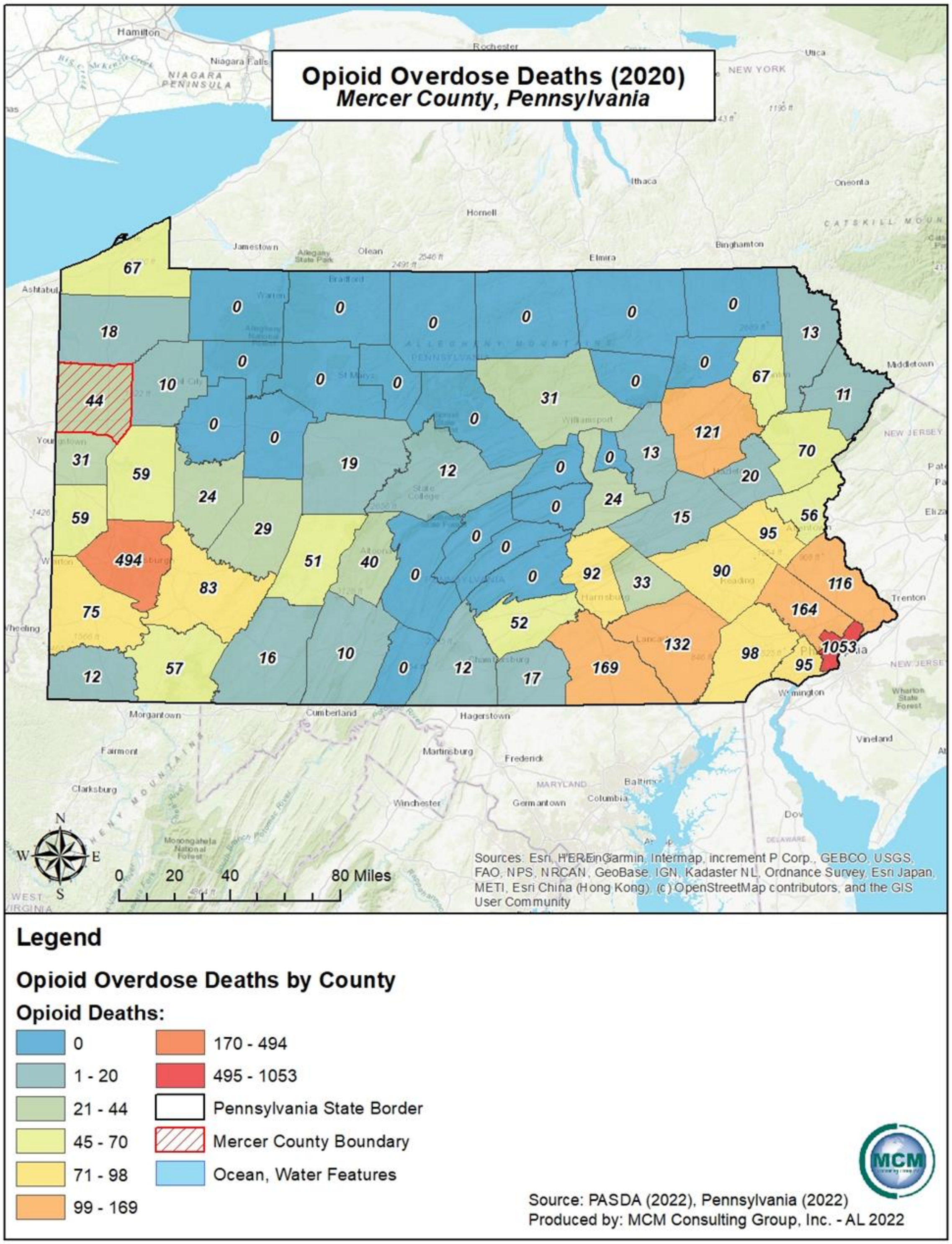
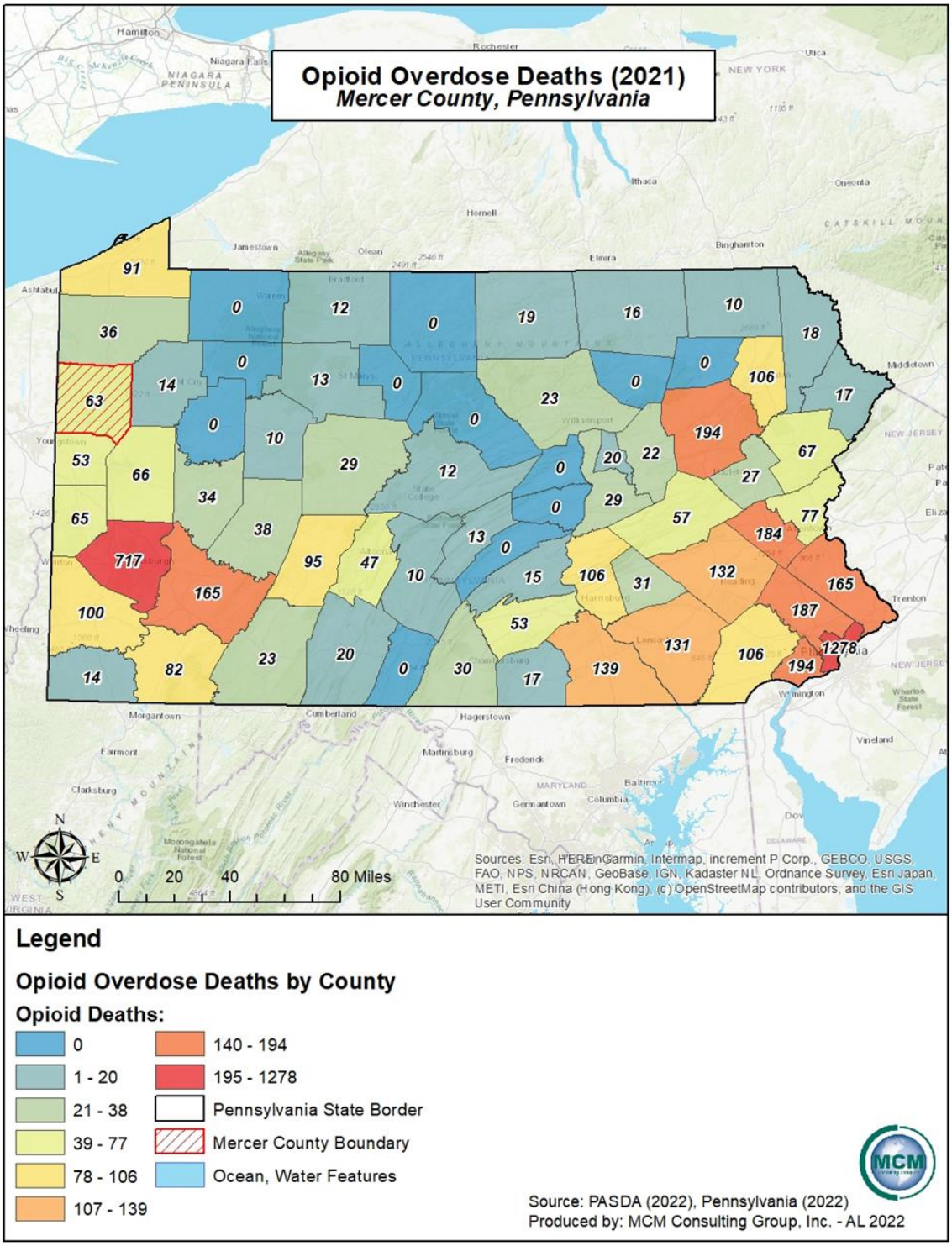


Figure 47 - Opioid Overdose Deaths in Pennsylvania 2021



4.3.19. Terrorism/Cyberterrorism

4.3.19.1 Location and Extent

Following several serious international and domestic terrorist incidents during the 1990s and early 2000s, citizens across the United States paid increased attention to the potential for deliberate, harmful actions of individuals or groups. The term "terrorism" refers to intentional, criminal, malicious acts. The functional definition of terrorism can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations as "…the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives." (28 CFR §0.85)

Cyber-terrorism is the unlawful use of force and violence over technological methods to cause harm to financial security, identity information, personal information, and attacking personal computers, mobile phones, gaming systems, and other Bluetooth or wirelessly connected devices. Cyber-terrorism can be just as damaging to infrastructure as conventional terrorism, due to the large amount of business that is carried out over the internet, through wirelessly connected devices, or from employees of companies working remotely.

The Federal Bureau of Investigations (FBI) further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. Often, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and the consequences. However, it is important to consider that the prevalence of homegrown violent extremists (HVEs) has increased in recent years, with individuals able to become radicalized on the internet. In a speech on August 29, 2018, addressed to the 11th annual Utah National Security and Anti-Terrorism Conference, FBI Director Christopher Wray describes HVEs as "the primary terrorist threat to the homeland here today, without question."

Community lifeline facilities are either in the public or private sector that provide essential products and/or services to the general public. Community lifeline facilities are often necessary to preserve the welfare and quality of life in the county, or fulfill important public safety, emergency response, and/or disaster recovery functions. Community lifeline facilities identified in the county are hospitals and health care facilities, schools, childcare centers, fire stations, police departments, municipal buildings, and hazardous waste facilities. In addition to critical facilities, the county contains at risk populations that should be factored into a vulnerability assessment. These populations include not only the residents and workforce in the county, but also the tourists that visit the area on a daily basis, those that are traveling through the county on

any major highway and marginalized groups such as LGBTQ persons and racial, religious, or other minorities.

Potential targets include:

- Commercial facilities
- Family planning clinics/organizations associated with controversial issues
- Education facilities
- Events attracting large amounts of people
- Places of worship
- Industrial facilities, especially those utilizing large quantities of hazardous materials
- Transportation infrastructure
- Historical sites
- Cultural sites
- Government facilities

4.3.19.2 Range of Magnitude

Terrorism may include use of Weapons of Mass Destruction (WMD) (including chemical, biological, radiological, nuclear, and explosive weapons) which include arson, incendiary, explosive, armed attacks, industrial sabotage, intentional release of hazardous materials, and cyber-terrorism. Within these general categories, there are many variations. There is a wide variety of agents and ways for them to be disseminated, particularly in the case of biological and chemical weapons.

Terrorist methods can take many forms including:

- Active assailant
- Agri-terrorism
- Arson/incendiary attack
- Armed attack
- Assassination
- Biological agent
- Chemical agent
- Cyber-terrorism
- Conventional bomb or bomb threat
- Hijackings
- Release of hazardous materials
- Kidnapping

- Nuclear bomb
- Radiological agent

Active assailant incidents and threats can disrupt the learning atmosphere in schools, interfere with worship services, cause traffic to be re-routed, and use taxpayer assets by deploying police, EMS and/or fire units. Mercer County has fourteen school districts (public schools K through 12th grade) that include Artman Elementary School, C.M. Musser Elementary School, Case Avenue Elementary School, Commodore Perry Elementary School, Commodore Perry Junior/Senior High School, Delahunty Middle School, Farrell Area Junior/Senior High School, Farrell Area Elementary School, Greenville Elementary School, Greenville Junior/Senior High School, Grove City High School, Grove City Middle School, Hickory High School, Highland Primary Center, Hillview Intermediate Center, Jamestown Area Junior/Senior High School, Jamestown Elementary School, Karen A. Ionta Elementary School, Lakeview High School, Lakeview Middle School, Luther W. Low Elementary School, Mercer Area Elementary, Mercer Area Middle and High School, New Wilmington Elementary School, Oakview Elementary School, Reynolds Junior/Senior High School, Reynolds Elementary School, Sharon Middle and High School, Sharpsville Area Elementary School, Sharpsville Area Middle School, Sharpsville Area Senior High School, West Hill Elementary School, West Middlesex Area Junior/Senior High School, Wilmington Area High School, and Wilmington Area Middle School. Butler County Community College (Pennsylvania) located in Hermitage, Grove City College, Thiel College, and Pennsylvania State University (Shenango Campus) are the post-secondary institutions in Mercer County.

The areas along major transportation routes can be susceptible to forms of public transit terrorist attacks. More populated areas of the county, including the county seat of Mercer and the cities of Farrell, Hermitage, and Sharon, can be susceptible to chemical, biological, radiological, nuclear, or explosive (CBRNE) events due to the concentration and density of residential communities and government activity and buildings. Secondary effects from CBRNE incidents can be damaging as well. Mass evacuations could result in congestion of roadways and possibly result in breakdown of civil order, further exacerbating the situation. Government operations may be disrupted due to the need to displace or operate under reduced capacity. Radiation fallout, hazardous chemical introduction into the groundwater or biologic/germ agents can cause long-term environmental damage.

Cyber terrorism is becoming increasingly prevalent. Cyber terrorism can be defined as activities intended to damage or disrupt vital computer systems. These acts can range from taking control of a host website to using networked resources to directly cause destruction and harm. Protection of databases and infrastructure are the main goals for a safe cyber environment. Cyber terrorists

can be difficult to identify because the internet provides a meeting place for individuals from various parts of the world. Individuals or groups planning a cyber-attack are not organized in a traditional manner, as they are able to effectively communicate over long distances without delay. The largest cyber terrorism threat to institutions comes from any processes that are networked or controlled via computers.

Ransomware continues to be the leading threat, with Maze ransomware accounting for nearly half of all known cases in 2020. Cybercriminals have increasingly begun to steal proprietary – and sometimes embarrassing – data before encrypting it. The cybercriminal will then threaten to publicly release the stolen files if the victims do not provide financial transactions.

4.3.19.3 Past Occurrence

There have been no major past occurrence of terrorism or cyberterrorism impacting Mercer County. Mercer County has seen bomb threats and small terrorist activity, but no major attacks have occurred in the past.

Significant international terrorism incidents in the United States include the World Trade Center bombing in 1993, the bombing of the Murrow Building in Oklahoma City in 1995, and the September 11th, 2001, attacks on the World Trade Center and the Pentagon. One of the aircrafts hijacked in the September 11th attacks crash landed in Somerset County, Pennsylvania before it reached its intended target. While fatalities and destruction at the intended target were avoided, all passengers on the flight perished.

While the largest scale terrorist incidents have often had international stimuli, many other incidents are caused by home grown actors who may have become radicalized through hate groups either in person or via the internet, and who may struggle with mental health issues. Hate groups such as the Ku Klux Klan (KKK), Aryan Nation, the New Black Panther Party, and more recently, the Alt-Right, Antifa, anarcho-communists, Proud Boys, plus conspiracy theorist believers/promoters such as QAnon, have been part of domestic terrorism in different forms. During the May 2020 George Floyd protests, anti-police individuals associated with one or more of the groups created incendiary devices to burn down the Minneapolis Third Precinct. On January 6, 2021, individuals associated with one or more of the groups, stormed the United States Capitol to disrupt the certification of the 2020 presidential election, resulting in five deaths and evacuation of Congress.

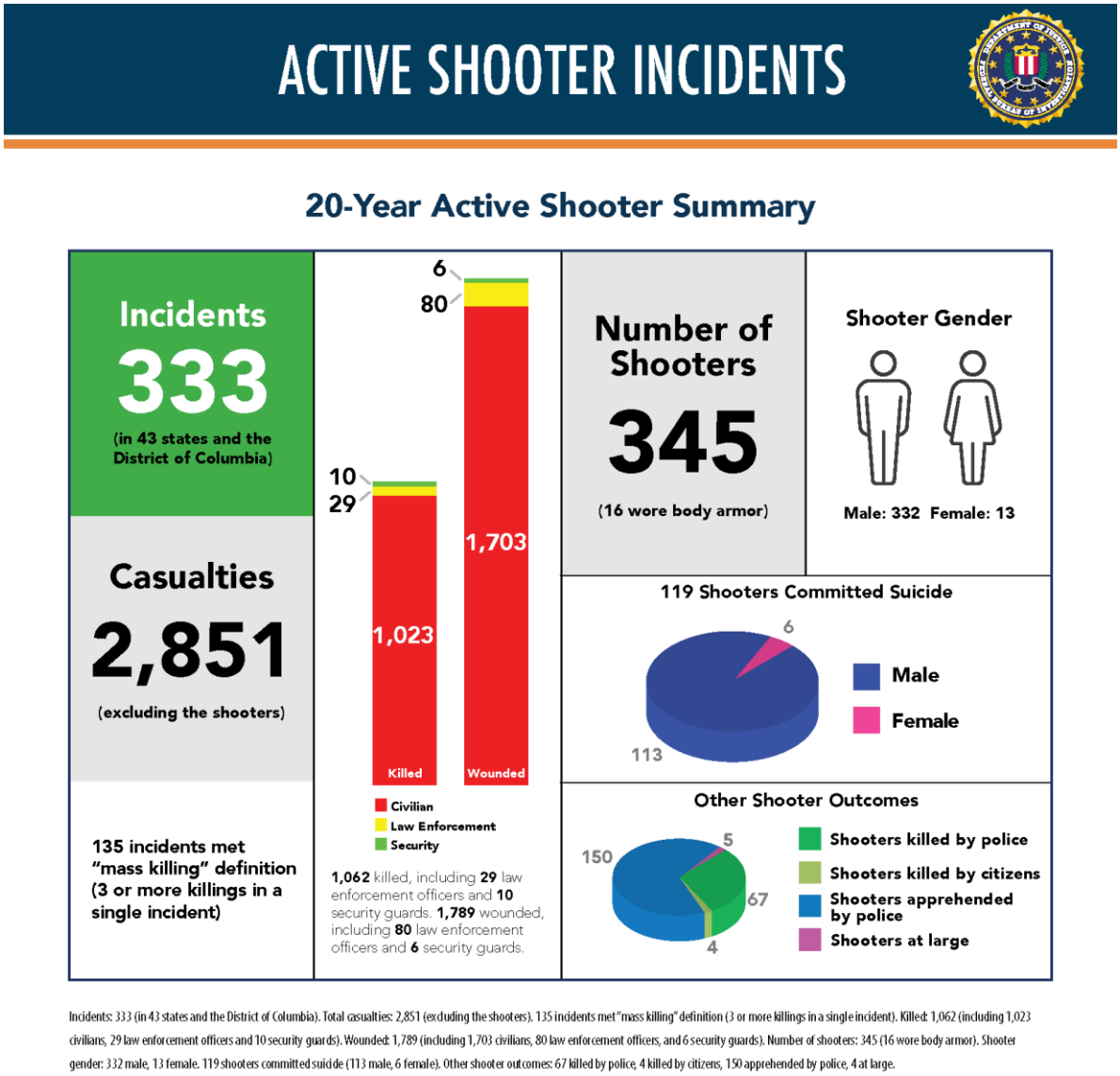
Active Shooters

An active assailant (shooter), as defined by the U.S. Department of Homeland Security, is an individual actively engaged in killing or attempting to kill people in a confined area, in most cases, active shooters use firearms and there is not necessarily a pattern or method to their selection of victims. Throughout the year in 2021, there were a total of sixty-one mass shooting

incidents in the United States according to the FBI. Data for 2022 was not compiled or available at the time of this writing. Often these shooters are HVEs. Two significant events have occurred in Pennsylvania in recent history: one occurred on October 27, 2018, when eleven people were killed by a gunman in the Pittsburgh neighborhood of Squirrel Hill; the gunman was a homegrown violent extremist and attacked the congregation of the Tree of Life Synagogue in a shooting that targeted the Jewish population and was fueled by the gunman's anti-Semitic, anti-immigrant, and anti-refugee sentiments. Another event occurred in January of 2019, where a gunman killed two people and permanently injured one inside P.J. Harrigan's bar in State College and later killed a homeowner and himself. One of the most tragic recent active shooters occurred in Uvalde, Texas, where an armored and masked gunman entered the Robb Elementary School on May 24, 2022 and killed nineteen students and two teachers. Another active shooter event occurred on November 22, 2022 when an employee at a Walmart in Chesapeake, Virginia entered the breakroom of the Chesapeake Walmart and killed six individuals before taking his own life.

Other active shooter events in the United States in recent years include Virginia Tech (April 2007), Sandy Hook Elementary School (December 2012), San Bernardino, California (December 2015), an Aurora, Colorado movie theater (July 2012) a church in Charleston, South Carolina (June 2015). An *Active Shooter Incidents 20-Year Review* by the FBI concluded that there has been a significant recent increase in frequency of active shooter incidents, and that most shooters were male. The report documents data from all the incidents, including location, commercial environments, educational environments, open spaces, military and other government properties, residential locations, houses of worship, and health care facilities (FBI, 2021). *Figure 48 – Active Shooter Incidents – 20 Year Active Shooter Summary* is one page from the report that illustrates a numerical breakdown of shooting events for those twenty years. *Figure 49 – Education Environments* shows two more summary pages from the report that detail active shooter statistics in educational environments.

Figure 48 - Active Shooter Incidents - 20 Year Active Shooter Summary



Incidents: 333 (in 43 states and the District of Columbia). Total casualties: 2,851 (excluding the shooters). 135 incidents met "mass killing" definition (3 or more killings in a single incident). Killed: 1,062 (including 1,023 civilians, 29 law enforcement officers and 10 security guards). Wounded: 1,789 (including 1,703 civilians, 80 law enforcement officers, and 6 security guards). Number of shooters: 345 (16 wore body armor). Shooter gender: 332 male, 13 female. 119 shooters committed suicide (113 male, 6 female). Other shooter outcomes: 67 killed by police, 4 killed by citizens, 150 apprehended by police, 4 at large.

Active Shooter Incidents 20-Year Review, 2000-2019 4

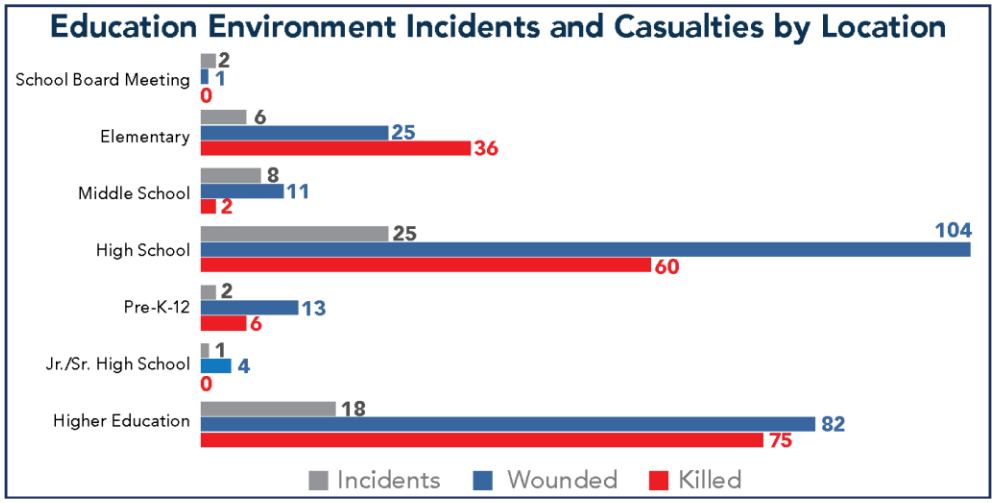
Figure 49 - Education Environments

ACTIVE SHOOTER INCIDENTS

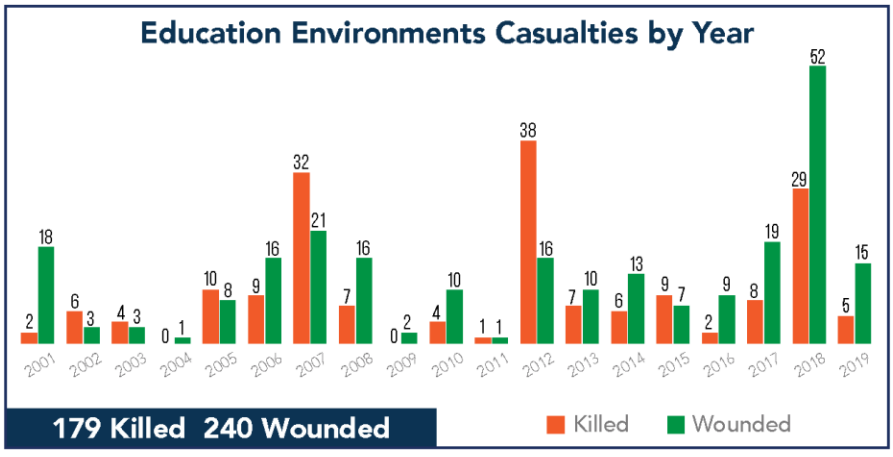
Education Environments

Quick Look:

Sixty-two incidents occurred in public and private educational settings, defined as schools covering pre-kindergarten to 12th grade, institutes of higher education, and school board meetings.



