

# McKean County 2025 Hazard Mitigation Plan

Prepared for:

McKean County Department  
of Emergency Services

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*McKean County, Pennsylvania  
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**Certification of Annual Review Meetings**

YEAR	DATE OF MEETING	PUBLIC OUTREACH ADDRESSED? *	SIGNATURE
2025			
2026			
2027			
2028			
2029			

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

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**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

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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/Sciences
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

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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
SC:	Steering Committee
SFHA:	Special Flood Hazard Area
TRI:	Toxic Release Inventory
UCC:	Uniform Construction Code
US HHS:	United States Department of Health and Human Services
USACE:	United States Army Corp of Engineers
USDA:	United States Department of Agriculture
USDA FS:	United States Department of Agriculture Forest Service

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USGS: United States Geological Survey  
WL: Working Level  
WMD: Weapon of Mass Destruction  
WUI: Wildland Urban Interface

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### **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 2023, McKean County and the Department of Emergency Services contracted the services of a consulting agency to revise and update the McKean County Hazard Mitigation Plan. The plan was successfully updated in accordance with the requirements set forth by PEMA and FEMA. The updated McKean County Hazard Mitigation Plan was adopted by the McKean County Commissioners in 2025. All twenty-two municipalities adopted the 2019 McKean County Hazard Mitigation Plan as the municipal hazard mitigation plan, and it is anticipated that all participating municipalities will adopt the 2025 McKean County Hazard Mitigation Plan Update.

The McKean County Commissioners secured a grant to complete the 2025 update to the McKean 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 February 20<sup>th</sup>, 2024.

The planning process for the 2025 McKean 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. Several meetings were held in person with a virtual option, and participants were invited to submit surveys and other documents via an online survey.

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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
- Extreme Temperatures
- Flooding, Flash Flooding, Ice Jam Flooding
- Invasive Species
- Landslide
- Pandemic, Epidemic, Endemic, and Infectious Disease
- Radon Exposure
- Subsidence/Sinkhole
- Tornado/Windstorm
- Wildfire
- Winter Storm

### Human-caused hazards:

- Blighted Properties
- Civil Disturbance
- Dam Failure
- Disorientation
- \*Emergency Services
- Environmental Hazards / Hazardous Materials
- Substance Use Disorder
- Terrorism/Cyberterrorism Incidents
- Transportation Accidents
- Urban Fire and Explosion
- Utility Interruption

A total of twenty-three hazards have been identified in the 2025 McKean County Hazard Mitigation Plan. A total of sixteen identified hazards were listed in the previous 2019 plan update. The new hazards include blighted properties, civil disturbance, emergency services, extreme temperatures, pandemic, epidemic, endemic, and infectious disease, radon exposure, and substance use disorder.

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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 forty-four actions were developed for this plan update as they pertain to hazards identified by the local planning team. The 2019 McKean County Hazard Mitigation Plan consisted of thirty 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. There were no project opportunity forms submitted during the 2019 HMP update. A total of three project opportunities were submitted for this plan update.

The 2025 McKean County Hazard Mitigation Plan is the cornerstone to reducing McKean 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 2025 McKean 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.

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## **1. Introduction**

### **1.1. Background**

The McKean 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 McKean County and all of its twenty-two municipalities. The McKean County Department of Emergency Services was charged by the County Board of Commissioners to prepare the 2025 plan. The 2019 HMP has been utilized and maintained during the five-year life cycle.

The McKean 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 McKean County as a sub-grantee. The McKean County Commissioners assigned the McKean County Department of Emergency Services with the primary responsibility to update the hazard mitigation plan (HMP). 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 McKean County. This updated HMP will provide another solid foundation for the McKean 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 damage and economic losses that result from hazards.

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- 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 McKean County Multi-Jurisdictional Hazard Mitigation Plan serves as a framework for saving lives, protecting assets, and preserving the economic viability of the twenty-two municipalities in McKean County. The HMP outlines actions designed to address and reduce the impact of a full range of natural hazards facing McKean 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 McKean 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:

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- 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

# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

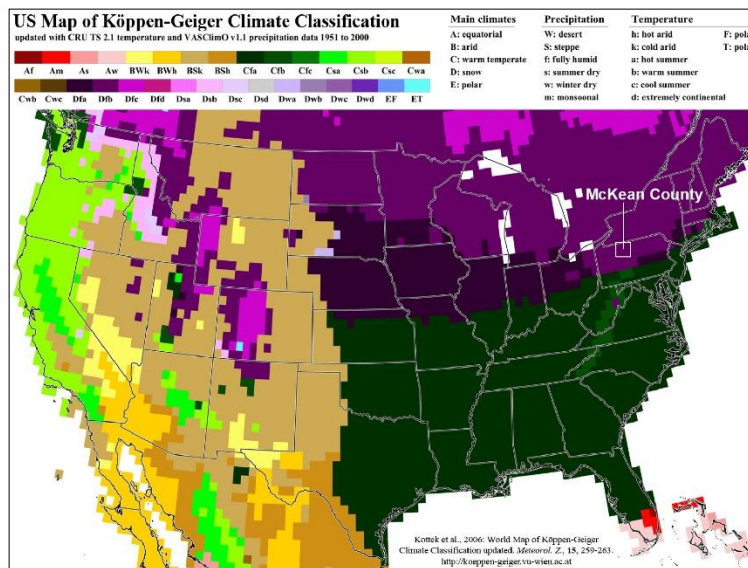
## 2. Community Profile

### 2.1. Geography and the Environment

McKean County covers approximately 984 square miles and is situated in the north-west region of Pennsylvania. The county is bordered by Warren County in the west, by Cattaraugus County, NY, and Allegany County, NY, to the north, by Potter County to the east, by Cameron County to the southeast, and by Elk County to the south. McKean County lies within two physiographic provinces of Pennsylvania—the Deep Valleys Province and the Ridge and High Plateau Province. The county is the 51<sup>st</sup> ranked county in terms of population within the Commonwealth of Pennsylvania. There is a total of 979 square miles of land and five square miles of water. McKean 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 2,444 feet near Mount Jewett to the northwest to a low of approximately 1,300 feet near Norwich.

The Köppen-Geiger Climate Areas map classifies McKean 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 since, the climate in McKean County is temperate, characterized by moderately hot summers and moderately severe winters. In winter, the average temperature is

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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35.3°F and the average daily minimum temperature is 16.6°F. In summer, the average temperature is 51.8°F and the average daily maximum temperature is 75.8°F. The average amount of snowfall each winter is 38.3 inches.

River and stream valleys dominate the landscape of McKean County. The Allegheny River is the primary feature and runs through the entire county. Its major tributaries include Kinzua, Marvin, Potato and the Allegheny Portage creeks.

McKean County is comprised of four watersheds:

*Table 1 - Watersheds in McKean County*

Watersheds in McKean County
Clarion
Middle Allegheny-Tionesta
Sinnemahoning
Upper Allegheny

### **2.2. Community Facts**

McKean County was created in 1804 and then later organized in 1826. McKean County got its name from the former Pennsylvania Governor Thomas McKean. McKean County was founded due to the natural resources it holds such as oil and timber. Smethport, the county seat, was organized in 1807 and it was named after Raymond and Theodor De Smeth who were Amsterdam bakers. In 1853, Smethport was incorporated as a borough.

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

- Cities: Bradford
- Boroughs: Eldred, Kame, Lewis Run, Mount Jewett, Port Allegany, and Smethport
- Townships: Annin, Bradford, Ceres, Corydon, Eldred, Foster, Hamilton, Hamlin, Keating, Lafayette, Liberty, Norwich, Otto, Sergeant, and Wetmore

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Table 2 - National Register of Historic Places in McKean County

<b>National Register of Historic Places in McKean County</b>	
<b>Name</b>	<b>Description</b>
Anokatok Mansion	Georgian Colonial style mansion that was constructed in 1896 for Dr. Elizabeth Dennistoun Wood Kane. She was the wife of General Thoams L. Kane. This mansion was listed in the National Register of Historic Places in January of 1986.
Bradford Armory	Bradford Armory was built in 1912 and was placed in the National Register of Historic Places in May of 1991.
Bradford Downtown Historic District	This historic district included 136 structures and was placed on the National Register of Historic Places in 2000.
Bradford Old City Hall	Bradford Old City Hall is a Victorian Romanesque Revival building that was constructed in 1897. This building was placed on the National Register of Historic Places in May of 1976.
Crook Farm	Crook Farm is a historic district located in Foster Township, Crook Farm was constructed in 1856 and was placed on the National Register of Historic Places in March of 1976.
Kane Armory	Kane Armory was built in 1922 for the 112 <sup>th</sup> Infantry of the Pennsylvania National Guard. This armory was placed in the National Register of Historic Places in May of 1991.
Lynn Hall	Lynn Hall was constructed in 1935 and originally used as a restaurant. Today Lynn Hall is being rehabilitated to offer short term rentals. Lynn Hall was placed on the National Register of Historic Places in 1984.
New Thomson House	New Thomson House is also known as the Penn-Kane Hotel. This six-story house was built in 1907. Today this house is still in use as a mixed-use building. This house was placed on the National Register of Historic Places in 1984.
Rufus Barrett Stone House	Rufus Barret Stone House is also known as the Flatiron Building and was constructed in 1903.
Thomas L. Kane Memorial Chapel	Thomas L. Kane Chapel was constructed in 1876 and was dedicated to the American Civil War General Thomas L. Kane. This chapel was placed on the National Register of Historic Places in March 1978.