Education Environment Incidents and Casualties by Location: School Board Meeting (2 incidents, 1 wounded, 0 killed); Elementary (6 incidents, 25 wounded, 36 killed); Middle School (8 incidents, 11 wounded, 2 killed); High School (25 incidents, 104 wounded, 60 killed); Pre-K-12 (2 incidents, 13 wounded, 6 killed); Jr./Sr. High School (1 incident, 4 wounded, 0 killed); Higher Education (18 incidents, 82 wounded, 75 killed)

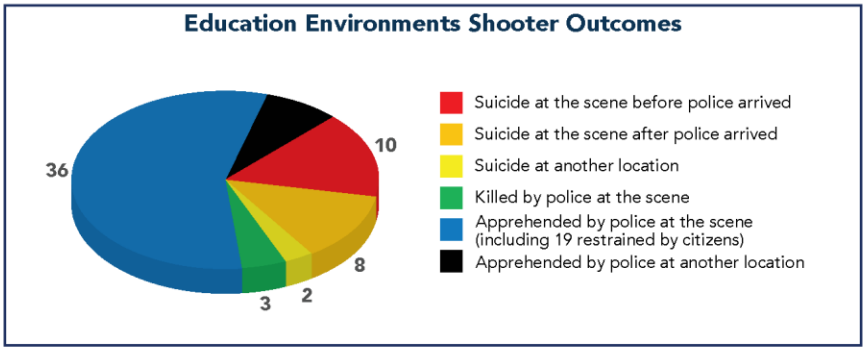


Education Environments Casualties by Year: 2001 (2 killed, 18 wounded); 2002 (6 killed, 3 wounded); 2003 (4 killed, 3 wounded); 2004 (0 killed, 1 wounded); 2005 (10 killed, 8 wounded); 2006 (9 killed, 16 wounded); 2007 (32 killed, 21 wounded); 2008 (7 killed, 16 wounded); 2009 (0 killed, 2 wounded); 2010 (4 killed, 10 wounded); 2011 (1 killed, 1 wounded); 2012 (38 killed, 16 wounded); 2013 (7 killed, 10 wounded); 2014 (6 killed, 13 wounded); 2015 (9 killed, 7 wounded); 2016 (2 killed, 9 wounded); 2017 (8 killed, 19 wounded); 2018 (29 killed, 52 wounded); 2019 (5 killed, 15 wounded)

Active Shooter Incidents 20-Year Review, 2000-2019 13

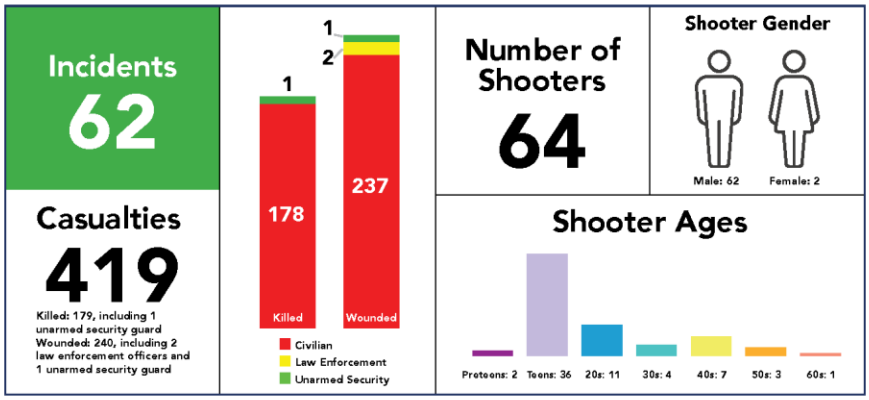
ACTIVE SHOOTER INCIDENTS

Education Environments



Education Environments Shooter Outcomes: Suicide at the scene before police arrived (10); Suicide at the scene after police arrived (8); Suicide at another location (2); Killed by police at the scene (3); Apprehended by police at the scene (including 19 restrained by citizens) (36); Apprehended by police at another location (5)

Key Findings:



Incidents: 62. Total casualties: 419. Killed: 179 (including 178 civilians and 1 unarmed security guard). Wounded: 240 (including 237 civilians, 2 law enforcement officers, and 1 unarmed security guard). Number of shooters: 64. Shooter gender: 62 male, 2 female. Shooter ages: Preteens (2); Teens (36); 20s (11); 30s (4); 40s (7); 50s (3); 60s (1).

Active Shooter Incidents 20-Year Review, 2000-2019 14

The complete report may be found here: https://www.fbi.gov/file-repository/active-shooter-incidents-20-year-review-2000-2019-060121.pdf/view.

Cyber-Threats

While Mercer County has not been the target of any critical cyber terrorist events, the county has seen multiple security breaches due to online phishing and other scams. Mercer county has seen small increases in cyber activity over the past two decades as more local governments use increasing aspects of the internet and technology.

There have been a few significant attacks in recent years. One attack took down the largest fuel pipeline in the U.S. and led to massive gasoline shortages; it was the result of a single compromised password. Hackers gained entry into the networks of Colonial Pipeline Company on April 29, 2021 through a virtual private network account, which allowed employees to remotely access the company's computer network. On May 7, 2021, a ransom of $4.4 million was demanded by the hackers, causing Colonial to shut down the entire supply line, immediately prompting temporary gasoline shortages and panic buying up and down the East Coast. The hackers, who were an affiliate of a Russian-linked cybercrime group known as *DarkSide*, were paid the ransom. The hackers also stole nearly 100 gigabytes of data from Colonial Pipeline and threatened to leak it if the ransom was not paid, according to Bloomberg News.

In early June 2021, JBS, the world's largest meat company by sales, paid an $11 million ransom to cybercriminals who temporarily knocked out plants that process roughly one-fifth of the nation's meat supply. The ransom payment, in bitcoin, was made to shield JBS meat plants from further disruption and to limit the potential impact on restaurants, grocery stores and farmers that rely on JBS, according to the company.

The attack on JBS was part of a wave of incursions using ransomware, in which companies are hit with demands for multimillion-dollar payments to regain control of their operating systems. The attacks show how hackers have shifted from targeting data-rich companies such as retailers, banks and insurers to essential-service providers such as hospitals, transport operators and food companies.

4.3.19.4 Future Occurrence

The likelihood of Mercer County being a primary target for a major international terrorist attack is small and unlikely. More likely terrorist activity in Mercer County includes bomb threats or other incidents at schools. Mercer County has fourteen school districts consisting of thirty-five public schools and two private schools. Several private schools and colleges/universities are also located in Mercer County. These locations are considered soft targets and may be vulnerable, especially to domestic incidents.

4.3.19.5 Vulnerability Assessment

Mercer County should stay prepared for terroristic events. The existence of industrial commerce, interstate highways and freight railroad activity create soft targets that could be used to interfere with the focus of day-to-day life that the county experiences. It is important to note that the use of and exposure to biological agents can remain unknown for several days until the infected person(s), livestock, or crops begin to experience symptoms or show damages. Often such agents are contagious, and the infected person(s) must be quarantined, livestock culled, and/or crops destroyed.

Although previous events have not resulted in what are considered to be significant terrorist attacks, the severity of a future incident cannot be predicted with a total level of certainty. One of the major concerns with agroterrorism is that acts can be carried out with minimal planning, effort, or expense.

Acronis, a global technology company that develops on-premises and cloud software for backup, disaster recovery, and secure file sync and share and data access, issues an annual threat scape report on cybercrime. Entitled *The Acronis Cyberthreats Report*, it contains an in-depth review of the current threat landscape and projections for the coming year. Based on the protection and security challenges that were amplified by the shift to remote work during the COVID-19 pandemic, Acronis warns aggressive cybercrime activities will continue as criminals pivot their attacks from data encryption to data exfiltration.

The major points illustrated in the report are as follows:

- Attacks against remote workers will increase due to the movement of workers to less secure working areas.
- Ransomware will look for new victims and will become more automated.
- Legacy IT and technical solutions will struggle to keep pace with ransomware and cybercrime attacks.

According to a study carried out on the data sourced from the Federal Bureau of Investigation, Pennsylvania is ranked second worst among states when it comes to handling cyber-attacks. The study made by Information Network Associates – an international security consulting company – says an increase of 25% was witnessed in cyber-attacks between 2016 and 2017. This illustrates the amount of preparation that must occur in the commonwealth so that it can better respond to potential cybercrime attacks.

Mercer County will continue to see cyber attacks on a local and small scale. Cyber attacks are effecting more and more local governments and municipalities as criminals look for easy targets

and information technology infrastructure that is vulnerable and has not been updated. All local governments and municipalities must be vigilant to cyber-attacks.

The probability of terrorist activity is more difficult to quantify than some other hazards. Instead of considering the likelihood of occurrence, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in communities, planning efforts can be put in place to reduce the risk of attack. Planning should work towards identifying potentially at-risk critical infrastructure and functional needs facilities in the community, prioritizing those assets and locations, and identifying their vulnerabilities relative to known potential threats.

All communities in Mercer County are vulnerable on some level, directly or indirectly, to a terrorist attack. However, communities with schools and government infrastructure like the county seat, should be considered more likely to attract terrorist activity.

4.3.20. Transportation Accidents

4.3.20.1 Location and Extent

Transportation accidents are defined as accidents involving highway, air, and rail travel. These incidents are collectively the costliest of all hazards in the Commonwealth in terms of lives lost, injuries, and economic losses. The sheer amount of roadway, coupled with the high volume of traffic, creates the potential for serious accidents along the roads and bridges. In Mercer County there are 438 state maintained and 165 bridges on locally maintained roads, according to PennDOT. Major transportation routes in Mercer County include interstates 79, 80, and 376, as well as state US highways 19, 62, and 322. Other state routes are also present in the county including PA 18, 58, 158, 173, 208, 258, 318, 358, 418, 518, 718, 760, 846, and 965. *Figure 50 – Major Transportation Routes* shows the major transportation systems in Mercer County.

Mercer County has two public airports - Greenville Municipal Airport in Greenville, Pennsylvania, and Grove City Airport in Grove City, Pennsylvania. There exists a potential extent for air transportation accidents to occur due to the number of commercial air traffic that flyovers the county every day. However, a two-mile radius around each airport can be considered a high-risk area since most aviation incidents occur near take-off and landing sites. *Figure 51 – Airports and Vulnerability Zones*.

There are several freight and passenger rail lines in Mercer County. The railroad companies that operate within Mercer County, include the Norfolk Southern Railway and Canadian National/Bessemer, Western New York and Pennsylvania, and Lake Erie Railway. With the ability of these railroads for interchanging with other companies, goods can be transported virtually anywhere via rail from Mercer County. Rail transportation accidents are generally classified as one of these three types:

- Derailment – an accident on a railway in which a train leaves the rails
- Collision – an accident in which a train strikes something such as another train or highway motor vehicle
- Other – accidents caused by other circumstances like obstructions on rails, fire, or explosion

Rail transportation is divided into two major categories: freight and passenger. Each category can be subdivided according to carrier type: major carrier and local/regional carriers. Rail accidents can occur anywhere along the miles of rail located in Mercer County.

There are 1,669 active, conventional oil and gas wells located in Mercer County and 100 active, unconventional oil and gas wells. Pipeline infrastructure is seen throughout the county. There are two major pipeline companies that transport hazardous materials related to natural gas in and

through Mercer County. Of these major pipelines, both are for natural gas only. *Figure 53 – Utility Pipelines Vulnerability* shows the various pipelines that run through Mercer County.

4.3.20.2 Range of Magnitude

Significant passenger vehicle, air, and rail transportation accidents can result in a wide range of outcomes from damage solely to property to serious injury or even death. The majority of motor vehicle crashes in Pennsylvania are non-fatal, but PennDOT estimates that every hour nine people are injured in a car crash, and every seven hours someone dies as a result of a car crash. Most fatal crashes occur in May and June, but the highest number of crashes overall occur in October, November, and December. Inclement weather and higher traffic volumes and speeds increase the risk for automobile accidents.

Railway and roadway accidents have the potential to result in hazardous materials release. Railroad accidents occur with less frequency than highway accidents. However, when these types of incidents occur, they often cause extensive property damage and have the potential to cause serious injuries or deaths.

The worst-case scenario for a transportation accident impacting the county would be a road accident at the I-80 and I-79 interchange in Findley Township, with a potential for major road closures on both highways. This would create a large traffic obstruction for both north/south routes and east/west routes. Primary transportation would have to be rerouted along turnpikes, taking trucks and motorists well out of their way. A hazardous material event at that interchange, located in the southern central portion of the county could constitute an immediate health hazard to the population and require evacuation of high population areas close by, specifically Mercer Borough and Grove City Borough.

4.3.20.3 Past Occurrence

Table 73 – PennDOT Crash Report for Mercer County shows crash statistics recorded by the Pennsylvania Department of Transportation between 2011 and 2021. Reports for 2022 were not available at the time of this report. The year 2011 had the most total crashes in Mercer County while 2020 had the least total cashes. The number of total crashes has declined over the span of ten years between 2011 and 2021 in the county. The most train with vehicle crashes occurred in 2019 with a total of two crashes happening in the county. The decline in transportation accidents in 2020 can be contributed to the increase in remote work and limited travel due to the COVID-19 pandemic. With a large portion of the county's population being laid off or moved to remote work status with jobs, there were simply fewer vehicles on the road.

The majority of municipalities noted, on the municipality hazard identification worksheet they received, that there was no change for transportation accidents between the previous hazard mitigation plan update and this hazard mitigation plan update. Five municipalities, however, did note that the incidence and vulnerability for them to transportation accidents has increased. These comments can be found discussed in greater detail in the vulnerability assessment section of this hazard profile. The increase noted on the hazard identification worksheets will also have an effect on the future occurrence in the Deer Creek Township, Hempfield Township, the City of Hermitage, Pymatuning Township, and Shenango Township.

Table 73 - PennDOT Crash Report for Mercer County

PennDOT Crash Report for Mercer County								
Year	Vehicle accidents for Mercer County				Vehicle Accident Deaths for Mercer County			Train/Trolley with Motor Vehicle Crashes/ Fatalities
	Total	Fatal Accidents	Injury Crashes	Property Damage Only	Total Vehicle Accident Fatalities	Alcohol-Related Fatalities	Pedestrian Fatalities	
2011	1,356	19	711	626	8	6	2	0
2012	1,280	15	630	635	9	9	0	0
2013	1,287	23	599	665	10	8	2	0
2014	1,216	14	554	648	5	3	2	1
2015	1,260	12	558	690	1	1	0	1
2016	1,300	15	545	740	3	2	1	1
2017	1,291	9	548	734	3	3	0	0
2018	1,223	11	486	726	9	7	2	0
2019	1,129	14	468	647	4	3	1	2
2020	969	12	370	587	6	5	1	0
2021	1,172	11	494	667	5	4	1	1

4.3.20.4 Future Occurrence

Mercer County's population has decreased over the last decade, so it can be assumed that local traffic has decreased slightly as well. However, with the increasing volume of goods and trucking through the county, transportation accidents will continue to occur routinely. Hazardous material release through transportation accidents is difficult to predict but can be assumed to happen in future events as well. The U.S. Census Bureau reports the mean travel time to work for those aged 16 plus is approximately twenty-four minutes. Automobile accidents occur frequently, and typically occur more frequently than rail or aviation accidents. In the case of highway accidents, PennDOT has taken great strides to reduce the number of highway

transportation accidents through programs such as the Pennsylvania Highway Safety Corridor. In this program, PennDOT designates sections of highway where traffic citation fines are doubled in the hopes that higher fines will deter unsafe diving and reduce accidents. Transportation accidents are impossible to predict accurately; however, areas prone to these hazards can be located, quantified through analysis of historical records, and plotted on countywide and municipal base maps.

The City of Hermitage will likely see an increase in tractor trailer traffic as a large distribution center will be brought into the city. The City of Hermitage stated on their hazard identification worksheet that the new distribution center will have tractor trailers arriving at or departing from the center approximately every seven minutes. This will add a large amount of trucks to the roads in the City of Hermitage, and with that increase, comes the chance of greater transportation accidents.

Shenango Township mentioned in their hazard identification worksheet that increased construction projects along the I-80 corridor increase the amount of traffic, and thus the amount of traffic accidents that occur every year.

4.3.20.5 Vulnerability Assessment

A transportation accident can occur anywhere in Mercer County, at any time. However, severe accidents are more likely to occur on the county's major highways due to the heavier traffic volumes which make highways extremely vulnerable. The vulnerability for accidents on either highway, railway, or aviation, are directly related to the population and traffic density within the county. The vulnerability increases if there are hazardous materials involved. Hazards associated with causing transportation accidents can include natural hazards that affect the environment, such as winter storms or heavy rains that cause slippery roadways or mud slides, to windstorms or tornadoes that cause high-profile vehicles or train cars to topple over. Loss of roadway use, and public transportation services would affect commuters, employment, delivery of critical municipal and emergency services, and day-to-day operations within the county.

With highway accidents, there is an added vulnerability that stems from the age and upkeep of bridges throughout the county. Unrepaired, deficient bridges may be more likely to break, thus leading to highway transportation damages or deaths. Approximately 50% of Mercer County bridges are in poor condition or are in need of some form of repair, indicating an increased vulnerability to transportation accidents, while 50% remain in fair condition.

Studying traffic and potential transportation accident patterns could provide information on vulnerability of specific road segments and nearby populations. Increased understanding of the types of hazardous materials transported through the county will also support mitigation efforts. Maintaining a record of these frequently transported materials can facilitate development of

preparatory measures for response to a release. *Figure 52– Average Daily Traffic on Major Highway Vulnerability* identifies all major highways and railroads within Mercer County.

The development of construction projects, distribution centers for shipping and receiving, and increased development along major highways will increase the vulnerability of Mercer County to transportation accidents. Reductions in police forces will also account of less traffic patrols throughout not only the county, but the Commonwealth of Pennsylvania and the country as a whole. The proliferation of distracted driving can also increase the amount of transportation and traffic accidents.

Figure 50 - Major Transportation Routes

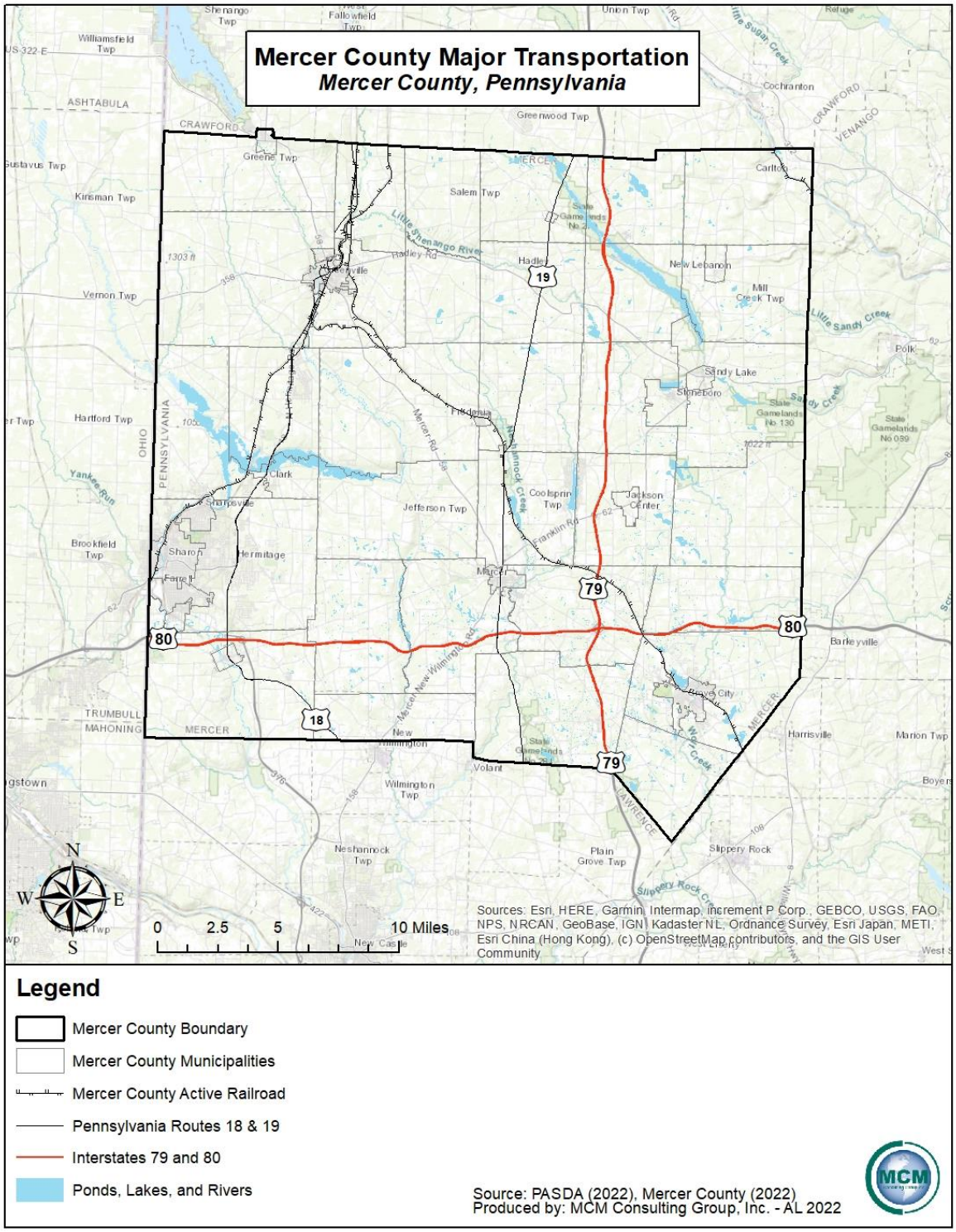
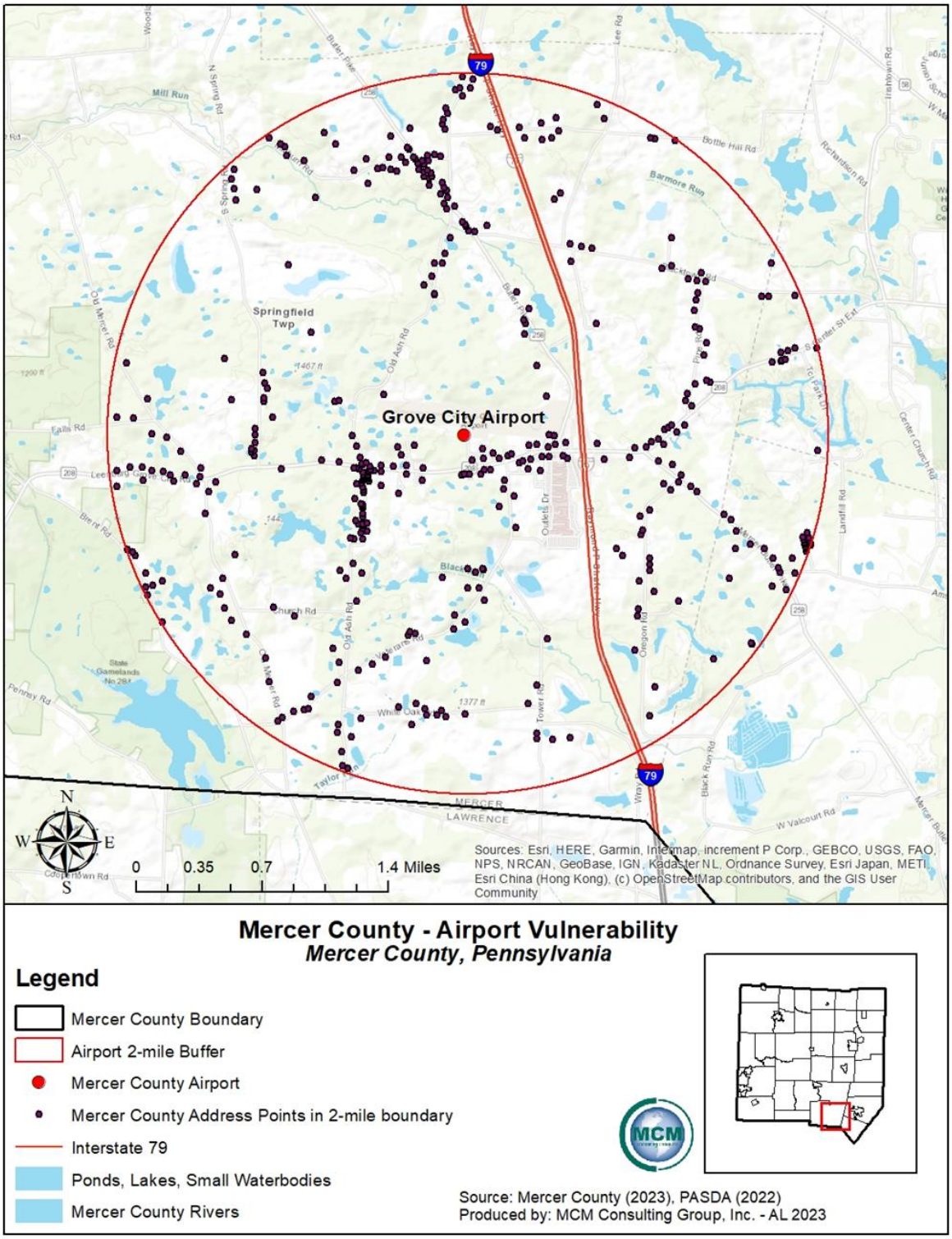
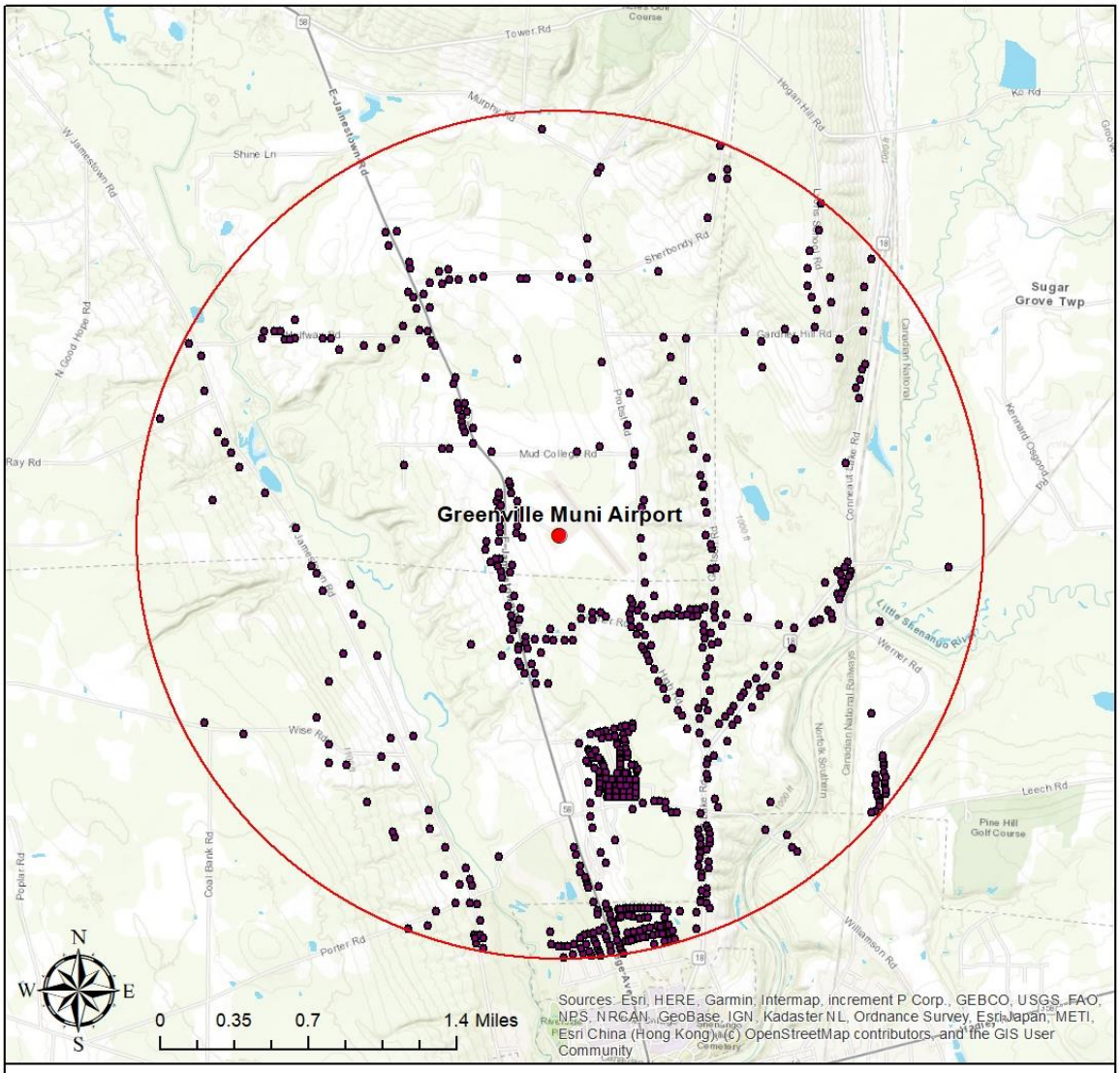


Figure 51 - Airports and Vulnerability Zones

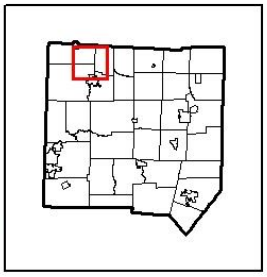




Mercer County - Airport Vulnerability
Mercer County, Pennsylvania

Legend

- Mercer County Boundary
- Airport 2-mile Buffer
- Mercer County Airport
- Mercer County Address Points in 2-mile boundary
- Interstate 79
- Ponds, Lakes, Small Waterbodies
- Mercer County Rivers



Source: Mercer County (2023), PASDA (2022)
Produced by: MCM Consulting Group, Inc. - AL 2023

Figure 52 - Average Daily Traffic on Major Highway Vulnerability

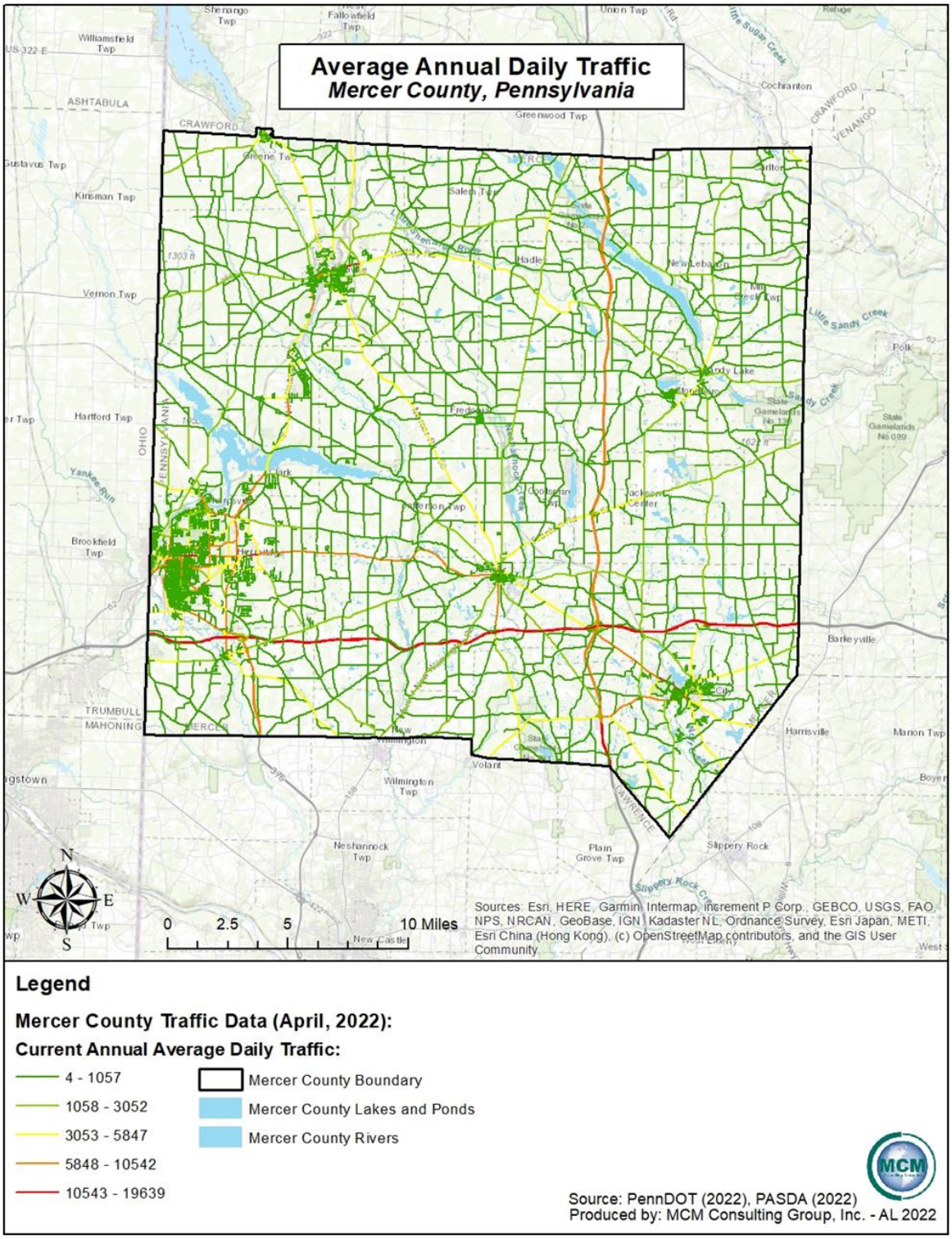
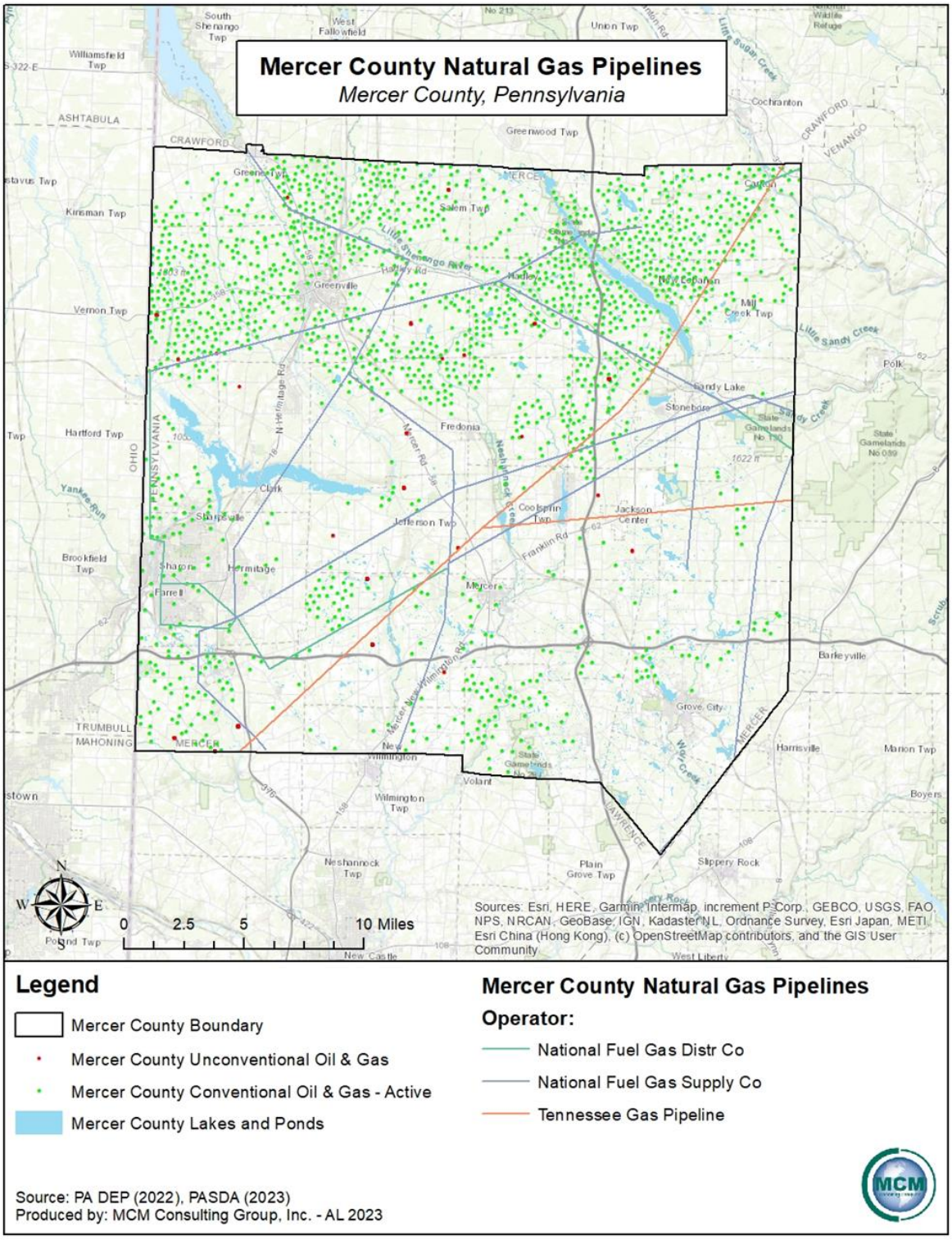


Figure 53 - Utility Pipelines Vulnerability



4.3.21. Utility Interruption

4.3.21.1 Location and Extent

Utility interruptions can occur from an internal system failure or as a secondary impact of another hazard, such as windstorm, winter storm, extreme temperatures, or a traffic accident. Strong adverse weather conditions and storms can cause widespread disruptions in electric and telecommunications service due to power lines being brought down by falling tree branches across a region. Strong heat waves may result in rolling blackouts where power may not be available for an extended period, impacting air conditioning across a region. Space weather, specifically solar flares, can also pose a threat to utility service across the globe. Although uncommon, the northeastern seaboard and the north central regions of the United States are particularly susceptible to this hazard.

The age of utility infrastructure also plays a role in interruptions, causing longer periods of outages in a larger area. Natural gas, water, telecommunications, and electric capabilities can all experience disruptions. Worker strikes at power generation facilities have also been known to cause minor and temporary power outages and failures. Other causes for minor power outages include but are not limited to vehicle accidents and wire destruction due to animals or wildlife. Outages can also be caused by blown transformers or tripped circuit breakers in the electric system. Major power outages typically occur on a regional scale and can last both short term and long term.

The list of utility providers in Mercer County is shown in *Table 74 – Mercer County Utility Providers*.

Table 74 - Mercer County Utility Providers

Mercer County Utility Providers	
Utility Type	**Name of Utility Provider**
Electricity	Penn Power - FirstEnergy
Telephone/9-1-1/Wireless	AT&T Boost Mobile Cricket Wireless DBS Telecommunication T-Mobile Verizon Wireless

Mercer County Utility Providers	
Utility Type	**Name of Utility Provider**
Natural Gas	AmeriGas Propance Heath Oil Marathon Gas Peoples Gas Pro Oil & Gas Services, LLC. Suburban Propane Tennessee Gas Pipeline Company
Water	Aqua PA Lake Latonka Aqua PA Shenango Buhl Community Water Association Fredonia Borough Municipal Water Greenville Municipal Water Authority Greystone Country Estates Grove City Borough Water Authority Jamestown Borough Water Authority Leesburg Community Water Liberty Township Water Authority New Wilmington Municipal Authority Pine Township Waterworks Sharpsville Borough Water Authority South Pymatuning Township Water Authority Stoneboro Borough Municipal Waterworks
Source: PA Public Utility Commission, 2022	

4.3.21.2 Range of Magnitude

Utility interruptions do not typically lead to large-scale problems by themselves. Typically, human casualties are not a direct result from outages. Many utility interruptions occur during storms or other severe weather events, and they can have secondary consequences. Typical secondary effects from a power outage can include a delay in emergency response and those services arriving in timely manner. A lack of potable drinking water can also become a major issue for areas impacted by utility interruptions.

Electricity:

Interruptions or power failures could have the following impacts:

- Public safety concerns
- Food spoilage
- Loss of heating or air conditioning

- Basement flooding due to sump pump failure
- Loss of indoor lighting
- Loss of internet service
- Stopped and stalled elevators
- Direct economic impact from retail settings

Of all the above listed impacts, the loss of heating or air conditioning poses the greatest risk to the elderly and very young populations during times of extreme temperature. Prolonged power outages also pose a risk to residents that rely on home-based medical equipment such as home-supply oxygen units. Some of the issues that are listed above can be considered more of a nuisance than a hazard, such as food spoilage due to long-term electrical outages. However, significant damage or harm can occur depending on the population affected, the duration, and the severity of the outage.

A worst-case scenario for the utility interruptions would be a county-wide power outage during winter months, forcing the evacuation of vulnerable populations to facilities outside of the county or to warming shelters within the county.

Fuel:

Interruptions of the transportation of gas and other products used for fuel can lead to a loss of heating and manufacturing capabilities. This can adversely affect the economic stability of a region and the production of needed products for consumption.

Telecommunications:

Interruptions to telecommunications systems include impacts to the 9-1-1 capabilities of a region, telephone, and internet service. The greatest risk in losing this utility to interruption is the risk of an emergency not being able to be reported to a public safety answering point (PSAP). Extensive loss of telephone and internet service can be detrimental to government, businesses, and to residents. With much of the country now dependent on wireless networks, signal interruptions can cause a large issue for people who are utilizing wireless telecommunications for work. There are also many concerns regarding safety and internet security due to the increase in people working over wireless networks that occurred during the COVID-19 pandemic. These interruptions and issues can be detrimental for the Mercer County workforce.

4.3.21.3 Past Occurrence

Minor utility interruptions occur annually in Mercer County and occur most often in conjunction with winter weather and/or windstorms. Mercer County utilizes a database system to track incidents within the county. There was minimal information from the county's reporting

software that could be used for the table listed below. Additional data was provided by Penn Power in listing electric interruptions over the past five years. *Table 75 – Utility Interruptions in Mercer County* illustrates the number of interruptions to electric, natural gas, telecommunications, and water services between 2018 and 2022.

Table 75 - Utility Interruptions in Mercer County

Utility Interruptions in Mercer County		
Date	**Event Type**	**Location**
06/23/2018	Power Line Failure	Mercer County
11/16/2018	Unknown	Mercer County
11/23/2018	Water Main Break	Mercer County
12/15/2018	Wires / Pole Down	Mercer County
02/22/2019	Boil Water Advisory	Mercer County
02/25/2019	Operating System Down	Mercer County
04/14/2019	Unknown	Mercer County
04/29/2019	Wastewater Plant Overflow	Mercer County
05/13/2019	Boil Water Advisory	Mercer County
05/28/2019	Trees Event	Mercer County
06/10/2019	Equipment Failure	Mercer County
06/02/2020	Trees Event	Mercer County
10/31/2020	AHN Grove City Power Issues	Grove City
07/16/2021	Trees Event	Mercer County
10/03/2021	Unknown	Mercer County
10/04/2021	Unknown	Mercer County
05/19/2022	Trees Event	Mercer County
05/21/2022	Trees Event	Mercer County
05/22/2022	Multiple Trees and Wires Down	Mercer County
06/22/2022	Boil Water Advisory	Mercer County
06/27/2022	Boil Water Advisory	Mercer County
08/09/2022	Boil Water Advisory	Mercer County
10/17/2022	Trees Event	Mercer County
Source: Mercer County, 2022, Penn Power, 2022		

The Pennsylvania Public Utility Commission tracks the reliability of electric distribution companies (EDC) and outages. *Table 76 – 2018 Winter Storms Riley and Quinn Power Outages* by EDC compares the customers affected by power outage in Pennsylvania during these storm events and compares the to statistics from Nika from 2014 and Sandy from 2012. Some of the EDCs were not impacted by Winter Storm Quinn. PP&L customers experienced power outages

for a duration of eight days with Winter Storm Quinn and Winter Storm Riley, whereas during Sandy in 2012, the duration was nine days. Nika in 2014 had a duration of just over three days.

Table 76 - 2018 Winter Storms Riley and Quinn Power Outages

2018 Winter Storms Riley and Quinn Power Outages			
Electric Distribution Company	**Customers affected by storms Riley and Quinn 2018 (Percentage of total customers)**	**Customers affected by Nika 2014 (Percentage of total customer)**	**Customers affected by Sandy 2012 (Percentage of total customers)**
Met-Ed	272,928 (49.22%)	144,000 (26.00%)	298,300 (54.00%)
PECO	794,969 (46.76%)	723,681 (42.00%)	845,703 (54.20%)
Penelec	90,856 (15.61%)	N/A	96,847 (16.40%)
PCLP	2,101 (47.44%)	N/A	4,487 (100.00%)
PP&L	261,341 (18.67%)	92,283 (7.00%)	523, 936 (37.50%)
Total:	**1,422,195**	**959,964**	**1,769,273**
Source: Winter Storm Riley and Quinn Report 2019			

Other past significant events of utility interruptions in the United States occur on a regional basis and can have varied effects related to number of impacted customers. A large water treatment plant failure occurred in Jackson, Mississippi in August of 2022 after flooding impacted the treatment facility. The city of Jackson was left without safe drinking water for close to two months until the water was deemed safe and potable in October of 2022. This event stood out as a large scale failure of community lifelines and utilities. This event also opened discussions related to equity in infrastructure repairs, as the repairs took a significant amount of time in a vulnerable socio-economic area.

4.3.21.4 Future Occurrence

Utility Interruptions are difficult to predict, and minor interruptions may occur several times a year to all utilities. Even so, utility interruptions occur more frequently as a secondary factor to severe weather events or transportation accidents.

Space weather is getting more attention as an infrastructure risk due in part to a March 2020 report by the United States Geological Survey (USGS). The report noted that geomagnetic storms caused by the dynamic action of the Sun and solar wind on the space environment surrounding the Earth can generate electric fields in the Earth's crust and mantle. These electric fields can interfere with the operation of grounded electric power-grid systems. Geomagnetic storms occur only occasionally, but when sufficiently energetic they can produce blackouts on a large scale.

As utility infrastructure ages, interruption events could occur more frequently if the maintenance of the infrastructure is not maintained. Utility providers can reduce Mercer County's vulnerability to power outages by implementing improvement plans for utility infrastructure. Total replacement is not a feasible solution to the issue, but compromises can be reached to ensure that the new and old equipment along a utility line can work together efficiently.

4.3.21.5 Vulnerability Assessment

Resources such as electricity, communications, gas, and water supply are critical to ensure the health, safety, and general welfare of the citizenry. *Figure 54 – Mercer County Utilities* illustrates the approximate locations of service lines, power plants, and electric substations throughout Mercer County.

Power outages can cause even greater detriment to at-risk and vulnerable populations, such as elderly (e.g., supplemental oxygen power needs) or those with functional and access needs to consider. All critical infrastructure is vulnerable to the effects of a power surge. The probability of a large-scale, extended utility failure is low; however, small-scale failures lasting short periods of time occur annually.

Long-term care facilities, senior centers, hospitals, and emergency medical facilities are all vulnerable to utility interruptions. Often back-up power generators are used at these facilities to offset electrical needs during extreme hot or cold temperature events. However, these back-up power generators must be maintained, and fuel supplies must be secured in advance of the utility interruption to ensure a seamless transition from the everyday, grid power source to the emergency generator. When officials consider maintenance and supplies for a facility, long-term use of back-up generators should be planned.

<u>Electricity:</u>

Severe weather is one of the largest causes of power loss. The electric power grid infrastructure can be damaged by snow, ice, high winds, lightning, flooding, falling tree limbs, and vehicle accidents involving utility poles. Small animals can also cause minor power outages by climbing along the lines and shorting out the system.

Causes of a regional scale power outage or failure could be from infrastructure failure, sabotage, human error, or worker strikes. Community lifeline facilities are vulnerable to utility interruptions, especially the loss of power. The establishment of reliable backup power at these facilities is extremely important to provide continued support of the health, safety, and well-being of Mercer County residents and visitors.

The occurrence of severe weather related utility interruptions will increase due to climate change in the Commonwealth of Pennsylvania and the United States as a whole. Climate change will cause weather to become more severe on a more frequent basis.

Water:

Water distribution can be affected in three ways.

- The amount of water available (depends on nature)
- The quality of the water (depends on human responsibility)
- The viability of the physical components of the distribution system

Well contamination or water shortages due to drought could pose a high vulnerability to local water distribution. Drought events will continue to occur more frequently as climate change alters that available amount of ground water for consumption. This will result in greater well shortages and water utility interruptions for citizens that have well water.

Water contamination can occur naturally, by human error, or intentionally. Releases of manure and milk into the water supply can cause contamination. Overflows from sewage systems and lagoons on farms can also cause contamination of groundwater and drinking water. There are times when accidental spills and releases of hazardous materials contaminate water supplies, thereby, water supplies along transportation routes may be affected.

Old infrastructure for distribution also leaves a large portion of the population open to vulnerability of a water interruption.

Gas and Liquid Pipelines:

Interruptions to natural gas distribution lines could be affected by:

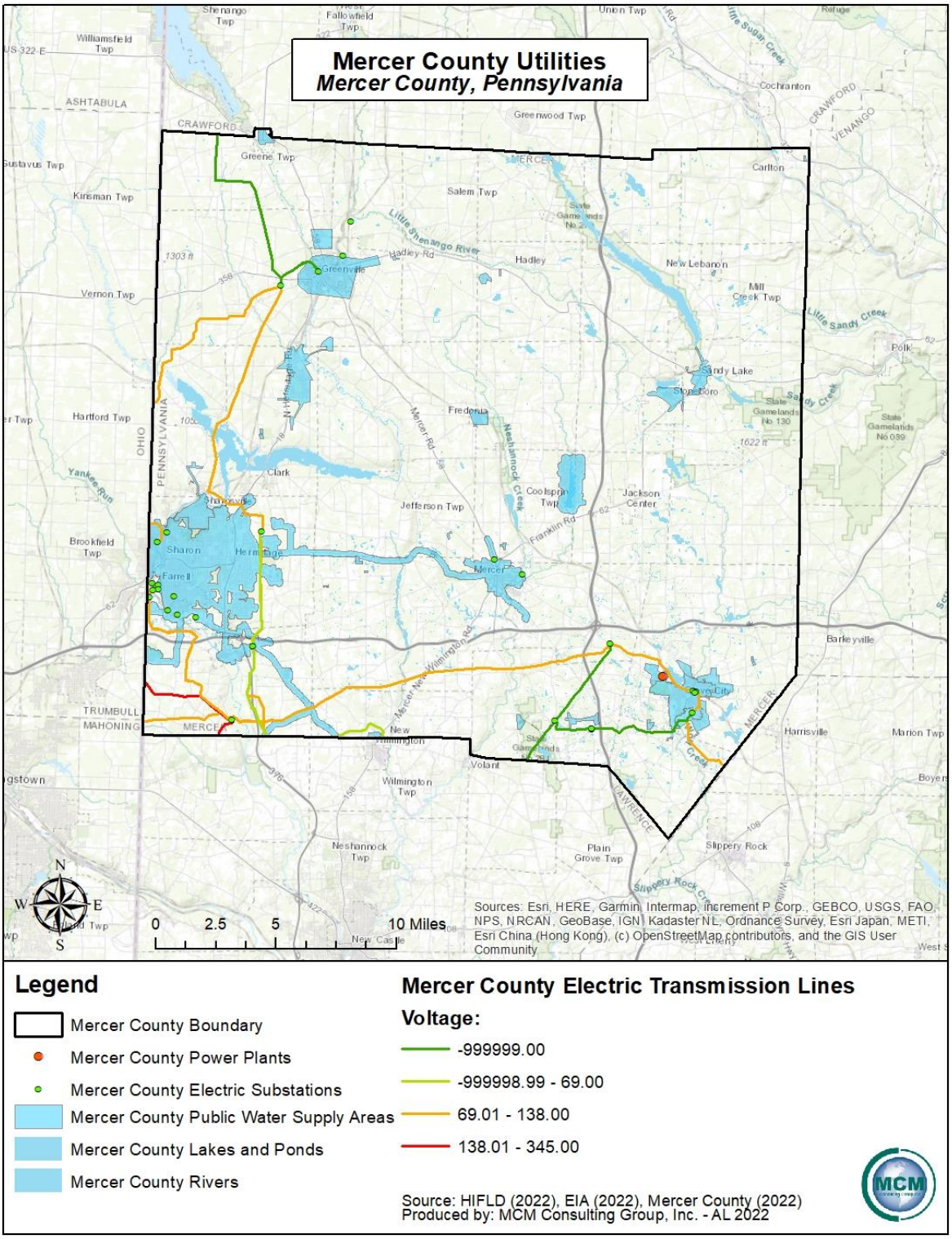
- Deterioration of line and facilities
- Puncturing the distribution lines by humans (either intentional or accidental)
- Coastal or winter storms
- Extreme heat or cold events
- Transportation accidents

Communications:

Interruptions in communications could be caused as a secondary effect of storms or high winds, infrastructure failure, or by humans (intentional or accidental). A loss of communications by emergency services would be devastating to the population of Mercer County if 9-1-1 calls could not be received, or if emergency units could not be dispatched properly and/or timely.