### **2.3. Population and Demographics**

The total population for McKean County is 40,432 based on 2020 United States Census Bureau. The total change in population for McKean County from 2010 to 2020 was a decrease of 3,018 residents and a change of -6.9%. The most populous municipality is Bradford City. The

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municipalities in the county that had the largest percentage of decrease from 2010 to 2020 were Lafayette Township (-24.8%), Norwich Township (-14.1%), and Smethport Borough (-13.2%). The municipalities that had the highest percentage of increase for the period from 2010 to 2020 were Corydon Township (2.9%), Sergeant Township (2.8%) and Annin Township (2.2%). *Table 3 – Population Change in McKean 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 5 – McKean County Population Density* illustrates the average population density values per census track in the various municipalities of McKean County.

*Table 3 - Population Change in McKean County*

<b>Population Change in McKean County from 2010-2020</b>			
<b>Municipality</b>	<b>2010 Census</b>	<b>2020 Census</b>	<b>Percent of Change 2010-2020</b>
Annin Township	694	709	2.20%
Bradford City	8,770	7,849	-10.50%
Bradford Township	4,805	4,793	-2.50%
Ceres Township	905	846	-6.50%
Corydon Township	275	283	2.90%
Eldred Borough	825	765	-3.60%
Eldred Township	1,592	1,394	-12.40%
Foster Township	4,316	4,038	-6.40%
Hamilton Township	543	549	1.10%
Hamlin Township	734	681	-7.20%
Kane Borough	3,730	3,630	-2.70%
Keating Township	3,021	2,725	-9.80%
Lafayette Township	2,350	1,768	-24.80%
Lewis Run Borough	617	583	-5.50%
Liberty Township	1,612	1,607	-0.30%
Mount Jewett Borough	919	858	-6.60%
Norwich Township	583	501	-14.10%
Otto Township	1,556	1,516	-2.60%
Port Allegany Borough	2,157	2,135	-1.00%
Sergeant Township	141	145	2.80%
Smethport Borough	1,655	1,436	-13.20%
Wetmore Township	1,650	1,621	-1.80%

Source: United States Census Bureau (2024), 2020 Census Data

During this hazard mitigation planning period, socially vulnerable populations were reviewed for McKean County. For the purposes of this hazard mitigation plan, socially vulnerable populations

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include the unhoused and unsheltered populations of McKean County, individuals who have mobility challenges, and those populations which may have not had an active role in hazard mitigation planning in the past. Social vulnerability can also include portions of the population that may not have access to specific resources or community lifelines. In McKean County, this includes, but is not limited to, populations with limited internet access, those individuals who do not have easy access to public transportation, and those populations that are not near grocery stores, or other community lifelines. In McKean County, populations located far from grocery stores or food locations are at increased vulnerability to natural and human-caused hazards.

Vulnerable populations in McKean County are represented by a variety of different groups. The McKean County Redevelopment & Housing Authority represents individuals located or utilizing low-income housing. The local planning team for this hazard mitigation plan made efforts to include individuals from the McKean County Department of Emergency Services in the planning process.

There are approximately 19,416 housing units in McKean County, Pennsylvania. Of these housing units, there are an estimated 15,931 households within the county, with an average size of 2.37 persons. Married couples make up a plurality of households in the county at 49.1%. The estimated owner-occupied housing rate of McKean County is 78.4%, with an overall occupancy rate of 81.6% of all units. The median value of the owner-occupied housing units in McKean County from 2018 to 2022 is \$105,900.00. The median monthly owner's costs for a structure with a mortgage was \$1,022.00 and the median monthly owner's costs for a structure without a mortgage was \$458.00. The median gross rent for rental properties in McKean County was \$756.00 for the same date range.