No data regarding economic impacts from utility interruptions in Mercer County are available. However, utility interruptions can cause economic impacts stemming from lost income, spoiled food and other goods, costs to the owners or operators of the utility facilities, and costs to government and community service groups.

Figure 54 - Mercer County Utilities



4.4. Hazard Vulnerability Summary

4.4.1. Methodology

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A risk factor (RF) is a tool used to measure the degree of risk for identified hazards in a particular planning area. The RF can also assist local community officials in ranking and prioritizing hazards that pose the most significant threat to a planning area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, general consensus from the planning team and information collected through development of the hazard profiles included in Section 4.3. The RF approach produces numerical values that allow identified hazards to be ranked against one another; the higher the RF value, the greater the hazard risk.

RF values were obtained by assigning varying degrees of risk to five categories for each of the hazards profiled in the HMP update. Those categories include *probability*, *impact, spatial extent, warning time and duration*. Each degree of risk was assigned a value ranging from one to four. The weighting factor agreed upon by the planning team is shown in *Table 78 – Risk Factor Approach Summary* To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the following example equation:

Table 77 - Risk Factor Approach Value

Risk Factor Value =
[(Probability x .30) + (Impact x .30) +(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Table 78 – Risk Factor Approach Summary summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Table 78 - Risk Factor Approach Summary

Summary of Risk Factor Approach Used to Rank Hazard Risk.					
RISK ASSESSMENT CATEGORY	**DEGREE OF RISK**				**WEIGHT VALUE**
	LEVEL	**CRITERIA**		**INDEX**	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	**UNLIKELY** **POSSIBLE** **LIKELY** **HIGHLY LIKELY**	LESS THAN 1% ANNUAL PROBABILITY BETWEEN 1 & 10% ANNUAL PROBABILITY BETWEEN 10 &100% ANNUAL PROBABILITY 100% ANNUAL PROBABILTY		1 2 3 4	30%
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	**MINOR** **LIMITED** **CRITICAL** **CATASTROPHIC**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES. MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY. MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK. HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.		1 2 3 4	30%
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	**NEGLIGIBLE** **SMALL** **MODERATE** **LARGE**	LESS THAN 1% OF AREA AFFECTED BETWEEN 1 & 10% OF AREA AFFECTED BETWEEN 10 & 50% OF AREA AFFECTED BETWEEN 50 & 100% OF AREA AFFECTED		1 2 3 4	20%
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**MORE THAN 24 HRS** **12 TO 24 HRS** **6 TO 12 HRS** **LESS THAN 6 HRS**	SELF-DEFINED SELF-DEFINED SELF-DEFINED SELF-DEFINED	*(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1 2 3 4	10%
DURATION *How long does the hazard event usually last?*	**LESS THAN 6 HRS** **LESS THAN 24 HRS** **LESS THAN 1 WEEK** **MORE THAN 1 WEEK**	SELF-DEFINED SELF-DEFINED SELF-DEFINED SELF-DEFINED	*(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1 2 3 4	10%

4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, *Table 79 – Risk Factor Assessment* lists the risk factor calculated for each of twenty-seven potential hazards identified in the 2023 HMP. Hazards identified as *high* risk have risk factors greater than 2.5. Risk factors ranging from 2.0 to 2.4 were deemed *moderate* risk hazards. Hazards with risk factors 1.9 and less are considered *low* risk.

Table 79 - Risk Factor Assessment

Mercer County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	HAZARD NATURAL(N) OR HUMAN-CAUSED (H)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Pandemic, Epidemic, and Infectious Disease	4	4	4	1	4	**3.7**
	Flash Flood	4	3	3	4	4	**3.5**
	Winter Storm	4	3	4	3	3	**3.5**
	Emergency Services (NEW)	4	3	4	1	4	**3.4**
	Opioid Epidemic (New)	4	3	4	1	4	**3.4**
	Windstorm	4	3	3	3	3	**3.3**
	Environmental Hazards: Transportation	4	3	3	4	2	**3.3**
	Transportation Accidents	4	3	3	4	2	**3.3**
	Tornado	3	3	3	4	4	**3.2**
	Terrorism (New)	4	3	3	4	1	**3.2**
	Utility Interruptions (New)	4	2	4	3	3	**3.2**
	Radon Exposure (New)	4	2	4	1	4	**3.1**
	Subsidence and Sinkhole	3	2	3	4	4	**2.9**
	Dam Failure	1	4	3	3	4	**2.8**
	Flood	2	3	3	1	4	**2.6**

Mercer County Hazard Ranking Based on RF Methodology.							
HAZARD RISK	HAZARD NATURAL(N) OR HUMAN-CAUSED (H)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	ECONOMIC IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
	Hurricane and Tropical Storm	3	2	4	1	2	**2.6**
	Invasive Species	4	1	3	1	4	**2.6**
	Nuclear Incident	1	3	3	4	4	**2.6**
	Drought	2	2	4	1	4	**2.5**
MODERATE	Cyberterrorism (New)	4	2	1	1	3	**2.4**
	Environmental Hazards: Fixed Facility	2	2	2	4	1	**2.1**
	Ice Jam Flood	2	1	3	3	2	**2**
	Civil Disturbance	2	2	2	2	2	**2**
	Levee Failure	1	2	2	3	4	**2**
LOW	Wildfire (New)	1	2	1	4	3	**1.8**
	Earthquake	1	1	2	3	3	**1.6**
	Landslide	1	2	1	1	4	**1.6**

Based on these results, there are nineteen high risk hazards, five moderate risk hazards, and three low risk hazards in Mercer County. Mitigation actions were developed for all high, moderate, and low risk hazards (see section 6.4). The threat posed to life and property for moderate and high-risk hazards is considered significant enough to warrant the need for establishing hazard-specific mitigation actions. Mitigation actions related to future public outreach and emergency service activities are identified to address low risk hazard events.

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. *Table 80 – Countywide Risk Factor Assessment* shows the different municipalities in Mercer County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the county as a whole. This table was developed by asking each municipality to complete a risk factor analysis comparison during the municipal mitigation strategy meetings.

Table 80 - Countywide Risk Factor

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Pandemic, Epidemic, and Infectious Disease	Flash Flood	Winter Storm	Emergency Services	Opioid Epidemic	Windstorm	Environmental Hazards: Transportation	Transportation Accident	Tornado
	3.7	3.5	3.5	3.4	3.4	3.3	3,3	3,3	3.2
City of Farrell									
City of Hermitage	<	<	=	=	=	=	=	<	>
City of Sharon	<	<	<	<	<	<	<	<	<
Clark Borough	=	<	=	=	=	>	=	=	=
Coolspring Township	<	=	=	=	=	=	=	=	=
Deer Creek Township	<	=	=	>	>	=	>	=	=
Delaware Township	=	=	=	<	=	<	=	=	<
East Lackawannock Township	=	<	=	=	=	=	<	=	=
Fairview Township	=	=	=	=	=	=	=	=	=
Findley Township	=	<	<	<	=	<	<	<	<
Fredonia Borough									
French Creek Township	<	>	>	>	<	=	<	=	>
Greene Township	=	=	=	=	=	=	<	<	=
Greenville Borough									
Grove City Borough	=	=	=	<	<	=	=	=	=
Hempfield Township	=	=	=	>	=	>	=	=	=
Jackson Township	=	<	=	=	=	=	=	>	=
Jackson Center Borough	=	<	=	=	<	=	<	<	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Pandemic, Epidemic, and Infectious Disease	Flash Flood	Winter Storm	Emergency Services	Opioid Epidemic	Windstorm	Environmental Hazards: Transportation	Transportation Accident	Tornado
	3.7	3.5	3.5	3.4	3.4	3.3	3,3	3,3	3.2
Jamestown Borough	=	>	=	>	=	=	=	=	=
Jefferson Township	<	<	=	=	<	=	<	=	<
Lackawannock Township	=	<	=	>	<	=	>	=	=
Lake Township	=	=	=	>	=	>	=	=	=
Liberty Township	=	=	=	=	=	=	=	=	=
Mercer Borough	=	=	=	>	>	=	=	=	=
Mill Creek Township									
New Lebanon Borough	=	<	>	>	=	>	>	>	=
New Vernon Township	=	=	=	=	<	=	=	<	<
Otter Creek Township	=	=	=	=	>	=	<	<	=
Perry Township	=	>	=	>	=	=	=	=	=
Pine Township	>	>	>	>	>	>	>	>	<
Pymatuning Township	=	>	=	>	=	=	>	>	=
Salem Township	=	=	=	>	=	=	=	<	>
Sandy Creek Township	=	=	=	=	=	=	<	>	=
Sandy Lake Borough	=	=	=	>	=	=	=	=	=
Sandy Lake Township									
Sharpsville Borough	=	<	=	=	>	<	<	<	=
Sheakleyville Borough									
Shenango Township	=	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Pandemic, Epidemic, and Infectious Disease	Flash Flood	Winter Storm	Emergency Services	Opioid Epidemic	Windstorm	Environmental Hazards: Transportation	Transportation Accident	Tornado
	3.7	3.5	3.5	3.4	3.4	3.3	3,3	3,3	3.2
South Pymatuning Township									
Springfield Township	=	=	=	>	=	=	=	>	=
Stoneboro Borough	=	<	=	=	<	=	=	<	<
Sugar Grove Township									
West Middlesex Borough	=	<	=	>	<	<	<	<	=
West Salem Township									
Wheatland Borough									
Wilmington Township	<	<	=	=	=	=	<	<	=
Wolf Creek Township									
Worth Township	=	<	=	>	=	<	<	<	<

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Terrorism	Utility Interruptions	Radon Exposure	Subsidence and Sinkhole	Dam Failure	Flood	Hurricane and Tropical Storm	Invasive Species	Nuclear Incident
	3.2	3.2	3.1	2.9	2.8	2.6	2.6	2.6	2.6
City of Farrell	=	=	=	=	=	=	<	<	<
City of Hermitage	<	=	<	=	>	=	=	=	=
City of Sharon	<	<	<	>	<	<	>	<	>
Clark Borough									
Coolspring Township	<	=	=	=	=	=	<	=	<
Deer Creek Township	<	>	<	=	=	=	=	=	=
Delaware Township	=	=	=	=	=	=	=	=	=
East Lackawannock Township	<	=	<	<	=	<	<	<	<
Fairview Township	<	=	=	=	<	=	=	<	=
Findley Township	<	>	<	<	<	>	>	<	<
Fredonia Borough									
French Creek Township	<	>	=	<	<	>	<	=	<
Greene Township	<	=	=	=	>	=	=	=	<
Greenville Borough									
Grove City Borough	=	>	=	=	<	>	=	<	<
Hempfield Township	=	=	=	=	>	>	=	=	<
Jackson Township	=	>	<	=	>	<	=	>	<
Jackson Center Borough	<	=	<	=	<	<	<	=	<

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Terrorism	Utility Interruptions	Radon Exposure	Subsidence and Sinkhole	Dam Failure	Flood	Hurricane and Tropical Storm	Invasive Species	Nuclear Incident
	3.2	3.2	3.1	2.9	2.8	2.6	2.6	2.6	2.6
Jamestown Borough	=	=	<	<	>	>	<	<	=
Jefferson Township	<	>	<	=	<	<	<	<	<
Lackawannock Township	<	<	<	=	=	=	=	=	=
Lake Township	=	>	<	<	=	=	=	>	=
Liberty Township	=	=	=	=	<	=	<	=	=
Mercer Borough	<	=	=	=	=	=	=	=	=
Mill Creek Township									
New Lebanon Borough	=	>	=	<	<	<	<	>	=
New Vernon Township	<	=	=	<	<	=	=	=	=
Otter Creek Township	=	=	<	<	<	=	=	=	<
Perry Township	>	=	=	=	>	=	<	>	<
Pine Township	<	>	<	<	<	<	<	<	<
Pymatuning Township	=	=	=	<	>	>	=	=	=
Salem Township	=	=	=	<	<	=	=	=	>
Sandy Creek Township	=	=	=	<	=	=	=	=	<
Sandy Lake Borough	=	>	=	=	>	>	=	>	>
Sandy Lake Township									
Sharpsville Borough	=	<	>	<	<	<	=	>	=
Sheakleyville Borough									

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Terrorism	Utility Interruptions	Radon Exposure	Subsidence and Sinkhole	Dam Failure	Flood	Hurricane and Tropical Storm	Invasive Species	Nuclear Incident
	3.2	3.2	3.1	2.9	2.8	2.6	2.6	2.6	2.6
Shenango Township	=	=	=	=	=	=	=	=	=
South Pymatuning Township									
Springfield Township	=	=	=	=	=	=	=	=	=
Stoneboro Borough	<	=	<	<	=	<	<	=	<
Sugar Grove Township									
West Middlesex Borough	<	<	<	<	<	<	<	<	<
West Salem Township									
Wheatland Borough									
Wilmington Township	<	=	=	=	<	=	=	=	<
Wolf Creek Township									
Worth Township	<	<	<	<	=	<	<	<	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Drought	Cyberterrorism	Environmental Hazards: Fixed Facility	Ice Jam Flood	Civil Disturbance	Levee Failure	Wildfire	Earthquake	Landslide
	2.5	2.4	2.1	2	2	2	1.8	1.6	1.6
City of Farrell									
City of Hermitage	=	=	>	=	>	=	=	=	=
City of Sharon	>	>	>	>	<	<	<	>	>
Clark Borough	=	=	=	=	=	=	=	=	<
Coolspring Township	=	=	=	=	=	=	=	=	=
Deer Creek Township	=	<	>	=	=	<	>	=	=
Delaware Township	=	=	=	=	<	=	=	=	=
East Lackawannock Township	=	<	<	=	=	=	=	=	<
Fairview Township	<	<	<	<	=	<	<	<	=
Findley Township	<	<	=	=	=	=	<	<	<
Fredonia Borough									
French Creek Township	<	=	>	<	=	<	=	=	=
Greene Township	>	<	=	<	<	<	=	=	=
Greenville Borough									
Grove City Borough	=	>	>	>	>	<	<	=	=
Hempfield Township	=	=	=	>	=	>	=	=	=
Jackson Township	=	=	=	<	=	<	>	=	<
Jackson Center Borough	=	<	<	<	<	<	<	=	<
Jamestown Borough	=	=	>	=	=	<	<	=	<
Jefferson Township	=	=	=	<	=	=	=	=	<

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Drought	Cyberterrorism	Environmental Hazards: Fixed Facility	Ice Jam Flood	Civil Disturbance	Levee Failure	Wildfire	Earthquake	Landslide
	2.5	2.4	2.1	2	2	2	1.8	1.6	1.6
Lackawannock Township	=	<	=	<	=	=	>	=	=
Lake Township	=	>	=	<	<	=	=	=	=
Liberty Township	=	>	=	<	=	<	=	>	=
Mercer Borough	=	<	=	=	=	=	=	=	=
Mill Creek Township									
New Lebanon Borough	>	>	=	<	=	<	=	=	<
New Vernon Township	=	<	<	<	=	<	<	=	<
Otter Creek Township	<	<	<	<	<	<	<	<	<
Perry Township	=	=	=	<	<	<	=	=	=
Pine Township	>	<	>	<	<	<	<	<	<
Pymatuning Township	=	=	=	=	=	=	=	=	=
Salem Township	=	=	=	<	<	<	=	=	=
Sandy Creek Township	=	=	=	<	<	<	=	=	=
Sandy Lake Borough	>	=	=	=	=	=	>	>	=
Sandy Lake Township									
Sharpsville Borough	=	=	<	=	<	<	<	=	=
Sheakleyville Borough									
Shenango Township	=	=	=	=	<	<	>	=	=
South Pymatuning Township									
Springfield Township	=	=	=	=	>	=	=	>	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Drought	Cyberterrorism	Environmental Hazards: Fixed Facility	Ice Jam Flood	Civil Disturbance	Levee Failure	Wildfire	Earthquake	Landslide
	2.5	2.4	2.1	2	2	2	1.8	1.6	1.6
Stoneboro Borough	=	=	=	=	=	<	<	<	=
Sugar Grove Township									
West Middlesex Borough	<	<	=	<	<	<	<	<	<
West Salem Township									
Wheatland Borough									
Wilmington Township	=	=	<	=	<	<	=	=	=
Wolf Creek Township									
Worth Township	<	=	<	<	<	<	=	=	=

4.4.3. Potential Loss Estimates

Based on various kinds of available data, potential loss estimates were established for flooding. Estimates provided in this section are based on HAZUS-MH, version MR4, geospatial analysis, and previous events. Estimates are considered *potential* in that they generally represent losses that could occur in a countywide hazard scenario. In events that are localized, losses may be lower, while regional events could yield higher losses.

Potential loss estimates have four basic components, including:

Replacement Value: Current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials.

Content Loss: Value of building's contents, typically measured as a percentage of the building replacement value.

Functional Loss: The value of a building's use or function that would be lost if it were damaged or closed.

Displacement Cost: The dollar amount required for relocation of the function (business or service) to another structure following a hazard event.

Flooding Loss Estimation:

Flooding is a high-risk natural hazard in Mercer County. The estimation of potential loss in this assessment focuses on the monetary damage that could result from flooding. The potential property loss was determined for each municipality and for the entire county. The quantity of commercial and residential structures in each Mercer County municipality is outlined in section 4.3.3 of the flooding hazard profile.

MCM Consulting Group, Inc. conducted a countywide flood study using the Hazards U.S. Multi-Hazard (HAZUS-MH) software that is provided by the Federal Emergency Management Agency. This software is a standardized loss estimation software deriving economic loss, building damage, content damage and other economic impacts that can be used in local flood mitigation planning activities.

Using HAZUS-MH, total building-related losses from a 1%-annual-chance flood in Mercer County are estimated to equal $13.66 million with 68.12% of that coming from residential homes. Total economic loss, including replacement value, content loss, functional loss, and displacement cost, from a countywide 1%-annual-chance flood are estimated to equal $295.72 million.

4.4.4. Future Development and Vulnerability

The 2020 census population for Mercer County is 110,652 which is 5,986 fewer than the 2010 census. There was an overall decrease of 5.14% in population based on the data. Four municipalities have seen population increases while the remaining forty-four had decreases in the period between 2010 and the 2020 as identified in *Table 81 – Population Change in Mercer County from 2010-2020.*

Table 81 - 2010 - 2020 Population Change

Population Change in Mercer County 2010-2020				
Municipality	**2010 Census**	**2020 Census**	**Change**	**Percent of Change 2010-2020**
City of Farrell	5,111	4,258	-853	-16.69

Population Change in Mercer County 2010-2020				
Municipality	**2010 Census**	**2020 Census**	**Change**	**Percent of Change 2010-2020**
City of Hermitage	16,220	16,144	-76	-0.47
City of Sharon	14,038	13,147	-891	-6.35
Clark Borough	640	576	-64	-10.00
Coolspring Township	2,278	2,112	-166	-7.29
Deer Creek Township	502	456	-46	-9.16
Delaware Township	2,291	2,088	-203	-8.86
East Lackawannock Township	1,682	1,666	-16	-0.95
Fairview Township	1,085	950	-135	-12.44
Findley Township	2,910	2,868	-42	-1.44
Fredonia Borough	502	435	-67	-13.35
French Creek Township	771	710	-61	-7.91
Greene Township	1,091	1,051	-40	-3.67
Greenville Borough	5,919	5,541	-378	-6.39
Grove City Borough	8,322	7,894	-428	-5.14
Hempfield Township	3,741	3,734	-7	-0.19
Jackson Township	1,273	1,181	-92	-7.23
Jackson Center Borough	224	192	-32	-14.29
Jamestown Borough	617	580	-37	-6.00
Jefferson Township	1,880	1,920	+40	+2.13
Lackawannock Township	2,662	2,469	-193	-7.25
Lake Township	780	702	-78	-10.00
Liberty Township	1,414	1,397	-17	-1.20
Mercer Borough	2,002	1,982	-20	-1.00
Mill Creek Township	721	776	+55	+7.63
New Lebanon Borough	188	186	-2	-1.06
New Vernon Township	504	492	-12	-2.38
Otter Creek Township	589	525	-64	-10.87
Perry Township	1,453	1,332	-121	-8.33
Pine Township	5,150	4,808	-342	-6.64
Pymatuning Township	3,281	3,114	-167	-5.09

Population Change in Mercer County 2010-2020				
Municipality	**2010 Census**	**2020 Census**	**Change**	**Percent of Change 2010-2020**
Salem Township	754	752	-2	-0.27
Sandy Creek Township	795	800	+5	+0.63
Sandy Lake Borough	659	649	-10	-1.52
Sandy Lake Township	1,226	1,197	-29	-2.37
Sharpsville Borough	4,415	4,253	-162	-3.67
Sheakleyville Borough	142	150	+8	+5.63
Shenango Township	3,929	3,519	-410	-10.44
South Pymatuning Township	2,695	2,650	-45	-1.67
Springfield Township	1,981	1,855	-126	-6.36
Stoneboro Borough	1,051	946	-105	-9.99
Sugar Grove Township	971	950	-21	-2.16
West Middlesex Borough	863	815	-48	-5.56
West Salem Township	3,538	3,220	-318	-8.99
Wheatland Borough	632	583	-49	-7.75
Wilmington Township	1,415	1,416	-1	-0.07
Wolf Creek Township	832	716	-116	-13.94
Worth Township	899	824	-75	-8.34
TOTAL	**116,638**	**110,652**	**-5,986**	**-5.14**

The significant county-wide population changes indicate a potential alteration to overall hazard vulnerability. Municipalities that undergo widespread population reductions may have more difficulty meeting personnel demand than municipalities that have had a large growth in population. However, certain municipalities experienced significant resident increase, and would then be more vulnerable to certain hazards due to development and residential growth. Although expanding population zones may be especially vulnerable to hazards outlined in Section 4.3 of this hazard mitigation plan update, natural and human-caused hazards could potentially occur at any time regardless of population change. The Mercer County Local Planning Team will conduct annual review of this plan and the impacts all hazards have on the county and new development every year, and within a time frame after a disaster of major emergency.

5. Capability Assessment

5.1. Update Process Summary

The capability assessment is an evaluation of Mercer County's governmental structure, political framework, legal jurisdiction, fiscal status, policies and programs, regulations, ordinances, and resource availability. Each category is evaluated for its strengths and weaknesses in responding to, preparing for, and mitigating the effects of the profiled hazards. A capability assessment is an integral part of the hazard mitigation planning process. Here, the county and municipalities identify, review, and analyze what they are currently doing to reduce losses and identify the framework necessary to implement new mitigation actions. This information will help the county and municipalities evaluate alternative mitigation actions and address shortfalls in the mitigation plan.

A capabilities assessment survey was provided to the municipalities during the planning process at meetings held with Mercer County officials. These meetings were designed to seek input from the key county and municipal stakeholders on legal, fiscal, technical, and administrative capabilities of all jurisdictions. As such, the capabilities assessment helps guide the implementation of mitigation projects and will help evaluate the effectiveness of existing mitigation measures, policies, plans, practices, and programs.

Throughout the planning process, the mitigation local planning team considered the county's forty-eight municipalities. Pennsylvania municipalities have their own governing bodies, pass, and enforce their own ordinances and regulations, purchase equipment and manage their own resources, including critical infrastructure. Therefore, these capability assessments consider the various characteristics and capabilities of municipalities under study.

The evaluation of the following categories – political framework, legal jurisdictions, fiscal status, policies and programs and regulations and ordinances – allows the mitigation planning team to determine the viability of certain mitigation actions. The capability assessment analyzes what Mercer County, and its municipalities have the capacity to do and provides an understanding of what must be changed to mitigate loss.

Mercer County has several resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities and participation in local, regional state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during and after a hazardous event. While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

5.2. Capability Assessment Findings

Forty-two of the forty-eight municipalities in Mercer County completed and submitted a capability assessment survey. The results of the survey were collected, aggregated, and analyzed.

5.2.1. Planning and Regulatory Capability

Municipalities have the authority to govern more restrictively than state and county minimum requirements as long as they are compliant with all criteria established in the Pennsylvania Municipalities Planning Code (MPC) and their respective municipal codes. Municipalities can develop their own policies and programs and implement their own rules and regulations to protect and serve their residents. Local policies and programs are typically identified in a comprehensive plan, implemented through a local ordinance, and enforced by the governmental body or its appointee.

Municipalities regulate land use via the adoption and enforcement of zoning, subdivision, land development, building codes, building permits, floodplain management and/or stormwater management ordinances. When effectively prepared and administered, these regulations can lead to an opportunity for hazard mitigation. For example, the National Flood Insurance Program (NFIP) established minimum floodplain management criteria, and adoption of the Pennsylvania Floodplain Management Act (Act 166 of 1978) established even higher floodplain management standards. A municipality must adopt and enforce these minimum criteria to be eligible for participation in the NFIP. Municipalities have the option of adopting a single-purpose ordinance or incorporating these provisions into their zoning, subdivision, and land development, or building codes; thereby mitigating the potential impacts of local flooding. This capability assessment details the existing Mercer County and municipal legal capabilities to mitigate the profiled hazards. It identifies the county and the municipal existing planning documents and their hazard mitigation potential. Hazard mitigation recommendations are, in part, based on the information contained in the assessment.

Building Codes

Building codes are important in mitigation because they are developed for a region of the country in respect to the hazards that exist in that area. Consequently, structures that are built according to applicable codes are inherently resistant to many hazards, such as intense winds, floods, and earthquakes; and can help mitigate regional hazards, such as wildfires. In 2003, Pennsylvania implemented the Uniform Construction Code (UCC) (Act 45), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures.

The code applies to almost all buildings, excluding manufactured and industrialized housing (which are covered by other laws), agricultural buildings, and certain utility and miscellaneous

buildings. The UCC requires builders to use materials and methods that have been professionally evaluated for quality and safety, as well as inspections to ensure compliance.

The initial election period, during which all of Pennsylvania's 2,565 municipalities were allowed to decide whether the UCC would be administered and enforced locally, officially closed on August 7, 2004. The codes adopted for use under the UCC are the 2003 International Codes issued by the International Code Council (ICC). Supplements to the 2003 codes have been adopted for use over the years since.

If a municipality has "opted in", all UCC enforcement is local, except where municipal (or third party) code officials lack the certification necessary to approve plans and inspect commercial construction for compliance with UCC accessibility requirements. If a municipality has "opted-out", the Pennsylvania Department of Labor and Industry is responsible for all commercial code enforcement in that municipality; and all residential construction is inspected by independent third-party agencies selected by the owner. The department also has sole jurisdictions for all state-owned buildings no matter where they are located. Historical buildings may be exempt from such inspections and Act 45 provides quasi-exclusion from UCC requirements.

The municipalities in Mercer County adhere to the standards of the Pennsylvania Uniform Code (Act 45). None of the municipalities in Mercer County have opted-in on building code enforcement, although all municipalities enforce their own code enforcement.

Zoning Ordinance

Article VI of the Municipalities Planning Code (MPC) authorizes municipalities to prepare and enact zoning to regulate land use. Its regulations can apply to the permitted use of land; the height and bulk of structures; the percentage of a lot that may be occupied by buildings and other impervious surfaces; yard setbacks; the density of development; the height and size of signs; the parking regulations. A zoning ordinance has two parts, including the zoning map that delineates zoning districts and the text that sets forth the regulations that apply to each district.

Subdivision Ordinance

Subdivision and land development ordinances include regulations to control the layout of streets, the planning lots and the provision of utilities and other site improvements. The objectives of subdivision and land development ordinance are to: coordinate street patterns; assure adequate utilities and other improvements are provided in a manner that will not pollute streams, wells and/or soils; reduce traffic congestions; and provide sound design standards as a guide to developers, the elected officials, planning commissions, and other municipal officials. Article V of the Municipality Planning Code authorizes municipalities to prepare and enact a subdivision and land development ordinance. Subdivision and land development ordinances provide for the division and improvement of land. Of the forty-eight municipalities in Mercer County, some

have subdivision/land use ordinances, some have zoning regulations – some have both and some have neither.

Stormwater Management Plan/Stormwater Ordinance

The proper management of storm water runoff can improve conditions and decrease the chance of flooding. Pennsylvania's Storm Water Management Act (Act 167) confers on counties the responsibility for development of watershed plans. The Act specifies that counties must complete their watershed storm water plans within two years following the promulgation of these guidelines by the Pennsylvania Department of Environmental Protection (PA DEP), which may grant an extension of time for any county for the preparation and adoption of plans. Counties must prepare the watershed plans in consultation with municipalities and residents. This is to be accomplished through the establishment of a watershed plan advisory committee. The counties must also establish a mechanism to periodically review and revise watershed plans. Plan revisions must be done every five years or sooner, if necessary.

Municipalities have an obligation to implement the criteria and standards developed in each watershed storm water management plan by amending or adopting laws and regulation for land use and development. The implementation of storm water management criteria and standards at the local level are necessary since municipalities are responsible for local land use decisions and planning. The degree of detail in the ordinance depends on the extent of existing and projected land development. The watershed storm water management plan is designed to aid the municipality in setting standards for the land uses it has proposed. Municipalities within rapidly developing watersheds will benefit from the watershed storm water management plan and will use the information for sound land use considerations. A major goal of the watershed plan and the attendant municipal regulations is to prevent future drainage problems and avoid the aggravation of existing problems. All municipalities in Mercer County have adopted the county's stormwater management plan.

Comprehensive Plan

A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities, and land use. It examines how the past led to the present and charts the community's future path. The Pennsylvania Municipalities Code (MPC Act 247 of 1968, as reauthorized and amended) requires counties to prepare and maintain a county comprehensive plan. In addition, the MPC requires counties to update the comprehensive plan every ten years.

Regarding hazard mitigation planning, Section 301.a(2) of the Municipality Planning Code requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the plan consider floodplains and other areas of special hazards and other similar

uses. The MPC also requires comprehensive plans to include a plan for community facilities and services that recommends considering storm drainage and floodplain management.

Mercer County last updated its comprehensive plan in 2006. This comprehensive plan is an update to the 1995-1996 Mercer County Comprehensive Plan.

Article III of the MPC enables municipalities to prepare a comprehensive plan: however, development of a comprehensive plan is voluntary. All of the forty-eight municipalities in Mercer County have adopted the county comprehensive plan as their comprehensive plan. No municipalities have independent comprehensive plans.

Capital Improvements Plan

The capital improvements plan is a multi-year policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements. Capital improvements relate to streets, storm water systems, water distribution, sewage treatment and other major public facilities. A capital improvements plan should be prepared by the respective county's planning department and should include a capital budget. This budget identifies the highest priority projects recommended for funding in the next annual budget. The capital improvements plan is dynamic and can be tailored to specific circumstances. There are no municipalities within Mercer County that have an identified capital improvement plan.

Participation in the National Flood Insurance Program (NFIP)

Floodplain management is the operation of programs or activities that may consist of both corrective and preventative measures for reducing flood damage, including but not limited to such things as emergency preparedness plans, flood control works, and flood plain management regulations. The Pennsylvania Floodplain Management Act (Act 166) require every municipality identified by the Federal Emergency Management Agency (FEMA) to participate in the National Flood Insurance Program and permits all municipalities to adopt floodplain management regulations. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their community. This helps keep insurance rates low and ensures that the risk of flood damage is not increased by property development.

The Pennsylvania Emergency Management Agency (PEMA) was appointed by legislation in September 2021 to coordinate the Commonwealth NFIP and employ the State NFIP Coordinator. For many years prior, these roles were held by the Pennsylvania Department of Community and Economic Development (DCED), which still offers support to communities through its Floodplain Mitigation Program. PEMA provides communities, based on CFR Title 44, Section 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP along with the Pennsylvania Flood Plain Management Act (Act 166). These suggested or model ordinances contain provisions that are

more restrictive than state and federal requirements. Suggested provisions include, but are not limited to, the below.

1. Prohibiting manufactured homes in the floodway
2. Prohibiting manufactured homes within the area measured fifty feet landward from the top-of-bank of any watercourse within a special flood hazard area
3. Special requirements for recreational vehicles within the special flood hazard area
4. Special requirement for accessory structure
5. Prohibiting new construction and development within the area measured fifty feet landward from the top-of-bank of any watercourse within a special flood hazard area
6. Providing the county conservation district an opportunity to review and comment on all applications and plans for any proposed construction or development in any identified floodplain area

Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for new or substantially improved structures which are used for the production or storage of dangerous materials (as defined by Act 166) by prohibiting them in the floodway. Additionally, Act 166 established the requirement that a special permit be obtained prior to any construction or expansion of any manufactured home park, hospital, nursing home, jail and prison if said structure is located within a special flood hazard area.

The NFIP's Community Rating System (CRS) provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations, acquisition, relocation, or flood-proofing of flood prone buildings, preservation of open space, and other measures that reduce flood damages or protect the natural resources and functions of floodplains.

The CRS was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. Section 541 of the 1994 Act amends Section 1315 of the 1968 Act to codify the Community Rating System in the NFIP. The section also expands the CRS goals to specifically include incentives to reduce the risk of flood-related erosion and to encourage measures that protect natural and beneficial floodplain functions. These goals have been incorporated into the CRS and communities now receive credit toward premium reductions for activities that contribute to them.

Under the Community Rating System, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet a minimum of three of the following CRS goals.

1. Reduce flood losses
2. Protect public health and safety
3. Reduce damage to property

4. Prevent increases in flood damage from new construction
5. Reduce the risk of erosion damage
6. Protect natural and beneficial floodplain functions
7. Facilitate accurate insurance rating
8. Promote the awareness of flood insurance

There are ten Community Rating System classes. Class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. CRS premium discounts on flood insurance range from 5% for Class 9 communities up to 45% for Class 1 communities. The CRS recognizes eighteen credible activities, organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

FEMA Region III makes available to communities an ordinance review checklist which lists required provisions for floodplain management ordinances. This checklist helps communities develop an effective floodplain management ordinance that meets federal requirements for participation in the NFIP. PEMA provides communities, based on their 44 CFR 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP and the Pennsylvania Flood Plain Management Act (Act 166). Act 166 mandates municipal participation in and compliance with the NFIP. It also established higher regulatory standards for hazardous materials and high-risk land uses. As new Digital Flood Insurance Rate Maps (DFIRMs) are published, the Pennsylvania State NFIP Coordinator at DCED works with communities to ensure the timely and successful adoption of an updated floodplain management ordinance by reviewing and providing feedback on existing and draft ordinances.

Currently, no municipalities have completed or started to complete the CRS program. Additional research will be conducted on the CRS program and mitigation actions will be developed in support of the CRS.

To spread awareness as well as capture participation levels, all municipalities were instructed to complete an NFIP survey provided by the Federal emergency Management Agency. In total, forty-two municipalities submitted an NFIP survey. These surveys can be found in Appendix C of this plan.

5.2.2. Administrative and Technical Capability

There are fourteen boroughs, thirty-one townships, and three cities within Mercer County. Each of these municipalities conducts it daily operations and provides various community services according to local needs and limitations. Some of these municipalities have formed cooperative agreements and work jointly with their neighboring municipalities to provide services such as police protection, fire and emergency response, infrastructure maintenance, and water supply management. Other municipalities choose to operate independently and provide such services

internally. Municipalities vary in staff size, resource availability, fiscal status, service provision, constituent population, overall size, and vulnerability to the profile hazards. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract resources for this expertise in order to effectively execute mitigation activities. Common examples of skill sets, and technical personnel needed for hazard mitigation include: planners with knowledge of land development and management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with education of expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, fiscal staff to handle complex grant application processes.

County Planning Commission

In Pennsylvania, planning responsibilities traditionally have been delegated to each county and local municipality through the Municipalities Planning Code (MPC). A planning agency acts as an advisor to the governing body on matters of community growth and development. A governing body may appoint individuals to serve as legal or engineering advisors to the planning agency. In addition to the duties and responsibilities authorized by Article II of the MPC, a governing body may, by ordinance, delegate approval authority to a planning agency for subdivision and land development applications. A governing body has considerable flexibility, not only as to which powers and duties are assigned to a planning agency, but also what form an agency will possess. A governing body can create a planning commission, a planning department, or both. The Mercer County Regional Planning Commission assists all municipalities in the county as needed.

Municipal Engineer

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer prepares plans, specifications and estimates of the work undertaken by the township. Most municipalities in Mercer County have a municipal engineer under contract to perform these duties. Twenty-eight municipalities marked that they did have a municipal engineer or retain the services of an engineer for the duties mentioned above.

Personnel Skilled in GIS or FEMA HAZUS Software

A geographic information system (GIS) is an integrated, computer-based system designed to capture, store, edit, analyze, and display geographic information. Some examples of uses for GIS technology in local government are land records management, land use planning, infrastructure

management and natural resources planning. A GIS automates existing operations such as map production and maintenance, saving a great deal of time and money. The GIS also includes information about map features such as the capacity of a municipal water supply or the acres of public land. GIS data is managed, maintained, and developed by a very robust Mercer County GIS Department, which is available to assist all the county's municipalities. GIS data is an important tool to use in hazard mitigation planning and is instrumental in assessing the risk of municipalities to various hazards. The Mercer County GIS Department currently has a staff of two, one GIS Coordinator and one GIS Technician.

Some municipalities within the county have their own technician or GIS specialist, some municipalities utilize a third-party contractor for GIS related work, and some municipalities work with the Mercer County Regional Planning Commission to complete required GIS related items.

Emergency Management Coordinator

Emergency management is a comprehensive, integrated program of mitigation, preparedness, response, and recovery for emergencies/disasters of any kind. No public or private entity is immune to disasters and no single segment of society can meet the complex needs of a major emergency or disaster on its own. Hence, the National Preparedness Goal of 2011 also defines what it means for the whole community to be prepared for all types of disasters and emergencies and lists five mission areas which support preparedness: prevention, protection, mitigation, response, and recovery – doubling the emphasis on mitigation activities in an emergency management program.

The Pennsylvania Emergency Management Services Code (PA Title 35) requires Mercer County and its municipalities to have an emergency management coordinator. Thirty of Mercer County's municipalities stated on their capability assessment form that they do have an emergency management coordinator and/or named that individual. It should be noted that even though some municipalities did not mark that they had an emergency management coordinator, it cannot be assumed that they do not have a coordinator. The filer of the paperwork may not have had all of the information when the surveys were completed.

The Mercer County Department of Public Safety coordinates countywide emergency management efforts. Each municipality has a designated local emergency management coordinator who possesses a unique knowledge of the impact hazardous events have on their community.

A municipal emergency management coordinator is responsible for emergency management – preparedness, response, recovery, and mitigation within his/her respective authority having jurisdiction (AHJ). The responsibilities of the emergency management coordinator are outlined in PA Title 35 §7633.

- Prepare and maintain a current disaster emergency management plan
- Establish, equip, and staff an emergency operations center
- Provide individual and organizational training programs
- Organize and coordinate all locally available manpower, materials, supplies, equipment, and services necessary for disaster emergency readiness, response, and recovery
- Adopt and implement precautionary measures to mitigate the anticipated effects of a disaster
- Cooperate and coordinate with any public and private agency or entity
- Provide prompt information regarding local disaster emergencies to appropriate commonwealth and local officials or agencies and the public
- Participate in all tests, drills, and exercises, including remedial drills and exercises, scheduled by the agency or by the federal government

PA Title 35 requires that all municipalities in the Commonwealth have a local emergency operations plan (EOP) which is updated every two years. A majority of Mercer County municipalities have adopted the county EOP. The notification and resource section of the plan was developed individually by each municipality.

Federal Agency Assistance

There are many federal agencies that can provide technical assistance for mitigation activities, and these include, but are not limited to:

- United States Army Corps of Engineers (USACE)
- Department of Housing and Urban Development (HUD)
- Department of Agriculture (DOA)
- Economic Development Administration
- Emergency Management Institute (EMI)
- Environmental Protection Agency (EPA)
- Federal Emergency Management Agency (FEMA)
- Small Business Administration (SBA)

State Agency Assistance

There are many commonwealth agencies that can provide technical assistance for mitigation activities, and these include but are not limited to:

- Pennsylvania Emergency Management Agency (PEMA)
- Pennsylvania Department of Community and Economic Development
- Pennsylvania Department of Conservation and Natural Resources
- Pennsylvania Department of Environmental Protection

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 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.

The capability assessment survey was used to capture information on each jurisdiction's political capability. Survey respondents were asked to identify examples of political capability, such as guiding development away from hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e., building codes, floodplain management ordinances, etc.). These examples were used to guide respondents in scoring their community on a scale of "unwilling" (0) to "very willing" (5) to adopt policies and programs that reduce hazard vulnerabilities. *Table 82 – Mercer County Community Political Capability* summarizes the results of political capability. Twenty-five municipalities returned this portion of the capability assessment survey completed.

Table 82 - Mercer County Community Political Capability

Mercer County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
Clark Borough	Not completed by municipality.					
Coolspring Township		X				
Deer Creek Township				X		
Delaware Township			X			
East Lackawannock Township	Not completed by municipality.					
Fairview Township				X		
Farrell City						X
Findley Township	Not completed by municipality.					
Fredonia Borough	Not completed by municipality.					
French Creek Township			X			

Mercer County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
Greene Township	X					
Greenville Borough	Not completed by municipality.					
Grove City Borough	Not completed by municipality.					
Hempfield Township				X		
Hermitage City	Not completed by municipality.					
Jackson Township	Not completed by municipality.					
Jackson Center Borough				X		
Jamestown Borough			X			
Jefferson Township	Not completed by municipality.					
Lackawannock Township				X		
Lake Township		X				
Liberty Township	Not completed by municipality.					
Mercer Borough	Not completed by municipality.					
Mill Creek Township			X			
New Lebanon Borough	Not completed by municipality.					
New Vernon Township			X			
Otter Creek Township				X		
Perry Township	Not completed by municipality.					
Pine Township				X		
Pymatuning Township				X		
Salem Township						X
Sandy Creek Township				X		
Sandy Lake Borough	Not completed by municipality.					
Sandy Lake Township	Not completed by municipality.					
Sharon City	Not completed by municipality.					
Sharpsville Borough	Not completed by municipality.					
Sheakleyville Borough	Not completed by municipality.					
Shenango Township	Not completed by municipality.					
South Pymatuning Township	Not completed by municipality.					
Springfield Township	Not completed by municipality.					

Mercer County Community Political Capability						
Municipality Name	**Capability Ranking**					
	0	**1**	**2**	**3**	**4**	**5**
Stoneboro Borough	Not completed by municipality.					
Sugar Grove Township				X		
West Middlesex Borough	Not completed by municipality.					
West Salem Township				X		
Wheatland Borough						X
Wilmington Township				X		
Wolf Creek Township						X
Worth Township				X		

Self-Assessment

In addition to the inventory and analysis of specific local capabilities, the capability assessment survey required each local jurisdiction to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to mechanisms that could enhance of further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either "L = Limited", "M = Moderate", or "H = High." *Table 83 – Capability Self-Assessment Matrix* summarizes the results of the self-assessment survey. Thirty-eight municipalities returned this section of the assessment completed.

Table 83 - Capability Self-Assessment Matrix

Mercer County Capability Self-Assessment Matrix				
Municipality Name	**Capability Category**			
	Planning and Regulatory Capability	**Administrative and Technical Capability**	**Fiscal Capability**	**Community Political Capability**
Clark Borough	M	M	M	M
Coolspring Township	L	L	L	L
Deer Creek Township	L	L	L	L
Delaware Township	M	M	M	M
East Lackawannock Township	M	M	M	M
Fairview Township	L	L	L	L
Farrell City	M	M	M	M
Findley Township	Not completed by municipality.			
Fredonia Borough	Not completed by municipality.			
French Creek Township	M	L	L	L
Greene Township	L	L	M	L
Greenville Borough	M	M	L	M
Grove City Borough	M	M	L	M
Hempfield Township	M	L	L	M
Hermitage City	M	M	M	M
Jackson Township	L	M		L
Jackson Center Borough	M	M	L	M
Jamestown Borough	L	L	L	L
Jefferson Township	Not completed by municipality.			
Lackawannock Township	M	M	L	M
Lake Township	L	L	L	L
Liberty Township	M	M	L	M
Mercer Borough	M	M	L	M
Mill Creek Township	L	L	L	L
New Lebanon Borough	L	L	L	M
New Vernon Township	L	L	L	L
Otter Creek Township	L	L	L	L
Perry Township	L	L	L	M

Mercer County Capability Self-Assessment Matrix				
Municipality Name	**Capability Category**			
	Planning and Regulatory Capability	**Administrative and Technical Capability**	**Fiscal Capability**	**Community Political Capability**
Pine Township	M	M	M	M
Pymatuning Township	M	M	M	M
Salem Township	L	L	L	L
Sandy Creek Township	L	L	M	M
Sandy Lake Borough	Not completed by municipality.			
Sandy Lake Township	Not completed by municipality.			
Sharon City	M	H	H	M
Sharpsville Borough	M	M	M	M
Sheakleyville Borough	Not completed by municipality.			
Shenango Township	M	M	L	M
South Pymatuning Township	Not completed by municipality.			
Springfield Township	Not completed by municipality.			
Stoneboro Borough	Not completed by municipality.			
Sugar Grove Township	M	M	M	M
West Middlesex Borough	Not completed by municipality.			
West Salem Township	M	M	L	M
Wheatland Borough	M	M	L	M
Wilmington Township	M	M	L	M
Wolf Creek Township	M	M	M	M
Worth Township	H	H	H	H

In addition to the institutional capability of the municipal government structure described above, the county itself can engage in mitigation activities. The county has its own staff, resources, budget, and objectives, which may or may not be like those of its constituent municipalities. Therefore, the county has its own capabilities to mitigate the profiled hazards through planning and coordination of local mitigation efforts. The Mercer County GIS Department can provide needed skills in the analysis of geographic data. Other local organizations that can and do act as partners include: the Mercer County Regional Planning Commission; and the Mercer County Conservation District.

Existing Limitations

Funding has been identified as the largest limitation for a municipality to complete mitigation activities. The acquisition of grants is the best way to augment this process the municipalities. The county and municipality representatives will need to rely on regional, state, and federal partnerships for future financial assistance. Development of intra-county regional partnerships and intra-municipality regional partnerships will bolster this process.

5.2.3. Financial Capability

Fiscal capability is significant to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of 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. Based on survey results, most municipalities within the county perceive fiscal capability to be moderate to limited. The following information pertains to various financial assistance programs relevant to hazard mitigation.

State and Federal Grants

During the 1960s and 1970s state and federal grants-in-aid were available to finance many municipal programs, including streets, water and sewer facilities, airports, parks, and playgrounds. During the early 1980s, there was a significant change in federal policy, based on rising deficits and a political philosophy that encouraged states and local governments to raise their own revenues for capital programs. The result has been a growing interest in “creative financing”.

Grant programs that may be utilized to accomplish hazard mitigation objectives include the: Pennsylvania Department of Community and Economic Development Community Development Block Grant (CDBG); Land Use Planning and Technical Assistance (LUPTAP); Shared Municipal Services (SMS); Community Revitalization (CR) and Floodplain Land Use Assistance Programs; the PA DEP’s Growing Greener; Act 167 Stormwater Management; Source Water Protection; and Flood Protection Programs. The Flood Protection Programs include the PA DCNR’s Community Conservation Partnership Program, PEMA’s Pre-Disaster Mitigation (PDM) Grant, Flood Mitigation Assistance Grant Programs (FMA), and Hazard Mitigation Grant Program.

Below are some of the other state programs that may provide financial support for mitigation activities:

- DCED Flood Mitigation Program
- DCED H2O PA Flood Control Projects
- DCED H2O PA High Hazard Unsafe Dam Projects
- DCED H2O PA Water Supply, Sanitary Sewer and Storm Water Projects
- DCED PA Small Water and Sewer
- DCNR Community Conservation Partnerships Program
- DCNR Pennsylvania Heritage Areas Program
- DCNR Pennsylvania Recreational Trails Program
- DCNR Land and Water Conservation Fund

Below are some of the federal programs that may provide financial support for mitigation activities:

- FEMA Community Assistance Program – State Support Services Element (CAP-SSSE)
- FEMA Community Disaster Loan Program
- FEMA Community Rating System
- FEMA Emergency Management Performance Grants (EMPG)
- FEMA Environmental Planning and Historic Preservation Program (EHP)
- FEMA Flood Mitigation Assistance Program
- FEMA Hazard Mitigation Grant Program (HMGP)
- FEMA Individuals and Households Program (IHAP)
- FEMA National Dam Safety Program
- FEMA National Flood Insurance Program
- FEMA Pre-Disaster Mitigation Program
- FEMA Public Assistance Program (PA)
- FEMA Regional Catastrophic Preparedness Grant Program
- FEMA Repetitive Flood Claims Program (RFC)
- FEMA Severe Repetitive Loss Grant Program
- USACE Continuing Authorities Program
- USACE Flood Plain Management Services Program (FPMS)
- USACE Inspection of Completed Works Program (ICW)
- USACE National Levee Safety Program
- USACE Planning Assistance to States
- USACE Rehabilitation and Inspection Program (RIP)

Capital Improvement Financing

Because most of the capital investments involve the outlay of substantial funds, local governments can seldom pay for these facilities through annual appropriations in the annual operating budget. Therefore, numerous techniques have evolved to enable local government to

pay for capital improvements over a time period exceeding one year. Public finance literature and state laws governing local government finance classify techniques that are used to finance capital improvements. The techniques include revenue bonds, lease-purchase, authorities and special district, current revenue (pay-as-you-go); reserve funds; and tax increment financing. Most municipalities have very limited local tax funds for capital projects. Grants and other funding are always priorities.

Indebtedness through General Obligation Bonds

Some projects may be financed with general obligation bonds. With this method, the jurisdiction's taxing power is pledged to pay interest and principal to retire debt. General obligation bonds can be sold to finance permanent types of improvements, such as schools, municipal buildings, parks, and recreational facilities. Voter approval for this may be required.

Municipal Authorities

Municipal authorities are most often used when major capital investments are required. In addition to sewage treatment, municipal authorities have been formed for water supply, airports, bus transit systems, swimming pools, and other purposes. Joint authorities have the power to receive grants, borrow money, and operate revenue generating programs. Municipal authorities are authorized to sell bonds, acquire property, sign contracts, and take similar actions. Authorities are governed by authority board members, who are appointed by the elected officials of the member municipalities.

Sewer Authorities

Sewer authorities include multi-purpose authorities with sewer projects. They sell bonds to finance acquisition of existing systems for construction, extension, or system improvement. Sewer authority operating revenues originate from user fees. The fee frequently is based on the amount of water consumed and payment is enforced by the ability to terminate service by the imposition of liens against real estate. In areas with no public water supply, flat rate charges are calculated on average use per dwelling unit.

Water Authorities

Water authorities are multi-purpose authorities with water projects, many of which operate both water and sewer systems. The financing of water systems for lease back to the municipality is one of the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities to construct, extend, or improve a system. The primary source of revenue is user fees based on metered usage. The cost of construction or extending water supply lines can be funded by special assessments against abutting property owners. Tapping fees also help fund water system capital costs. Water utilities are also directly operated by municipal governments and by privately owned public utilities

regulated by the Pennsylvania Public Utility Commission. The Pennsylvania Department of Environmental Protection has a program to assist with consolidating small water systems to make system upgrades more cost effective.