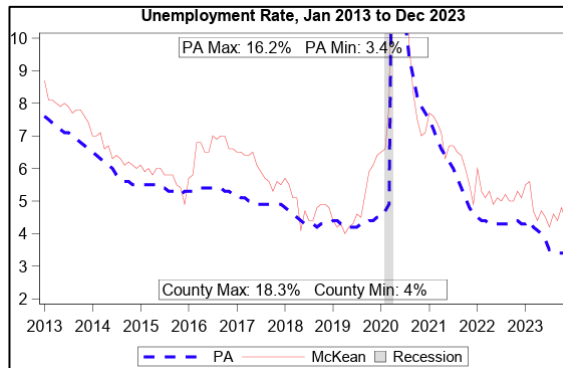
The racial composition of the county is 92.2% White, 2.1% Black or African American, 1.6% Hispanic or Latino, 0.3% American Indian and Alaska Native, 0.5% Asian, less than 0.1% Native Hawaiian and other Pacific Islander, and 3.9% two or more races. The median age of McKean County is 43.8 years of age, which is higher than the median age of Pennsylvania at 40.9 and the national median of 39.0 years of age. The percentage of McKean County under the age of 5 years old is 4.7%, through the ages of 5 and 17 years of age is 15%, between the ages of 18 and 64 years old is 60.3%, and aged 65 years old and older is 20.0%.

The median household income for households in McKean County is \$57,861.00 and the poverty rate of McKean County is 14.1% of the total population. The poverty rate for the Commonwealth of Pennsylvania as a whole is 11.8%. There are approximately 2,627 veterans in McKean County. The median veteran income in McKean County as of 2020 was \$29,966.00, with 4.9% of McKean County veterans living below the poverty level. The veteran unemployment rate in the county was approximately 4.2%.

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The Covid-19 Pandemic created an increase in unemployment and interruptions in employment throughout the United States, to include Pennsylvania and McKean County. According to Pennsylvania Department of Labor and Industry data, there was a large spike in unemployment both across the Commonwealth and McKean County. At the height of the Covid-19 Pandemic in the spring of 2020, the unemployment rate for McKean County hit 18.3% of the working population of the county. That is higher than the peak unemployment percentage for Pennsylvania, which peaked at 16.2% of the working population of the entire state. *Figure 2 – Unemployment Rate Jan. 2013 to Dec. 2023* illustrates the trend and large spike in unemployment. The unemployment rate for McKean County in March 2024 was 4.2%, which roughly accounted for 15,900 working age adults (ages 16 to 65). The total estimated workforce for McKean County was 16,600 working age adults (ages 16 to 65) in March 2024.

*Figure 2 - Unemployment Rate Jan. 2013 to Dec. 2023*



Source: Pennsylvania Department of Labor & Industry

McKean County’s leading industries are education, healthcare, federal government, manufacturing, and retail trade. The primary employment providers within McKean County are displayed below in *Table 4 - McKean County Top Employers*.

*Table 4 - McKean County Top Employers*

<b>McKean County Top Employers (Excluding State Employers)</b>	
<b>Ranking</b>	<b>Company</b>
1	Zippo Manufacturing Co.
2	Bradford Area School District
3	Federal Government
4	Bradford Hospital
5	W R Case & Sons Cutlery Company
6	Wal-Mart Associates Inc.
7	American Refining Group, Inc.
8	Ardagh Glass Inc.

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<b>McKean County Top Employers (Excluding State Employers)</b>	
<b>Ranking</b>	<b>Company</b>
9	McKean County
10	B&T Contractors Inc.
Source: Pennsylvania Department of Labor & Industry, 2023	

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 5 – Quarterly Census of Employment and Wages, 2022 Annual Averages in McKean County* only calls out how many locations per NAICS description and total number of employees.

*Table 5 - Quarterly Census of Employment and Wages, 2022 Annual Averages in McKean County*

<b>Quarterly Census of Employment and Wages, 2022 Annual Averages in McKean County (PA DLI)</b>					
<b>NAICS</b>	<b>Description</b>	<b>Number of Locations</b>	<b>Number of Employees</b>	<b>Employment Percentage</b>	<b>Average Wages</b>
11	Agriculture, Forestry, Fishing, and Hunting	26	79	0.6%	\$53,676.00
21	Mining, Quarrying, and Oil & Gas	34	335	2.4%	\$74,036.00
22	Utilities	13	126	0.9%	\$73,873.00
23	Construction	72	593	4.2%	\$52,105.00
31-33	Manufacturing	53	2,918	20.9%	\$61,012.00
42	Wholesale Trade	31	267	1.9%	\$64,365.00
44-45	Retail Trade	139	1,635	11.7%	\$31,395.00
48-49	Transportation and Warehousing	61	615	4.4%	\$42,610.00
51	Information	10	91	0.7%	\$53,415.00
52	Finance and Insurance	44	231	1.7%	\$50,417.00
53	Real Estate, Rental, and Leasing	11	40	0.3%	\$34,720.00
54	Professional and Technical Services	56	181	1.3%	\$47,008.00