U.S. Department of Agriculture Circuit Riding Program (Engineer)

The Circuit Riding Program is an example of intergovernmental cooperation. This program offers municipalities the ability to join to accomplish a common goal. The circuit rider is a municipal engineer who serves several small municipalities simultaneously. These are municipalities that may be too small to hire a professional engineer for their own operations yet need the skills and expertise the engineer offers. Municipalities can jointly obtain what no one municipality could obtain on its own.

5.2.4. Education and Outreach

Mercer County conducts an education and outreach program. The Mercer County Department of Public Safety conducts public outreach at public events to update the citizens and visitors of the county on natural and human-caused hazards. The county conservation district also conducts outreach on various activities and projects in the county.

Education activities that directly impact hazard mitigation in Mercer County predominantly revolve around the first responders. Providing fire, medical, search and rescue training, and education enhances the response and recovery capabilities of response agencies in the county. Newly appointed emergency management coordinators are trained in both Duties and Responsibilities and damage assessment – which includes a discussion on mitigation; this training can be translated into teaching municipal employees or local emergency services to assist them during a disaster.

For the COVID-19 pandemic response, the county maintenance department was trained in the correct methods and appropriate chemicals to be used to disinfect large areas that were contaminated by an infected employee.

The county also has several websites and social media accounts that can educate residents about hazard mitigation and risk while also communicating information in the event of a disaster:

- Mercer County Webpage: https://www.mercercountypa.gov/
- Mercer County Facebook: https://www.facebook.com/MercerCountyPA/
- Mercer County Twitter: http://www.twitter.com/MercerCountyPA
- Mercer County Department of Public Safety Webpage: https://www.mercercountypa.gov/DPS/
- Mercer County Department of Public Safety Facebook: https://www.facebook.com/mercercodps/

The Mercer County GIS Department website has an education and outreach capability, particularly with the county map viewer, which could be updated to include hazard mitigation data. The websites of the Mercer County Department of Public Safety (DPS) and the Mercer County Regional Planning Commission also post information to educate residents, particularly in disaster preparedness, floodplain management, and zoning requirements. The Mercer County Regional Planning Commission currently provides access to planning documents and educational brochures about the benefits of planning and helpful guides. The DPS also holds quarterly Local Emergency Planning Committee (LEPC) meetings that are open to the public, which serve as another means to conduct outreach and educate the public about hazard mitigation.

Education and outreach on the NFIP are necessary. With new regulations in flood-plain management, updated digital flood insurance rate maps and new rates for insurance policies, education, and outreach on the NFIP would assist the program. The Mercer County Local Planning Team will identify actions necessary to complete this and update those actions in the Mercer County 2023 Hazard Mitigation Plan Update.

5.2.5. Plan Integration

Plan integration recognizes that hazard mitigation is most effective when it works in efficient coordination with other plans, regulations, and programs. Plan integration promotes safe, resilient growth, effective management, an overall reduction of risk, by ensuring that the goals and actions established in the Hazard Mitigation Plan are included in the comprehensive planning efforts so they can affect future land use and development. Some of the most important areas of planning and regulatory capabilities which hazard mitigation goals and actions should be integrated include comprehensive plans, the hazard mitigation plans from all surrounding or encompassing areas, Emergency Operations Plans, building codes, floodplain ordinances, subdivision, land development ordinances, stormwater management plans and ordinances, and zoning ordinances. All of these tools provide mechanisms for the implementation of adopted mitigation strategies.

Mercer County and all of its participating municipalities have attempted integration of hazard mitigation principals and concepts from the 2018 Mercer County Hazard Mitigation Plan. Due to the impact of the COVID-19 pandemic and staffing shortages, integration of hazard mitigation principals was limited between the calendar year 2020 and 2021. Attempts to collaborate and integrate the 2023 Mercer County Hazard Mitigation Plan into other planning mechanism will continue during the next five-year planning period.

Mercer County Comprehensive Plan

Overview

Article III of the Pennsylvania Municipalities Planning code (Act 247 of 1968, as reenacted and amended) requires all Pennsylvania counties (except Philadelphia) to adopt a comprehensive

plan and update it at least every 10 years. The Mercer County Commissioners adopted the updated Mercer County Comprehensive Plan in 2006.

Comprehensive plans establish the overall vision, goals, and objectives for a community's growth. The Mercer County Comprehensive Plan was adopted by Mercer County on April 26, 2006. The plan is a collaborative effort between the county and the municipalities in the county and contains regional priorities and actions for each local jurisdiction. The plan establishes countywide goals and objectives, describes environmental and demographic characteristics, identified potential capital improvement projects, and inventories existing planning initiatives and tools in the county including but not limited to Mercer County Long Range Transportation Plan and the Mercer County Greenways, Open Space & Outdoor Recreation Plan.

Recommendations for Continued and Future Integration

The Mercer County Regional Planning Commission is responsible for maintaining and updating the Mercer County Comprehensive Plan and many other regulatory tools. Technical assistance on community planning matters is provided to the Mercer County Board of Commissioners through the Mercer County Regional Planning Commission. The planning commission administers the Mercer County Comprehensive Plan. The planning commission also performs technical reviews of municipal subdivision and land development plans, municipal floodplain ordinances and other community planning and development matters. An update to the Mercer County Comprehensive is due to be executed in the short term and should be updated as soon as possible. The Mercer County Comprehensive Plan provides an outline of goals and objectives that can be tied into hazard mitigation planning.

Mercer County Flood Study

Overview

Flood studies provide a comprehensive look at all aspects of flooding and how it relates to municipalities in Mercer County, the county itself, and the vulnerability of populations in Mercer County to flooding events. MCM Consulting Group, Inc. was chosen by the county to complete a flood study prior to the start of the hazard mitigation plan update. The Mercer County Flood Study was completed on May 3, 2022 and presented to the Mercer County Department of Public Safety and the county commissioners. The plan examines past flooding, flash flooding, and ice jam flooding events, the amount of rainfall in Mercer County and how that relates to flooding, and presents analysis based on HAZUS scenarios for the county as a whole and split down to the census track level. The Local Planning Team for the 2022 Mercer County Flood Study included the dam owner at Lake Latonka, a local dam, increasing the integration with the High-Hazard Potential Dam program.

As part of the flood study process, the Local Planning Team reviewed previously submitted project opportunities and the mitigation goals, objectives, and actions that relate to flooding,

flash flooding, and ice jam flooding. The plan examined the county's ability to respond to flooding events and where the county is significantly vulnerable, whether that be due to topography, demographics, or the presence of dams and levees. The flood study provided a holistic view of the flooding capabilities and capacities of Mercer County.

Recommendations for Continued and Future Integration

The 2022 Mercer County Flood Study is imperative to continued integration into hazard mitigation planning. The flood study directly interfaces with both the risk assessment and mitigation strategy section of the 2023 Mercer County Hazard Mitigation Plan. The flood study also examine and identifies key areas of the county that are vulnerable to flooding, flash flooding, and ice jam flooding. This information was utilized in confirming where these locations occur and how they can be tied into future mitigation actions. The flood study also provided another opportunity for Mercer County to review aspects of the plan, in order to ensure that the hazard mitigation plan is a living document, and not static. The Mercer County Flood Study can be considered another tool at the county's disposal to engage in hazard mitigation planning and developing more resilient communities. The flood study should be updated on a regular basis, preferably just prior to the completion of a hazard mitigation plan update.

Plan Interrelationships

Ensuring consistency between these planning mechanisms is critical. In fact, Section 301 (4.1) of the Pennsylvania Municipalities Planning Code requires that comprehensive plans include a discussion of the interrelationships among their various plan components, "which may include an estimate of the environmental, energy conservation, fiscal, economic development and social consequences on the environment."

To that end, Mercer County and its municipalities must ensure that the components of the hazard mitigation plan are integrated into existing community planning mechanisms and are generally consistent with goals, policies and recommended actions. Mercer County and the hazard mitigation planning team will utilize the existing maintenance schedule of each plan to incorporate the goals, policies and recommended actions as each plan is updated.

6. Mitigation Strategy

6.1. Update Process Summary

Mitigation goals are general guidelines that explain what the county wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. There were six goals and twenty objectives identified in the 2018 hazard mitigation plan. The 2023 Mercer County Hazard Mitigation Plan Update has seven goals and twenty-two objectives. Objectives have been added and arranged in order to associate them with the most appropriate goal. These changes are noted in *Table 84 – 2018 Mitigation Goals and Objectives Review*. These reviews are based on the five-year hazard mitigation plan review worksheet, which includes a survey on existing goals and objectives completed by the local planning team. Municipal officials then provided feedback on the changes to the goals and objectives via a mitigation strategy update meeting. Copies of these meetings and all documentation associated with the meetings are located in Appendix C.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. There were forty-three actions identified in the 2018 mitigation strategy. A review of the 2018 mitigation actions was completed by the local planning team. The results of this review are identified in *Table 85 – 2018 Mitigation Actions Review*. Actions were evaluated by the local planning team with the intent of carrying over any actions that were not started or continuous for the next five years.

Table 84 - 2018 Mitigation Goals and Objectives Review

Mercer County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
GOAL 1	Attempt to reduce the current and future risk of flood damage in Mercer County	**No comment**
Objective 1.1	Reduce flood damage by directing new development away from high hazard areas by reviewing existing regulations to ensure adequacy in reducing the amount of future development in identified flood hazard areas	**2023 verbiage change:** "…..in the special flood hazard area (SFHA) and any vulnerable flood, flash flood, and ice jam flood areas."

Mercer County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
Objective 1.2	Municipalities to review all comprehensive plans to ensure that designated growth areas are not in flood hazard areas	**2023 verbiage change:** "…….comprehensive plans and local zoning ordinances……."
Objective 1.3	Review any capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas without adhering to all applicable state, federal, and local regulations.	**2023 verbiage change:** "……..local, state, and federal regulations." **Move objective to Goal 2.**
Objective 1.4	Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards	**2023 verbiage change:** "Evaluate, update, and enforce existing floodplain ordinances to meet or exceed the NFIP standards and encourage municipalities to enforce existing floodplain regulations <u>in addition to other ordinances pertaining to flooding</u>."
Objective 1.5	Improve the enforcement of existing floodplain regulations	**Remove and develop into mitigation action.**
GOAL 2	Reduce the potential impact of natural and human-caused hazards.	**No comment.**
Objective 2.1	Encourage participation in the National Flood Insurance Program	**Move to mitigation action plan under goal 1 and add action related to CRS.**
Objective 2.2	Protect Mercer County's most vulnerable populations (e.g. schools, senior citizens, hospital patients, etc.), buildings, and critical facilities with the purchase of appropriate equipment (e.g. generators, busses, etc.)	**2023 verbiage change:** "Protect Mercer County's most vulnerable populations (e.g. school children, senior citizens, hospital patients, unsheltered and homeless individuals, etc.), buildings, and community lifeline facilities with the purchase of appropriate equipment (e.g. generators, busses, etc.)"
Objective 2.3	Enhance the existing information resources available to Mercer County Department of Public Safety	**2023 verbiage change:** "….available to Mercer County local jurisdictions or municipalities."

Mercer County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
Objective 2.4	Identify actions and projects to decrease the impact of pandemic, epidemic and infectious diseases	**MCM to review verbiage. Change to be more broad**
GOAL 3	Improve upon the protection of the citizens of Mercer County from all natural and human-caused hazards	**2023 verbiage change:** "…….from all hazards."
Objective 3.1	Ensure adequate training and resources are made available to emergency organizations and emergency personnel	**2023 verbiage change:** "Ensure adequate training and resources are made available to all levels of government and public safety."
Objective 3.2	Improve emergency preparedness in Mercer County and its municipalities	**No comment.**
Objective 3.3	Evaluate cost-effective ways of augmenting existing broadcast and communication systems to monitor warning information continuously and to disseminate appropriate warnings	**No comment.**
GOAL 4	Reduce or redirect the impact of natural disasters and human-caused hazards away from at-risk population areas	**2023 verbiage change:** "Reduce or redirect the impact of all hazards away from at-risk population areas."
Objective 4.1	Research and implement mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow/infiltration problems. Projects for review and implementation include reservoirs, levees, floodwalls, diversions, channel modification and storm sewers, as well as, acquisition, elevation, relocation and demolition/reconstruction of properties in the floodplain.	**2023 Verbiage Change:** "Research, evaluate, and implement mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow infiltration problems."
Objective 4.2	Enact ordinances and plans to decrease the impact of all hazards	**No comment**

Mercer County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
GOAL 5	Protect existing natural resources and open space, including parks and wetlands, within the floodplain and watershed to improve their flood control function	**Turn this goal into objective 5.1**
Objective 5.1	Protect Mercer County's natural resources through the implementation of cost-effective and technically feasible mitigation projects	**Turn this objective into goal 5**
Objective 5.2	Protect Mercer County's natural resources through the implementation of recreation planning and storm water management planning	**No comment**
GOAL 6	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards	**No comment**
Objective 6.1	Develop and distribute public awareness materials about all-hazard risks, preparedness, and mitigation	**No comment**
Objective 6.2	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness	**No comment**
Objective 6.3	Identify actions and projects to decrease the impact of invasive species.	**No comment**

Mercer County 2018 Mitigation Goals and Objectives		
GOAL Objective	**Description**	**Comment**
Objective 6.4	Participate in hazard specific planning committees and organizations to decrease the impact and increase public knowledge of these hazards	**No comment**

Table 85 - 2018 Mitigation Actions Review

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.1.1 Encourage municipal offices to review regulations pertaining to their jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard areas in their jurisdiction. Planning department to review Subdivision and Land Development Ordinance.			✓			**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.2.1 Planning department and applicable municipal offices to review their comprehensive plans to ensure that designated growth areas are not in high hazard areas identified in this plan			✓			**No comment.**
1.2.2 Planning department and applicable municipal offices enact an ordinance to require present and future mobile homes to install tie down anchors.	✓					**Department of Emergency Services:** Municipal. **GIS Department:** Add "zoning ordinances"
1.3.1 Encourage applicable municipal offices to review their capital improvement plans to ensure that programmed infrastructure improvements are not in high-hazard areas.	✓					**Department of Emergency Services:** Municipal
1.4.1 Applicable municipalities to review and update their floodplain ordinances to be sure that they are in full compliance with the NFIP.			✓			**GIS Department:** Augment to say, "floodplain ordnance and stormwater management plan."

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
1.5.1 Arrange with PEMA/FEMA/DCED to hold training sessions for Mercer County and the municipalities on the NFIP requirements	✓					**No comment.**
1.5.2 Identify a floodplain manager within the municipality so that the public could obtain and/or view floodplain maps	✓					**Department of Emergency Services:** Municipal **GIS Department:** Add "that coordinates with Regional Planning Commission and county GIS."
2.1.1 Conduct outreach efforts to educate municipalities about the NFIP and its requirements			✓			**GIS Department:** Add "Encourage all municipalities to be active in and in compliance with NFIP."
2.1.2 Obtain updated information on the number of NFIP policyholders in Mercer County and its municipalities from PEMA and FEMA		✓				**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
2.1.3 Provide property owners with information how they can obtain and purchase flood insurance from the NFIP.			✓			**No comment.**
2.2.1 Conduct research with municipalities to collect updated information of the number and location of all repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities		✓				**GIS Department:** DPS and county GIS is local champion.
2.2.2 The local planning team will work with the Northwest Planning Commission to develop a database in existing hazard GIS system of information on all repetitive loss properties including maps to be used in future mitigation activities		✓				**GIS Department:** Change from NWRPC to county GIS, DPS, and Regional Planning Commission.

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
2.3.1 Enhance the GIS with hazard specific data and ensure that all agencies and organizations have direct access to the data		✓				**GIS Department:** County GIS is local champion, create AGOL application.
2.3.2 Assist with coordination between county residents and utility companies on critical outage events.			✓			**GIS Department:** New Item 2.3.3 "Encourage local utility authority municipal utility system, to collaborate with county GIS to map out utility systems and overlay with county GIS datasets to benefit both entities, and increase institutional knowledge, and to better locate infrastructure issues that could impact services."

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
3.1.1 DPS to conduct annual tabletop disaster exercises with local law enforcement, emergency managers, county and local officials, and other disaster response agencies. Types of exercises to include: Flood Exercise, Weapons of Mass Destruction Exercise, Hazardous Materials Spill Exercise, Weather Exercise and Biological Terrorism Exercise.			✓			**No comment.**
3.1.2 DPS to provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders. Develop a list of training opportunities that are available and distribute the list to all local emergency responders.			✓			**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
3.1.3 Continue to conduct National Weather Service Storm Spotter classes by partnering with the National Weather Service to provide training to people throughout Mercer County on SKYWARN, all weather preparedness.			✓			**No comment.**
3.2.1 Review the existing Mercer County Emergency Operations Plan (EOP) and update when necessary based on the recommendations of the 2018 Mercer County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually.			✓			**No comment.**
3.2.2 Identify other emergency response equipment and seek funding to purchase the equipment			✓			**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
3.2.3 A temporary water supply should be established for persons with no water in the event of a dam failure or drought	✓					**No comment.**
3.2.4 Mercer County municipalities will identify any equipment needed to combat a moderate to severe winter storm and submit project opportunities for inclusion in the hazard mitigation plan			✓			**GIS Department:** *winter storms.
3.3.1 Maintain communications center equipment to allow faster more timely warning notifications to mitigate the results of a natural, manmade or technological emergency.			✓			**No comment.**
3.3.2 Research the possibility of installing an emergency notification system to reach all populated areas throughout the county		✓				**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
3.3.3 Distribution of NOAA Weather Radios to Mercer County municipalities, schools, hospitals, nursing homes, day care centers, libraries, malls, SARA Facilities to initiate earlier warnings to minimize the impact of an emergency on the community				✓		**No comment.**
4.1.1 Review post-disaster reviews and annual hazard mitigation plan reviews submitted by the municipalities.			✓			**No comment.**
4.1.2 Submit Hazard Mitigation Project Opportunity Forms for acquisition, elevation, relocation and demolition/reconstruction of properties in the floodplain and other flood mitigation projects	✓					**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
4.2.1 Coordinate with the Pennsylvania Department of Transportation on winter storm response and snow removal			✓			**GIS Department:** And ice.
4.2.2 Review and update all existing ordinances and other regulatory planning mechanisms with respect to findings included in the 2018 hazard mitigation plan update		✓				**No comment.**
5.1.1 Develop a database in existing GIS system of all natural resource areas including maps to be used in future mitigation activities.		✓				**GIS Department:** County GIS is local champion.
5.1.2 Conduct meetings to identify high-risk properties in the county and to determine potential participation in future acquisition and relocation projects.	✓					**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
5.2.1 Maintain the Act 167 Stormwater Management Plan and update as needed.			✓			**Department of Emergency Services:** Regional Planning Commission
5.2.2 Work with DEP, conservation agencies, and others, to research avenues for restoring degraded natural resources and open space to improve their flood control functions	✓					**No comment.**
6.1.1 Use the media for the distribution and publication of hazard information by sending news releases to local newspapers, radio and TV stations about pre-disaster information.			✓			**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
6.1.2 Work with the American Red Cross to ensure that citizen's disaster classes are held on a frequent basis and that there is not a duplication of services. The American Red Cross holds a variety of courses to educate the public and responders to mitigate the effects of an emergency situation. Some courses offered: CPR, first aid, mass care, shelter ops., etc.			✓			**No comment.**
6.1.3 Continue to provide public speaking series on hazard related topics which include, how to develop and family disaster plan and disaster supply kit, sheltering in place, development of a business continuity plan, and sheltering in place, how to use 9-1-1. These topics of instruction are offered to the civic groups such as Rotary, Kiwanis, Chamber of Commerce, local churches, and scout groups.			✓			**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
6.1.4 Update the county website to provide hazard related information that is easily accessible. The County website has information about disaster preparedness and related activities. The plan is to expand and update the website as needed and as appropriate in a timely manner to benefit all County residents.			✓			**No comment.**
6.1.5 Develop a county resource directory, including all municipal equipment that can be updated and accessed via the county website.	✓					**No comment.**
6.2.1 Work with representatives from the NFIP to hold local course on the National Flood Insurance Program (NFIP) for realtors, bankers, and insurers to be attended from all areas of Mercer County.	✓					**No comment.**

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
6.2.2 Educate residents on keeping drainage ditches clear through yearly mailings as well as water and sewer bills as reminders.			✓			**Department of Emergency Services:** Municipal **GIS Department:** Change to PDF, post on website, have paper copies available in offices.
6.2.3 Educate the public on how to make use of a yard sump to minimize drainage into sewer systems.	✓					**No comment.**
6.2.4 Educate the public on the damages associated with high winds in combination with loose debris, and standing objects near buildings, such as trees.			✓			**No comment.**
6.3.1 Municipalities to identify dead ash trees from the emerald ash borer attack and submit opportunity forms to remove the hazards.	✓					**GIS Department:** Edit to change to education about SLF (spotted lantern fly) and noxious weeds.
6.3.2 Conduct outreach to public on the invasive species profile data.			✓			**GIS Department:** Edit verbiage.

Mercer County Mitigation Actions Review Worksheet						
Existing Mitigation Actions *(2018 HMP)*	***Status***					***Review Comments***
	No Progress/ Unknown	**In Progress/Not Yet Complete**	**Continuous**	**Completed**	**Discontinued**	
6.4.1 Participate in the pandemic, epidemic and infectious disease planning committees.			✓			**No comment.**
6.4.2 Encourage participation in the opioid intervention committee and conduct outreach to educate the public on opioid addiction.			✓			**No comment.**

6.2. Mitigation Goals and Objectives

Based on results of the goals and objectives evaluation exercise and input from the local planning team, a list of seven goals and twenty-two corresponding objectives were developed. *Table 86 – 2023 Goals and Objectives* details the mitigation goals and objectives established for the 2023 Mercer County Hazard Mitigation Plan.

Table 86 - 2023 Goals and Objectives

Mercer County 2023 Mitigation Goals and Objectives	
Goal / Objective	**Description**
Goal 1	**Attempt to reduce the current and future risk of flood damage in Mercer County.**

Mercer County 2023 Mitigation Goals and Objectives	
Goal / Objective	**Description**
Objective 1.1	Reduce flood damage by directing new development away from high hazard areas by reviewing existing regulations to ensure adequacy in reducing the amount of future development in the special flood hazard area (SFHA) and any vulnerable flood, flash flood, and ice jam flood areas.
Objective 1.2	Municipalities to review all comprehensive plans and local zoning ordinances to ensure that designated growth areas are not in the flood hazard area.
Objective 1.3	Evaluate, update, and enforce existing floodplain ordinances to meet or exceed the NFIP standards and encourage municipalities to enforce existing floodplain regulations in addition to other ordinances pertaining to flooding.
Objective 1.4	Encourage participation in the National Flood Insurance Program.
Objective 1.5	Acquire, elevate, demolish or demolish/reconstruct flood prone properties to remove or mitigate risks to homeowners and property.
Goal 2	**Reduce the potential impact of natural and human-caused hazards.**
Objective 2.1	Review any capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas without adhering to all applicable local, state, and federal regulations.
Objective 2.2	Protect Mercer County's most vulnerable populations (e.g. school children, senior citizens, hospital patients, unsheltered and homeless individuals, etc.), buildings, and community lifeline facilities with the purchase of appropriate equipment (e.g. generators, busses, etc.)
Objective 2.3	Enhance the existing information resources available to Mercer County local jurisdictions or municipalities.
Objective 2.4	Identify actions and projects to decrease the impact of pandemic, epidemic and infectious diseases
Goal 3	**Improve upon the protection of the citizens of Mercer County from all hazards.**
Objective 3.1	Ensure adequate training and resources are made available to all levels of government and public safety.
Objective 3.2	Improve emergency preparedness in Mercer County and its municipalities.
Objective 3.3	Evaluate cost-effective ways of augmenting existing broadcast and communication systems to monitor warning information continuously and to disseminate appropriate warnings.
Goal 4	**Reduce or redirect the impact of all hazards away from at-risk population areas.**

Mercer County 2023 Mitigation Goals and Objectives	
Goal / Objective	**Description**
Objective 4.1	Research, evaluate, and implement mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow infiltration problems.
Objective 4.2	Enact ordinances and plans to decrease the impact of all hazards.
Goal 5	**Protect Mercer County's natural resources through the implementation of cost-effective and technically feasible mitigation projects**
Objective 5.1	Protect existing natural resources and open space, including parks and wetlands, within the floodplain and watershed to improve their flood control function.
Objective 5.2	Protect Mercer County's natural resources through the implementation of recreation planning and storm water management planning.
Goal 6	**Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by fostering both individual and public responsibility in mitigating risks due to those hazards.**
Objective 6.1	Develop and distribute public awareness materials about all-hazard risks, preparedness, and mitigation.
Objective 6.2	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness.
Objective 6.3	Identify actions and projects to decrease the impact of invasive species.
Objective 6.4	Participate in hazard specific planning committees and organizations to decrease the impact and increase public knowledge of these hazards.
New Goal 7	**Participate in FEMA's High-Hazard Potential Dam Program (HHPD).**
New Objective 7.1	Educate Mercer County municipalities, property owners, and businesses about FEMA's HHPD program.
New Objective 7.2	Reduce long-term vulnerabilities from eligible high-hazard potential dams that pose an unacceptable risk to the public.
New Objective 7.3	Identify, by area, locations in Mercer County that could potentially be impacted by FEMA's HHPD program.

Goal 7 and Objective 7.1, Objective 7.2, and Objective 7.3 relate to multiple mitigation actions in *Table 88 – 2023 Mitigation Action Plan*. Action 7.1.1 relates to Objective 7.1, Action 7.2.1 relates to Objective 7.2, and Action 7.3.1 relates to Objective 7.3. All three of the mitigation actions are covered by Goal 7 of the goals and objectives for the 2023 Hazard Mitigation Plan.

These mitigations reduce the vulnerability of county populations and structures by educating the public on the HHPD program, enhancing local policies and procedures for HHPD planning, and digitizing dam inundation areas for future analysis and prevention of losses.

6.3. Identification and Analysis of Mitigation Techniques

This section includes an overview of alternative mitigation actions based on the goals and objectives identified in Section 6.2. There are four general mitigation strategy techniques to reducing hazard risks.

- Planning and regulations
- Structure and infrastructure
- Natural systems protection
- Education and awareness

Planning and Regulations: These actions include government authorities, policies or codes that influence the way land and buildings are developed and built. The following are some examples.

- Comprehensive plans
- Land use ordinances
- Subdivision regulations
- Development review
- Building codes and enforcement
- National Flood Insurance Program and Community Rating System
- Capital improvement programs
- Open space preservation
- Stormwater management regulations and master plans

The planning and regulations technique will protect and reduce the impact of specific hazards on new and existing buildings by improving building code standards and regulating new and renovation construction. The improved building codes will decrease the impact of risk hazards. Subdivision and land development enhancements will also augment this process. Ensuring that municipalities participate in the National Flood Insurance Program and encourage participation in the Community Rating System will decrease the impact as well.

Structure and infrastructure implementation: These actions involve modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. The following are examples:

- Acquisitions and elevations of structures in flood prone areas
- Utility undergrounding

- Structural retrofits
- Floodwalls and retaining walls
- Detention and retention structures
- Culverts
- Safe rooms

Structure and infrastructure implementation is a technique that removes or diverts the hazard from structure or protects the structure from a specific hazard. The new or renovated structures are therefore protected or have a reduced impact of hazards.

Natural Systems Protection: These are actions that minimize damage and losses and also preserve or restore the functions of natural systems. They include the following:

- Erosion and sediment control
- Stream corridor restoration
- Forest management
- Conservation easements
- Wetland restoration and preservation

Natural resource protection techniques allow for the natural resource to be used to protect or lessen the impact on new or renovated structures through the management of these resources. Utilization and implementation of the examples above will protect new and existing buildings and infrastructure.

Education and Awareness: These are actions to inform and educate citizens, elected officials and property owners about hazards and potential ways to mitigate them and may also include participation in national programs. Examples of these techniques include the following.

- Radio and television spots
- Websites with maps and information
- Real estate disclosure
- Provide information and training
- NFIP outreach
- StormReady
- Firewise communities

The education and awareness technique will protect and reduce the impact of specific hazards on new and existing buildings through education of citizens and property owners on the impacts that specific hazards could have on new or renovated structures. This information will allow the

owner to make appropriate changes or enhancements that will lessen or eliminate the impacts of hazards.

Table 87 – Mitigation Strategy Technique Matrix provides a matrix identifying the mitigation techniques used for all low, moderate, and high-risk hazards in the county. The specific actions associated with these techniques are included in *Table 88 – 2023 Mitigation Action Plan*.

Table 87 - Mitigation Strategy Technique Matrix

Mercer County Mitigation Strategy Technique Matrix				
Hazard	**MITIGATION TECHNIQUE**			
	Planning and Regulations	**Structure and Infrastructure**	**Natural Systems Protection**	**Education and Awareness**
Civil Disturbance	X	X		X
Dam Failure	X	X		X
Drought	X	X	X	X
Earthquake	X	X	X	X
Emergency Services	X	X		X
Environmental Hazards/Hazardous Materials	X	X		X
Flooding, Flash Flooding, Ice Jam Flooding	X	X	X	X
Hurricane/Tropical Storm	X	X	X	X
Invasive Species	X	X	X	X
Landslide	X	X	X	X
Levee Failure	X	X		X
Nuclear Incident	X	X		X
Opioid Epidemic	X	X		X
Pandemic, Epidemic, and Infectious Disease	X	X	X	X
Radon Exposure	X	X	X	X
Subsidence and Sinkhole	X	X	X	X
Terrorism/Cyberterrorism Incidents	X	X		X
Tornadoes/Windstorms	X	X	X	X
Transportation Accidents	X	X		X
Utility Interruption	X	X		X
Wildfire	X	X	X	X
Winter Storm	X	X	X	X

6.4. Mitigation Action Plan

The Mercer County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2023 hazard mitigation plan (HMP) update after the risk assessment section was completed. The LPT started this section by reviewing the 2018 HMP mitigation strategy section. A review of the previous goals, objectives, actions, and project opportunities documented in the 2018 HMP was conducted. The next step the LPT completed was the brainstorming of possible new actions based on new identified risks. The LPT compiled all this information for presentations to the municipalities.

MCM Consulting Group, Inc. completed municipality meetings at various time periods via virtual platforms or in-person meetings. During all these meetings, an overview of mitigation strategy was presented, and the municipalities were informed that they needed to have at least one hazard-related mitigation action for their municipality. All municipalities were invited to attend these meetings. Municipalities that were not able to join conference calls were contacted individually.

The municipalities were notified of draft mitigation actions and encouraged to provide new mitigation actions that could be incorporated into the plan. Municipalities were provided copies of their previously submitted mitigation opportunity forms and asked to determine if the projects were still valid. Municipalities were solicited for new project opportunities as well. All agendas, sign in sheets, and other support information from these meetings is included in Appendix C.

Mitigation measures for the 2023 Mercer County HMP are listed in the mitigation action plan. *Table 88 – 2023 Mitigation Action Plan* is the 2023 Mercer County Mitigation Action Plan. This plan outlines mitigation actions and projects that comprise a strategy for Mercer County. The action plan includes actions, a benefit and cost prioritization, a schedule for implementation, any funding sources to complete the action, a responsible agency or department and an estimated cost. All benefit and cost analysis were completed using the Pennsylvania Emergency Management Agency recommended analysis tool. The completed analysis is located in Appendix H. *Table 88 – 2023 Mitigation Action Plan* is a matrix that identifies the county and/or municipalities responsible for mitigation actions in the new mitigation action plan. *Table 89 – Municipal Hazard Mitigation Actions Checklist* shows which actions tie to specific municipalities for responsibilities. *Table 90 – Objective to Action Checklist* shows that each mitigation objective has a mitigation action item related to it. *Table 91 – Actions Tied to Hazards* illustrates the specific actions that are tied to each hazard outlined in the hazard mitigation plan.

Funding acronym definitions:

FMA: Flood Mitigation Assistance Grant Program, administered by the Federal Emergency Management Agency

HMGP: Hazard Mitigation Grant Program, administered by the Federal Emergency Management Agency

BRIC: Building Resilient Infrastructure and Communities (BRIC) Program, administered by the Federal Emergency Management Agency

EMPG: Emergency Management Performance Grant, administered by the Federal Emergency Management Agency

HSGP: Homeland Security Grant Program, administered by the Federal Emergency Management Agency

HMEP: Hazardous Material Emergency Planning Grant, administered by the Pennsylvania Emergency Management Agency

HMRF: Hazardous Material Response Fund, administered by the Pennsylvania Emergency Management Agency

HMERP: Hazard Mitigation Emergency Response Program administered by the Pennsylvania Emergency Management Agency

HHPD: Rehabilitation of High-Hazard Potential Dams Grant Program, administered by the Federal Emergency Management Agency

Evaluate and Prioritize Mitigation Actions

Mitigation Action Evaluation:
Evaluating mitigation actions involves judging each action against certain criteria to determine whether or not it can be executed. The feasibility of each mitigation action is evaluated using the ten evaluation criteria set forth in the Mitigation Action Evaluation methodology as outlined in the Commonwealth of Pennsylvania's All-Hazard Mitigation Planning, Standard Operating Guide. The methodology solicits input on whether each action is highly effective or feasible and ineffective or not feasible for the criteria. These criteria are listed below and aid in determining the feasibility of implementing one action over another.

- Life Safety: Will the action be effective in promoting public safety?
- Property Protection: Will the action be effective in protecting public or private property?
- Technical: How effective will the action be in avoiding or reducing future losses?
- Political: Does the action have public and political support?
- Legal: Does the community have the authority to implement the proposed measure?
- Environmental: Will the action provide environmental benefits, and will it comply with local, state, and federal environmental regulations?

- Social: Will the action be acceptable by the community, or will it cause any one segment of the population to be treated unfairly?
- Administrative: Is there adequate staffing and funding available to implement the action in a timely manner?
- Local Champion: Is there local support for the action to help ensure its completion?
- Other Community Objectives: Does the action address any current or future community objectives either through municipal planning or community goals?

To evaluate the mitigation actions, each action is identified as highly effective or feasible, ineffective, or not favorable and no cost or benefit. For each criterion, the prioritization methodology assigns a "+" if the action is highly effective or feasible, a "-" if the action was ineffective or not feasible, and a "N" if no cost of benefit could be associated with the suggested action or the action was no applicable to the criteria.

Mitigation Action Prioritization:
Actions should be compared with one another to determine a ranking or priority by applying the multi-objective mitigation action prioritization criteria. Scores are assigned to each criterion using the following weighted, multi-objective mitigation action prioritization criteria:

- Effectiveness (weight: 20% of score): The extent to which an action reduces the vulnerability of people and property.
- Efficiency (weight: 30% of score): The extent to which time, effort, and cost is well used as a means of reducing vulnerability.
- Multi-Hazard Mitigation (weight: 20% of score): The action reduces vulnerability for more than one hazard.
- Address High Risk Hazard (weight: 15% of score): The action reduces vulnerability for people and property from a hazard identified as high risk.
- Address Critical Communications/Critical Infrastructure (weight: 15% of score): The action pertains to the maintenance of critical functions and structures such as transportation, supply chain management, and data circuits, etc.

Scores of 1, 2, or 3 are assigned for each multi-objective mitigation action prioritization criterion where 1 is a low score and 3 is a high score. Actions are prioritized using the cumulative score assigned to each. Each mitigation action is given a priority ranking (Low, Medium, and High) based on the following:

- Low Priority: 1.0 – 1.8
- Medium Priority: 1.9 – 2.4
- High Priority: 2.5 – 3.0

The cumulative results of the prioritization of mitigation actions is identified in the mitigation action evaluation and prioritization tool. The results for the mitigation action evaluation and prioritization are located in Appendix H of this plan.

Table 88 - 2023 Mitigation Action Plan

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
1.1.1	Planning and Regulations	Encourage municipal offices to review regulations pertaining to their jurisdiction to make sure that adequate zoning regulations are in place to reduce future development in high hazard areas in their jurisdiction. The Mercer County Regional Planning Commission is to review Subdivision and Land Development Ordinances.	All Hazards			**X**	2023 - 2028	Local	Mercer County RPC
1.2.1	Planning and Regulations	Planning Commission and applicable municipal offices to review their comprehensive plans and zoning ordinances to ensure that designated growth areas are not in high hazard areas identified in the plan.	All Hazards		**X**		2023 - 2028	Local	Mercer County RPC Mercer County Municipalities
1.2.2	Planning and Regulations	Planning department and applicable municipal offices enact an ordinance to require present and future mobile homes to install tie down anchors.	Tornado & Windstorm			**X**	2023 - 2028	Local	Mercer County RPC Mercer County Municipalities
1.3.1	Planning and Regulations	Applicable municipalities to review and update their floodplain and stormwater ordinances to be sure that they are in full compliance with the NFIP.	Flooding, Flash Flooding, & Ice Jam Flooding		**X**		2023 - 2028	Local	Mercer County Municipalities

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
1.4.1	Education and Awareness	Conduct outreach efforts to educate municipalities about the NFIP and its requirements.	Flooding, Flash Flooding, & Ice Jam Flooding	**X**			2023 - 2028	Local	Mercer County DPS Mercer County RPC?
1.4.2	Education and Awareness	Encourage all municipalities to research the Community Rating System (CRS) and the feasibility of municipality participation in the CRS.	Flooding, Flash Flooding, & Ice Jam Flooding	**X**			2023 - 2028	Local	Mercer County DPS Mercer County RPC?
1.4.3	Planning and Regulations	Obtain updated information on the number of NFIP policyholders in Mercer County and its municipalities from PEMA and FEMA.	Flooding, Flash Flooding, & Ice Jam Flooding	**X**			2023 - 2028	Local	Mercer County Municipalities
1.4.4	Education and Awareness	Provide property owners with information how they can obtain and purchase flood insurance from the NFIP.	Flooding, Flash Flooding, & Ice Jam Flooding	**X**			2023 - 2028	Local	Mercer County Municipalities
1.5.1	Structural and Infrastructure	Continue to target, prioritize, and perform acquisitions, relocations, elevations and demolition/reconstruction projects for at-risk structures countywide, completing Hazard Mitigation Opportunity Forms when applicable, and meet with homeowners on the benefits of mitigation.	Flooding, Flash Flooding, and Ice Jam Flooding	**X**			2023 - 2028	HMGP, PDM, and FMA	Mercer County Municipalities
2.1.1	Planning and Regulations	Encourage applicable municipal offices to review their capital improvement plans to ensure that programmed infrastructure improvements are not in high-hazard areas and ensure that all projects in high-hazard areas adhere to all local, state, and federal regulations.	All Hazards		**X**		2023 - 2028	Local	Mercer County RPC

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
2.2.1	Planning and Regulations	Conduct research with municipalities to collect updated information on the number and location of all repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities.	Flooding, Flash Flooding, & Ice Jam Flooding		**X**		2023 - 2028	Local	Mercer County DPS Mercer County GIS Mercer County RPC
2.2.2	Planning and Regulations	The local planning team will work with the Mercer County GIS department and the Mercer County Regional Planning Commission to develop a database in existing hazard GIS system of information on all repetitive loss properties including maps to be used in future mitigation activities.	Flooding, Flash Flooding, & Ice Jam Flooding	**X**			2023 - 2028	Local	Mercer County DPS Mercer County GIS Mercer County RPC
2.3.1	Planning and Regulations	Enhance the county GIS database with hazard specific data and ensure that all agencies and organizations have direct access to the data.	All Hazards	**X**			2023 - 2028	Local	Mercer County GIS
2.3.2	Structure and Infrastructure	Assist with coordination between county residents and utility companies on critical outage events.	Utility Interruptions		**X**		2023 - 2028	Local	Mercer County DPS
2.3.3	Structure and Infrastructure	Encourage local municipal authorities and utility systems to collaborate with Mercer County GIS department to map out utility systems to overlay with county GIS datasets to benefit both entities and provide better institutional knowledge and allow for greater accuracy in locating infrastructure.	Utility Interruptions	**X**			2023 - 2028		Mercer County DPS Mercer County GIS

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
2.4.1	Planning and Regulations	Collaborate with Pennsylvania Department of Health district to address pandemic, epidemic, and infectious disease mitigation including but not limited to COVID-19, RSV, Influenza etc.	Pandemic, Epidemic, and Infectious Disease			**X**	2023 - 2028		Mercer County DPS
3.1.1	Planning and Regulations	DPS to conduct annual tabletop disaster exercises with local law enforcement, emergency managers, county and local officials, and other disaster response agencies. Types of exercises to include: Flood Exercise, Weapons of Mass Destruction Exercise, Hazardous Materials Spill Exercise, Weather Exercise and Biological Terrorism Exercise.	All Hazards	**X**			2023 - 2028	Local	Mercer County DPS
3.1.2	Education and Awareness	DPS to provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders. Develop a list of training opportunities that are available and distribute the list to all local emergency responders.	Emergency Services	**X**			2023 - 2028	Local	Mercer County DPS
3.1.3	Education and Awareness	Continue to conduct National Weather Service Storm Spotter classes by partnering with the National Weather Service to provide training to people throughout Mercer County on SKYWARN, all weather preparedness.	Hurricane/ Tropical Storms Winter Storms		**X**		2023 - 2028	Local	Mercer County DPS
3.2.1	Planning and Regulations	Review the existing Mercer County Emergency Operations Plan (EOP) and update when necessary based on the recommendations of the 2023 Mercer County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually.	All Hazards		**X**		2023 - 2028	Local	Mercer County DPS
3.2.2	Planning and Regulations	Identify other emergency response equipment and seek funding to purchase the equipment.	All Hazards			**X**	2023 - 2028	Local	Mercer County DPS

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
3.2.3	Structure and Infrastructure	Establish a temporary water supply for persons with no water in the event of a dam failure or drought.	Dam Failure Drought		**X**		2023 - 2028	Local	Mercer County DPS USACE
3.2.4	Planning and Regulations	Mercer County municipalities will identify any equipment needed to combat moderate to severe winter storms and submit project opportunities for inclusion in the hazard mitigation plan.	Winter Storm		**X**		2023 - 2028	Local	Mercer County Municipalities
3.2.5	Structure and Infrastructure	Examine snow emergency route signage throughout the county and determine which signs are in need of replacement.	Winter Storm		**X**		2023 - 2028		PennDOT
3.2.6	Planning and Regulations	Conduct an update to the Mercer County Commodity Flow Study during this planning period to determine the volume and extent of hazardous material transportation in Mercer County.	Environmental Hazards: Transportation		**X**		2023 - 2028		Mercer County DPS
3.2.7	Planning and Regulations	Examine and research cybersecurity directives from the Cybersecurity & Infrastructure Security Agency (CISA) to lessen the impact of a potential cyber-security incident at Mercer County.	Terrorism and Cyber-Terrorism		**X**		2023 - 2028		Mercer County MIS
3.2.8	Structure and Infrastructure	Conduct an inventory of emergency generators at community lifeline and critical infrastructure facilities, including but not limited to police stations, municipal buildings, and water treatment plants. Also include the address of the generator locations and counts.	Utility Interruptions		**X**		2023 - 2028		Mercer County DPS
3.2.9	Education and Awareness	Continue training for first responders in Mercer County in nuclear incident response in transportation accidents.	Nuclear Incidents		**X**		2023 - 2028		Mercer County DPS
3.3.1	Structure and Infrastructure	Maintain communications center equipment to allow faster more timely warning notifications to mitigate the results of a natural, manmade or technological emergency.	All Hazards	**X**			2023 - 2028	Local	Mercer County DPS

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
3.3.2	Structure and Infrastructure	Research the possibility of installing an emergency notification system to reach all populated areas throughout the county.	All Hazards		**X**		2023 - 2028	Local	Mercer County Municipalities Mercer County DPS
3.3.3	Structure and Infrastructure	Mercer County to upgrade the countywide radio system.	All Hazards	**X**			2023 - 2028	Local	Mercer County DPS
4.1.1	Planning and Regulations	Review post-disaster reviews and annual hazard mitigation plan reviews submitted by the municipalities.	All Hazards	**X**			2023 - 2028	Local	Mercer County DPS
4.1.2	Planning and Regulations	Submit Hazard Mitigation Project Opportunity Forms for acquisition, elevation, relocation, and demolition/reconstruction of properties in the floodplain and other flood mitigation projects.	Flooding, Flash Flooding, & Ice Jam Flooding	**X**			2023 - 2028	Local	Mercer County Municipalities
4.2.1	Planning and Regulations	Coordinate with the Pennsylvania Department of Transportation on plans for winter storm response, snow removal, and ice mitigation.	Winter Storm		**X**		2023 - 2028	Local	Mercer County DPS
4.2.2	Planning and Regulations	Review and update all existing ordinances and other regulatory planning mechanisms with respect to findings included in the 2023 hazard mitigation plan update.	All Hazards		**X**		2023 - 2028	Local	Mercer County Municipalities Mercer County RPC
5.1.1	Natural System Protection	Develop and maintain datasets in the county database of all natural resource areas enabling custom maps and cartographic products to be used in future mitigation activities.	All Natural Hazards	**X**			2023 - 2028	Local	Mercer County GIS Mercer County CD

Mercer County 2023 Mitigation Action Plan									
Action Number	**Mitigation Actions**		**Hazard Vulnerability**	**Prioritization**			**Implementation**		
	Category	**Description/ Action Items**		**High**	**Medium**	**Low**	**Schedule**	**Funding**	**Local Champion**
5.1.2	Planning and Regulations	Conduct meetings to identify high-risk properties in the county and to determine potential participation in future acquisition and relocation projects.	Flooding, Flash Flooding, & Ice Jam Flooding			**X**	2023 - 2028	Local	Mercer County RPC Mercer County CD
5.2.1	Natural System Protection	Maintain the Act 167 Stormwater Management Plan and review and update every five years.	Flooding, Flash Flooding, & Ice Jam Flooding		**X**		2023 - 2028	Local	Mercer County RPC
5.2.2	Natural System Protection	Work with DEP, conservation agencies, and others, to research avenues for restoring degraded natural resources and open space to improve their flood control functions.	Flooding, Flash Flooding, & Ice Jam Flooding		**X**		2023 - 2028	Local	Mercer County CD
6.1.1	Education and Awareness	Use the media for the distribution and publication of hazard information by sending news releases to local newspapers, radio, and TV stations about pre-disaster information.	All Hazards	**X**			2023 - 2028	Local	Mercer County DPS
6.1.2	Planning and Regulations	Coordinate with the American Red Cross to ensure that citizen's disaster classes are held on a frequent basis and that there is not a duplication of services. The American Red Cross holds a variety of courses to educate the public and responders to mitigate the effects of an emergency situation. Some courses offered: CPR, first aid, mass care, shelter ops., etc.	All Hazards		**X**		2023 - 2028	Local	Mercer County DPS
6.1.3	Education and Awareness	Continue to provide public speaking series on hazard related topics which include, how to develop and family disaster plan and disaster supply kit, sheltering in place, development of a business continuity plan, and sheltering in place, how to use 9-1-1. These topics of instruction are offered to the civic groups such as Rotary, Kiwanis, Chamber of Commerce, local churches, and scout groups.	All Hazards		**X**		2023 - 2028	Local	Mercer County DPS

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
6.1.4	Education and Awareness	Update the county website to provide hazard related information that is easily accessible. The County website has information about disaster preparedness and related activities. The plan is to expand and update the website as needed and as appropriate in a timely manner to benefit all County residents.	All Hazards	**X**			2023 - 2028	Local	Mercer County DPS Mercer County MIS
6.1.5	Planning and Regulations	Encourage locals to utilize United Way 211 system in times of need.	All Hazards			**X**	2023 - 2028	Local	Mercer County United Way
6.1.6	Planning and Regulations	Update the county website to provide information on drug take back box locations throughout the county to allow for easy disposal of prescription medications not needed or not in use by residents.	Opioid Epidemic			**X**	2023 - 2028		Mercer County Police Departments Mercer County MIS
6.1.7	Education and Awareness	Educate municipal residents about Radon exposure and potential radon mitigation actions at a local level.	Radon Exposure		**X**		2023 - 2028		Mercer County Municipalities
6.2.1	Education and Awareness	Work with PEMA NFIP coordinator to hold local course on the National Flood Insurance Program (NFIP) for realtors, bankers, and insurers to be attended from all areas of Mercer County.	Flooding, Flash Flooding, & Ice Jam Flooding	**X**			2023 - 2028	Local	Mercer County DPS
6.2.2	Education and Awareness	Educate residents on keeping drainage ditches clear through yearly mailings, posts on municipal social media pages, and having paper copies for distribution as well as water and sewer bills as reminders.	Flooding, Flash Flooding, & Ice Jam Flooding			**X**	2023 - 2028	Local	Mercer County Municipalities
6.2.3	Education and Awareness	Educate the public on how to make use of a yard sump to minimize drainage into sewer systems.	Flooding, Flash Flooding, & Ice Jam Flooding			**X**	2023 - 2028	Local	Mercer County Municipalities

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
6.2.4	Education and Awareness	Educate the public on the damages associated with high winds in combination with loose debris, and standing objects near buildings, such as trees.	Tornado & Windstorm		**X**		2023 - 2028	Local	Mercer County Municipalities
6.3.1	Natural System Protection	Municipalities to identify dead ash trees and affected vegetation from the emerald ash borer infestation and submit opportunity forms to remove the hazards.	Invasive Species Transportation Accidents Utility Interruptions		**X**		2023 - 2028	Local	Mercer County Municipalities Mercer County CD
6.3.2	Natural Systems Protection	Municipalities to identify and educate residents, with the assistance of the conservation district, about the spread of the spotted lanternfly and noxious weeds in Mercer County.	Invasive Species		**X**		2023 - 2028	Local	Mercer County Municipalities Mercer County CD MC Penn State Extension
6.3.3	Natural System Protection	Conduct outreach to public on the invasive species information and quarantine status for specific species.	Invasive Species		**X**		2023 - 2028	Local	Mercer County CD MC Penn State Extension

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
6.4.1	Planning and Regulations	Participate in the pandemic, epidemic and infectious disease planning committees.	Pandemic, Epidemic, and Infectious Disease		**X**		2023 - 2028	Local	Mercer County Pandemic Committee
6.4.2	Education and Awareness	Encourage participation in the opioid intervention committee and conduct outreach to educate the public on opioid addiction.	Opioid Epidemic		**X**		2023 - 2028	Local	Mercer County Pandemic Committee
6.4.3	Planning and Regulations	Collaborate with the Cybersecurity & Infrastructure Security Administration (CISA) in the event of a cyber-security incident for response and remediation.	Terrorism and Cyber-Terrorism		**X**		2023 - 2028		Mercer County MIS
6.4.4	Planning and Regulations	Participate in Beaver Valley Nuclear Power Station nuclear incident exercises and planning due to location near Beaver County.	Nuclear Incident			**X**	2023 - 2028		Mercer County DPS
6.4.5	Planning and Regulations	Participate in the Mercer County Fire Chief's Association Recruitment and Retention Subcommittee to discuss ways to maintain and increase the number of paid staff and volunteers in emergency services.	Emergency Services	**X**			2023 - 2028		Mercer County DPS
7.1.1	Education and Awareness	Distribute educational pamphlets about the HHPD program to municipalities and county residents.	Dam Failure		**X**		2023 - 2028		Mercer County DPS Mercer County CD
7.2.1	Planning and Regulations	Educate local mitigation policies and programs that address high-hazard potential dams.	Dam Failure		**X**		2023 - 2028		Mercer County DPS
7.3.1	Planning and Regulations	Acquire or maintain digitized dam inundation GIS polygons to determine at risk populations for dams designated High-Hazard Potential Dams by FEMA.	Dam Failure		**X**		2023 - 2028		Mercer County Dam Owners

Mercer County 2023 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
7.3.2	Planning and Regulations	Coordinate planning efforts regarding HHPD related items with the Pennsylvania Department of Environmental Protection Dam Safety personnel for the next planning period.	Dam Failure		**X**		2023 - 2028	Local	Mercer County DPS

Table 89 - Municipal Hazard Mitigation Actions Checklist

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.1.1**	**1.2.1**	**1.2.2**	**1.3.1**	**1.4.1**	**1.4.2**	**1.4.3**
Clark Borough	X	X	X	X	X	X	X
Coolspring Township	X	X	X	X	X	X	X
Deer Creek Township	X	X	X	X	X	X	X
Delaware Township	X	X	X	X	X	X	X
East Lackawannock Township	X	X	X	X	X	X	X
Fairview Township	X	X	X	X	X	X	X
Farrell City	X	X	X	X	X	X	X
Findley Township	X	X	X	X	X	X	X
Fredonia Borough	X	X	X	X	X	X	X
French Creek Township	X	X	X	X	X	X	X
Greene Township	X	X	X	X	X	X	X
Greenville Borough	X	X	X	X	X	X	X
Grove City Borough	X	X	X	X	X	X	X
Hempfield Township	X	X	X	X	X	X	X
Hermitage City	X	X	X	X	X	X	X
Jackson Township	X	X	X	X	X	X	X
Jackson Center Borough	X	X	X	X	X	X	X
Jamestown Borough	X	X	X	X	X	X	X
Jefferson Township	X	X	X	X	X	X	X
Lackawannock Township	X	X	X	X	X	X	X
Lake Township	X	X	X	X	X	X	X
Liberty Township	X	X	X	X	X	X	X
Mercer Borough	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.1.1**	**1.2.1**	**1.2.2**	**1.3.1**	**1.4.1**	**1.4.2**	**1.4.3**
Mill Creek Township	X	X	X	X	X	X	X
New Lebanon Borough	X	X	X	X	X	X	X
New Vernon Township	X	X	X	X	X	X	X
Otter Creek Township	X	X	X	X	X	X	X
Perry Township	X	X	X	X	X	X	X
Pine Township	X	X	X	X	X	X	X
Pymatuning Township	X	X	X	X	X	X	X
Salem Township	X	X	X	X	X	X	X
Sandy Creek Township	X	X	X	X	X	X	X
Sandy Lake Borough	X	X	X	X	X	X	X
Sandy Lake Township	X	X	X	X	X	X	X
Sharon City	X	X	X	X	X	X	X
Sharpsville Borough	X	X	X	X	X	X	X
Sheakleyville Borough	X	X	X	X	X	X	X
Shenango Township	X	X	X	X	X	X	X
South Pymatuning Township	X	X	X	X	X	X	X
Springfield Township	X	X	X	X	X	X	X
Stoneboro Borough	X	X	X	X	X	X	X
Sugar Grove Township	X	X	X	X	X	X	X
West Middlesex Borough	X	X	X	X	X	X	X
West Salem Township	X	X	X	X	X	X	X
Wheatland Borough	X	X	X	X	X	X	X
Wilmington Township	X	X	X	X	X	X	X
Wolf Creek Township	X	X	X	X	X	X	X
Worth Township	X	X	X	X	X	X	X
Mercer County	X	X	X	X	X	X	

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.4.4**	**2.1.1**	**2.2.1**	**2.2.2**	**2.3.1**	**2.3.2**	**2.3.3**
Clark Borough	X	X	X				X
Coolspring Township	X	X	X				X
Deer Creek Township	X	X	X				X
Delaware Township	X	X	X				X
East Lackawannock Township	X	X	X				X
Fairview Township	X	X	X				X
Farrell City	X	X	X				X
Findley Township	X	X	X				X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.4.4**	**2.1.1**	**2.2.1**	**2.2.2**	**2.3.1**	**2.3.2**	**2.3.3**
Fredonia Borough	X	X	X				X
French Creek Township	X	X	X				X
Greene Township	X	X	X				X
Greenville Borough	X	X	X				X
Grove City Borough	X	X	X				X
Hempfield Township	X	X	X				X
Hermitage City	X	X	X				X
Jackson Township	X	X	X				X
Jackson Center Borough	X	X	X				X
Jamestown Borough	X	X	X				X
Jefferson Township	X	X	X				X
Lackawannock Township	X	X	X				X
Lake Township	X	X	X				X
Liberty Township	X	X	X				X
Mercer Borough	X	X	X				X
Mill Creek Township	X	X	X				X
New Lebanon Borough	X	X	X				X
New Vernon Township	X	X	X				X
Otter Creek Township	X	X	X				X
Perry Township	X	X	X				X
Pine Township	X	X	X				X
Pymatuning Township	X	X	X				X
Salem Township	X	X	X				X
Sandy Creek Township	X	X	X				X
Sandy Lake Borough	X	X	X				X
Sandy Lake Township	X	X	X				X
Sharon City	X	X	X				X
Sharpsville Borough	X	X	X				X
Sheakleyville Borough	X	X	X				X
Shenango Township	X	X	X				X
South Pymatuning Township	X	X	X				X
Springfield Township	X	X	X				X
Stoneboro Borough	X	X	X				X
Sugar Grove Township	X	X	X				X
West Middlesex Borough	X	X	X				X
West Salem Township	X	X	X				X
Wheatland Borough	X	X	X				X
Wilmington Township	X	X	X				X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**1.4.4**	**2.1.1**	**2.2.1**	**2.2.2**	**2.3.1**	**2.3.2**	**2.3.3**
Wolf Creek Township	X	X	X				X
Worth Township	X	X	X				X
Mercer County			X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**2.4.1**	**3.1.1**	**3.1.2**	**3.1.3**	**3.2.1**	**3.2.2**	**3.2.3**
Clark Borough							
Coolspring Township							
Deer Creek Township							
Delaware Township							
East Lackawannock Township							
Fairview Township							
Farrell City							
Findley Township							
Fredonia Borough							
French Creek Township							
Greene Township							
Greenville Borough							
Grove City Borough							
Hempfield Township							
Hermitage City							
Jackson Township							
Jackson Center Borough							
Jamestown Borough							
Jefferson Township							
Lackawannock Township							
Lake Township							
Liberty Township							
Mercer Borough							
Mill Creek Township							
New Lebanon Borough							
New Vernon Township							
Otter Creek Township							
Perry Township							
Pine Township							
Pymatuning Township							
Salem Township							

Municipal Hazard Mitigation Actions Checklist							
Municipality	**2.4.1**	**3.1.1**	**3.1.2**	**3.1.3**	**3.2.1**	**3.2.2**	**3.2.3**
Sandy Creek Township							
Sandy Lake Borough							
Sandy Lake Township							
Sharon City							
Sharpsville Borough							
Sheakleyville Borough							
Shenango Township							
South Pymatuning Township							
Springfield Township							
Stoneboro Borough							
Sugar Grove Township							
West Middlesex Borough							
West Salem Township							
Wheatland Borough							
Wilmington Township							
Wolf Creek Township							
Worth Township							
Mercer County	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**3.2.4**	**3.2.5**	**3.2.6**	**3.2.7**	**3.2.8**	**3.2.9**	**3.3.1**
Clark Borough	X						
Coolspring Township	X						
Deer Creek Township	X						
Delaware Township	X						
East Lackawannock Township	X						
Fairview Township	X						
Farrell City	X						
Findley Township	X						
Fredonia Borough	X						
French Creek Township	X						
Greene Township	X						
Greenville Borough	X						
Grove City Borough	X						
Hempfield Township	X						
Hermitage City	X						
Jackson Township	X						

Municipal Hazard Mitigation Actions Checklist							
Municipality	**3.2.4**	**3.2.5**	**3.2.6**	**3.2.7**	**3.2.8**	**3.2.9**	**3.3.1**
Jackson Center Borough	X						
Jamestown Borough	X						
Jefferson Township	X						
Lackawannock Township	X						
Lake Township	X						
Liberty Township	X						
Mercer Borough	X						
Mill Creek Township	X						
New Lebanon Borough	X						
New Vernon Township	X						
Otter Creek Township	X						
Perry Township	X						
Pine Township	X						
Pymatuning Township	X						
Salem Township	X						
Sandy Creek Township	X						
Sandy Lake Borough	X						
Sandy Lake Township	X						
Sharon City	X						
Sharpsville Borough	X						
Sheakleyville Borough	X						
Shenango Township	X						
South Pymatuning Township	X						
Springfield Township	X						
Stoneboro Borough	X						
Sugar Grove Township	X						
West Middlesex Borough	X						
West Salem Township	X						
Wheatland Borough	X						
Wilmington Township	X						
Wolf Creek Township	X						
Worth Township	X						
Mercer County			X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**3.3.2**	**3.3.3**	**4.1.1**	**4.1.2**	**4.2.1**	**4.2.2**	**5.1.1**
Clark Borough	X					X	

Municipal Hazard Mitigation Actions Checklist							
Municipality	**3.3.2**	**3.3.3**	**4.1.1**	**4.1.2**	**4.2.1**	**4.2.2**	**5.1.1**
Coolspring Township	X			X		X	
Deer Creek Township	X			X		X	
Delaware Township	X			X		X	
East Lackawannock Township	X			X		X	
Fairview Township	X			X		X	
Farrell City	X			X		X	
Findley Township	X			X		X	
Fredonia Borough	X			X		X	
French Creek Township	X			X		X	
Greene Township	X			X		X	
Greenville Borough	X			X		X	
Grove City Borough	X			X		X	
Hempfield Township	X			X		X	
Hermitage City	X			X		X	
Jackson Township	X			X		X	
Jackson Center Borough	X			X		X	
Jamestown Borough	X			X		X	
Jefferson Township	X			X		X	
Lackawannock Township	X			X		X	
Lake Township	X			X		X	
Liberty Township	X			X		X	
Mercer Borough	X			X		X	
Mill Creek Township	X			X		X	
New Lebanon Borough	X			X		X	
New Vernon Township	X			X		X	
Otter Creek Township	X			X		X	
Perry Township	X			X		X	
Pine Township	X			X		X	
Pymatuning Township	X			X		X	
Salem Township	X			X		X	
Sandy Creek Township	X			X		X	
Sandy Lake Borough	X			X		X	
Sandy Lake Township	X			X		X	
Sharon City	X			X		X	
Sharpsville Borough	X			X		X	
Sheakleyville Borough	X			X		X	
Shenango Township	X			X		X	
South Pymatuning Township	X			X		X	

Municipal Hazard Mitigation Actions Checklist							
Municipality	**3.3.2**	**3.3.3**	**4.1.1**	**4.1.2**	**4.2.1**	**4.2.2**	**5.1.1**
Springfield Township	X			X		X	
Stoneboro Borough	X			X		X	
Sugar Grove Township	X			X		X	
West Middlesex Borough	X			X		X	
West Salem Township	X			X		X	
Wheatland Borough	X			X		X	
Wilmington Township	X			X		X	
Wolf Creek Township	X			X		X	
Worth Township	X			X		X	
Mercer County	X	X	X		X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**5.1.2**	**5.2.1**	**5.2.2**	**6.1.1**	**6.1.2**	**6.1.3**	**6.1.4**
Clark Borough							
Coolspring Township							
Deer Creek Township							
Delaware Township							
East Lackawannock Township							
Fairview Township							
Farrell City							
Findley Township							
Fredonia Borough							
French Creek Township							
Greene Township							
Greenville Borough							
Grove City Borough							
Hempfield Township							
Hermitage City							
Jackson Township							
Jackson Center Borough							
Jamestown Borough							
Jefferson Township							
Lackawannock Township							
Lake Township							
Liberty Township							
Mercer Borough							
Mill Creek Township							

Municipal Hazard Mitigation Actions Checklist							
Municipality	**5.1.2**	**5.2.1**	**5.2.2**	**6.1.1**	**6.1.2**	**6.1.3**	**6.1.4**
New Lebanon Borough							
New Vernon Township							
Otter Creek Township							
Perry Township							
Pine Township							
Pymatuning Township							
Salem Township							
Sandy Creek Township							
Sandy Lake Borough							
Sandy Lake Township							
Sharon City							
Sharpsville Borough							
Sheakleyville Borough							
Shenango Township							
South Pymatuning Township							
Springfield Township							
Stoneboro Borough							
Sugar Grove Township							
West Middlesex Borough							
West Salem Township							
Wheatland Borough							
Wilmington Township							
Wolf Creek Township							
Worth Township							
Mercer County	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**6.1.5**	**6.1.6**	**6.1.7**	**6.2.1**	**6.2.2**	**6.2.3**	**6.2.4**
Clark Borough			X		X	X	X
Coolspring Township			X		X	X	X
Deer Creek Township			X		X	X	X
Delaware Township			X		X	X	X
East Lackawannock Township			X		X	X	X
Fairview Township			X		X	X	X
Farrell City			X		X	X	X
Findley Township			X		X	X	X
Fredonia Borough			X		X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**6.1.5**	**6.1.6**	**6.1.7**	**6.2.1**	**6.2.2**	**6.2.3**	**6.2.4**
French Creek Township			X		X	X	X
Greene Township			X		X	X	X
Greenville Borough			X		X	X	X
Grove City Borough			X		X	X	X
Hempfield Township			X		X	X	X
Hermitage City			X		X	X	X
Jackson Township			X		X	X	X
Jackson Center Borough			X		X	X	X
Jamestown Borough			X		X	X	X
Jefferson Township			X		X	X	X
Lackawannock Township			X		X	X	X
Lake Township			X		X	X	X
Liberty Township			X		X	X	X
Mercer Borough			X		X	X	X
Mill Creek Township			X		X	X	X
New Lebanon Borough			X		X	X	X
New Vernon Township			X		X	X	X
Otter Creek Township			X		X	X	X
Perry Township			X		X	X	X
Pine Township			X		X	X	X
Pymatuning Township			X		X	X	X
Salem Township			X		X	X	X
Sandy Creek Township			X		X	X	X
Sandy Lake Borough			X		X	X	X
Sandy Lake Township			X		X	X	X
Sharon City			X		X	X	X
Sharpsville Borough			X		X	X	X
Sheakleyville Borough			X		X	X	X
Shenango Township			X		X	X	X
South Pymatuning Township			X		X	X	X
Springfield Township			X		X	X	X
Stoneboro Borough			X		X	X	X
Sugar Grove Township			X		X	X	X
West Middlesex Borough			X		X	X	X
West Salem Township			X		X	X	X
Wheatland Borough			X		X	X	X
Wilmington Township			X		X	X	X
Wolf Creek Township			X		X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**6.1.5**	**6.1.6**	**6.1.7**	**6.2.1**	**6.2.2**	**6.2.3**	**6.2.4**
Worth Township			X		X	X	X
Mercer County		X		X			

Municipal Hazard Mitigation Actions Checklist							
Municipality	**6.3.1**	**6.3.2**	**6.3.3**	**6.4.1**	**6.4.2**	**6.4.3**	**6.4.4**
Clark Borough	X	X					
Coolspring Township	X	X					
Deer Creek Township	X	X					
Delaware Township	X	X					
East Lackawannock Township	X	X					
Fairview Township	X	X					
Farrell City	X	X					
Findley Township	X	X					
Fredonia Borough	X	X					
French Creek Township	X	X					
Greene Township	X	X					
Greenville Borough	X	X					
Grove City Borough	X	X					
Hempfield Township	X	X					
Hermitage City	X	X					
Jackson Township	X	X					
Jackson Center Borough	X	X					
Jamestown Borough	X	X					
Jefferson Township	X	X					
Lackawannock Township	X	X					
Lake Township	X	X					
Liberty Township	X	X					
Mercer Borough	X	X					
Mill Creek Township	X	X					
New Lebanon Borough	X	X					
New Vernon Township	X	X					
Otter Creek Township	X	X					
Perry Township	X	X					
Pine Township	X	X					
Pymatuning Township	X	X					
Salem Township	X	X					
Sandy Creek Township	X	X					

Municipal Hazard Mitigation Actions Checklist							
Municipality	**6.3.1**	**6.3.2**	**6.3.3**	**6.4.1**	**6.4.2**	**6.4.3**	**6.4.4**
Sandy Lake Borough	X	X					
Sandy Lake Township	X	X					
Sharon City	X	X					
Sharpsville Borough	X	X					
Sheakleyville Borough	X	X					
Shenango Township	X	X					
South Pymatuning Township	X	X					
Springfield Township	X	X					
Stoneboro Borough	X	X					
Sugar Grove Township	X	X					
West Middlesex Borough	X	X					
West Salem Township	X	X					
Wheatland Borough	X	X					
Wilmington Township	X	X					
Wolf Creek Township	X	X					
Worth Township	X	X					
Mercer County	X	X	X	X	X	X	X

Municipal Hazard Mitigation Actions Checklist							
Municipality	**6.4.4**	**6.4.5**	**7.1.1**	**7.2.1**	**7.3.1**		
Clark Borough				X			
Coolspring Township				X			
Deer Creek Township			X	X			
Delaware Township			X	X			
East Lackawannock Township			X	X			
Fairview Township			X	X			
Farrell City			X	X			
Findley Township			X	X			
Fredonia Borough			X	X			
French Creek Township			X	X			
Greene Township			X	X			
Greenville Borough			X	X			
Grove City Borough			X	X			
Hempfield Township			X	X			
Hermitage City			X	X			
Jackson Township			X	X			
Jackson Center Borough			X	X			

Municipal Hazard Mitigation Actions Checklist							
Municipality	**6.4.4**	**6.4.5**	**7.1.1**	**7.2.1**	**7.3.1**		
Jamestown Borough			X	X			
Jefferson Township			X	X			
Lackawannock Township			X	X			
Lake Township			X	X			
Liberty Township			X	X			
Mercer Borough			X	X			
Mill Creek Township			X	X			
New Lebanon Borough			X	X			
New Vernon Township			X	X			
Otter Creek Township			X	X			
Perry Township			X	X			
Pine Township			X	X			
Pymatuning Township			X	X			
Salem Township			X	X			
Sandy Creek Township			X	X			
Sandy Lake Borough			X	X			
Sandy Lake Township			X	X			
Sharon City			X	X			
Sharpsville Borough			X	X			
Sheakleyville Borough			X	X			
Shenango Township			X	X			
South Pymatuning Township			X	X			
Springfield Township			X	X			
Stoneboro Borough			X	X			
Sugar Grove Township			X	X			
West Middlesex Borough			X	X			
West Salem Township			X	X			
Wheatland Borough			X	X			
Wilmington Township			X	X			
Wolf Creek Township			X	X			
Worth Township			X	X			
Mercer County	X	X	X	X			

Table 90 - Objective to Action Checklist

Objective	Number of Actions
Objective 1.1	1
Objective 1.2	2

Objective	Number of Actions
Objective 1.3	1
Objective 1.4	4
Objective 2.1	1
Objective 2.2	2
Objective 2.3	3
Objective 2.4	1
Objective 3.1	3
Objective 3.2	9
Objective 3.3	3
Objective 4.1	2
Objective 4.2	2
Objective 5.1	2
Objective 5.2	2
Objective 6.1	7
Objective 6.2	4
Objective 6.3	3
Objective 6.4	5
Objective 7.1	1
Objective 7.2	1
Objective 7.3	1

Table 91 - Actions Tied to Hazard

Actions Tied to Hazard	
Hazard	**Actions Related**
Civil Disturbance	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.2.2, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Dam Failure	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.2.3, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 7.1.1, 7.2.1, 7.3.1
Drought	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.2.3, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Earthquake	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Emergency Services	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.4.5

Actions Tied to Hazard	
Hazard	**Actions Related**
Environmental Hazards/Hazardous Materials	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.2.6, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Flooding, Flash Flooding, Ice Jam Flooding	1.1.1, 1.2.1, 1.3.1, 1.4.1, 1.4.2, 1.4.3, 1.4.4, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.1.2, 4.2.2, 5.1.1, 5.1.2, 5.2.1, 5.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.2.1, 6.2.2, 6.2.3
Hurricane/Tropical Storm	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.1.3, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Invasive Species	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.3.1, 6.3.2, 6.3.3
Landslide	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Levee Failure	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Nuclear Incident	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.2.9, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.4.4
Opioid Epidemic	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.4.2
Pandemic, Epidemic, and Infectious Disease	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 2.4.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.4.1
Radon Exposure	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.1.7
Subsidence and Sinkhole	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Terrorism/Cyberterrorism Incidents	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.2.7, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.4.3
Tornadoes/Windstorms	1.1.1, 1.2.1, 1.2.2, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.2.4

Actions Tied to Hazard	
Hazard	**Actions Related**
Transportation Accidents	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.3.1
Utility Interruption	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 2.3.2, 2.3.3, 3.1.1, 3.2.1, 3.2.2, 3.2.8, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.3.1
Wildfire	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.2.1, 3.2.2, 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5
Winter Storm	1.1.1, 1.2.1, 2.1.1, 2.2.1, 2.3.1, 3.1.1, 3.1.3, 3.2.1, 3.2.2, 3.2.4, 3.2.5, , 3.3.1, 3.3.2, 3.3.3, 4.1.1, 4.2.1, 4.2.2, 5.1.1, 6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating, and updating this plan is critical to maintaining its value and success in Mercer County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. This HMP update also defines the municipalities' role in updating and evaluating the plan. Finally, the 2023 HMP update encourages continued public involvement and how this plan may be integrated into other planning mechanisms in the county.

7.2. Monitoring, Evaluating and Updating the Plan

Hazard mitigation planning in Mercer County is a responsibility of all levels of government (i.e., county, and local), as well as the citizens of the county. The Mercer County Local Planning Team will be responsible for maintaining this multi-jurisdictional HMP. The local planning team will meet annually and following each emergency declaration to review the plan. Every municipality that has adopted this plan will also be afforded the opportunity to provide updated information or information specific to hazards encountered during an emergency or disaster. Each review process will ensure that the hazard vulnerability and risk analysis reflect the current conditions of the county, that the capabilities assessment accurately reflects local circumstances and that the hazard mitigation strategies are updated based on the county's damage assessment reports and local mitigation project priorities. The HMP must be updated on a five-year cycle. An updated HMP must be completed and approved by the end of the five-year period. The monitoring, evaluating, and updating of the plan every five years will rely heavily on the outcomes of the annual HMP planning team meetings.

The Mercer County Local Planning Team will complete a hazard mitigation progress report to evaluate the status and accuracy of the multi-jurisdictional HMP and record the local planning team's review process. The annual plan review will be distributed to appropriate representatives at both PEMA and FEMA. The following items will be completed during the annual review and reporting process:

- Review the risk assessment section and identify occurrences of hazards within the last year. Identify date, time, damage, fatalities, and other specific information of the events. Also identify any new hazards that have occurred or increased risk with the county.

- Complete a review and update of the capability assessment section. Identify any capability weaknesses since the last review.
- Complete a review of the mitigation strategy section. Review the goals and objectives identified in the 2023 HMP and determine if any updates are needed. Provide all mitigation actions and opportunities to the county and municipalities that are applicable. Have all entities complete an action review matrix and document all results in the report. Also, add any new actions that are identified. Complete a review of each mitigation opportunity and identify the status of each opportunity on the opportunity review spreadsheet. All information will be included in the annual review report.

The Mercer County Department of Public Safety will maintain a copy of these records and place them in Appendix I of this plan. Mercer County will continue to work with all municipalities regarding hazard mitigation projects, especially those municipalities that did not submit projects for inclusion in this plan.

7.3. Continued Public Involvement

The Mercer County Department of Public Safety will ensure that the 2023 Mercer County Hazard Mitigation Plan is posted and maintained on the Mercer County website and will continue to encourage public review and comment on the plan. The Mercer County website that the plan will be located at is as follows:
https://www.mercercountypa.gov/hazard.mitigation/default.htm

The public will have access to the 2023 Mercer County HMP through their local municipal office, the Mercer County Regional Planning Commission, or the Mercer County Department of Public Safety. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and the county website.

The citizens of Mercer County are encouraged to submit their comments to elected officials and/or members of the Mercer County HMP Local Planning Team. To promote public participation, the Mercer County Local Planning Team will post a public comment form as wells as the Hazard Mitigation Project Opportunity Form on the county's website. These forms will offer the public various opportunities to supply their comments and observations. All comments received will be maintained and considered by the Mercer County Hazard Mitigation Planning Team.

8. Plan Adoption

8.1. Resolutions

In accordance with federal and state requirements, the governing bodies of each participating jurisdiction must review and adopt by resolution, the 2023 Mercer County Hazard Mitigation Plan. Copies of the adopting resolutions are included in this plan in Appendix J. FEMA Region III in Philadelphia, Pennsylvania is the final approval authority for the Hazard Mitigation Plan. PEMA also reviews the plan before submission to FEMA.

9. Appendices

APPENDIX A: **References**

APPENDIX B: **FEMA Local Mitigation Review Tool**

APPENDIX C: **Meetings and Support Documents**

APPENDIX D: **Municipal Flood Maps**

APPENDIX E: **Critical and Special Needs Facilities**

APPENDIX F: **2023 HAZUS Reports**

APPENDIX G: **2023 Mitigation Project Opportunities**

APPENDIX H: **2023 Mitigation Action Evaluation & Prioritization**

APPENDIX I: **Annual Review Documentation**

APPENDIX J: **Mercer County & Municipal Adoption Resolutions**