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<b>Quarterly Census of Employment and Wages, 2022 Annual Averages in McKean County (PA DLI)</b>					
<b>NAICS</b>	<b>Description</b>	<b>Number of Locations</b>	<b>Number of Employees</b>	<b>Employment Percentage</b>	<b>Average Wages</b>
55	Management of Companies and Enterprises	7	273	2.0%	\$86,998.00
56	Administrative and Waste Services	28	532	3.8%	\$26,263.00
61	Educational Services	30	1,242	8.9%	\$48,806.00
62	Healthcare and Social Assistance	241	2,197	15.7%	\$46,757.00
71	Arts, Entertainment, and Recreation	15	97	0.7%	\$20,289.00
72	Accommodation and Food Services	97	1,080	7.7%	\$16,353.00
81	Other Services (Except Public Administration)	103	543	3.9%	\$21,153.00
92	Public Administration	38	883	6.3%	\$55,787.00
-	<b>Total, All Industries</b>	<b>1,108</b>	<b>13,656</b>	<b>100%</b>	<b>\$46,564.00</b>
NAICS (North American Industry Classification System)					

## **2.4. Land Use and Development**

McKean County is composed of twenty-two municipalities, which include:

- Fifteen townships
- Six boroughs
- One city

The majority of acreage in McKean County is forested, while approximately 43,084 acres of the acreage is agriculture.

McKean County has approximately 626,560 acres of total land area, and 3,200 acres of water area, with a population per square mile of 41.3 based on 2020 data estimates. Forested areas make up 41% of the county, while Agriculture makes up approximately 54% of the total land area in McKean County, and high density urban, low density urban, water, transitional, resource extraction, quarries, and wetlands each account for 6% of the land area.

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Construction and building development in McKean County has been limited in recent years, with few large-scale projects taking place. The construction that has occurred has been widespread throughout the county, rather than concentrated in one specific area.

### **Systems**

The specific systems in McKean County must also be considered when discussing the community characteristics. Food, water, and shelter are of primary concern when looking at a community's lifelines. As McKean County is a rural county, food areas and grocery stores are spread over a wide geographic area. Specific grocery stores can be found in four municipalities. These municipalities are the City of Bradford, Kane Borough, Port Allegany Borough, and Smethport Borough. Water in McKean County is primarily provided by small, local water authorities and public water suppliers. Local domestic water wells are also prevalent throughout the entire community. Shelter features in McKean County during emergencies can include municipal borough and township buildings and any buildings that are currently part of emergency response and recovery planning for McKean County.

### **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 Incident Reporting System. (PEIRS)
- Pennsylvania Emergency Management Agency (PEMA).
- McKean County Comprehensive Plan 2020.

The countywide Digital Flood Insurance Rate Maps (DFIRM) were used for all flood risk analysis and estimation of loss. The McKean County DFIRMs were approved and effective in 2013. The DFIRM database provides flood frequency and elevation information used in the flood hazard risk assessment. Other McKean 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

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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 McKean 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, critical infrastructure 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 McKean County GIS Department.

### **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 McKean 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 was delayed, and the information

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received during the census was spread out due to social distancing and the limiting of census takers going door to door to gather information.

The McKean County GIS Department provided the following layers for use in the development of hazard profiles and hazard profile mapping for the 2025 Hazard Mitigation Plan Update:

- McKean County Address Points
- McKean County Boundary
- McKean County Centerline
- McKean County EMS Boundaries
- McKean County Fire Boundaries
- McKean County Law Boundaries
- McKean County Municipal Boundaries
- McKean County PSAP Boundary

The following GIS Data layers were developed for use in the 2025 Hazard Mitigation Plan Update:

- McKean County Abandoned Mine Sites
- McKean County Adjacent Counties
- McKean County Airports
- McKean County Community Lifelines
- McKean County Conventional Oil and Gas Sites
- McKean County Courthouse
- McKean County Dam Inventory
- McKean County Earthquakes
- McKean County Electric Substations
- McKean County High Hazard Dams
- McKean County Historic Streams
- McKean County Land Use
- McKean County Levee Area
- McKean County Levee Inventory
- McKean County National Forests
- McKean County Natural Gas Pipelines
- McKean County National Register of Historic Places
- McKean County Population Density
- McKean County Public Water Supply Areas
- McKean County Special Flood Hazard Areas

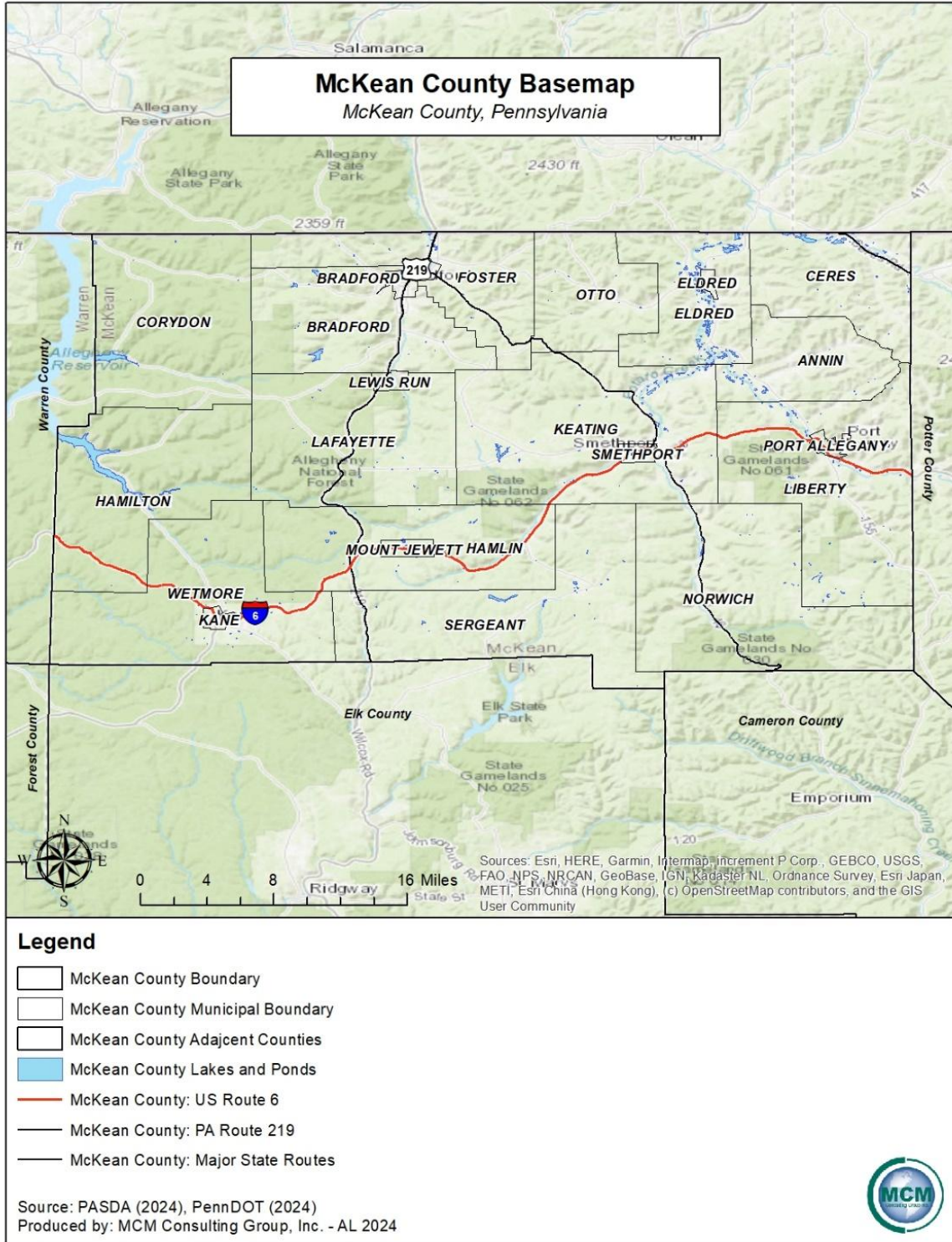
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- McKean County Slope Features
- McKean County Small Lakes and Ponds
- McKean County State Roads
- McKean County Tornado Impacted Municipalities
- McKean County Traffic Information
- McKean County TRI Facilities
- McKean County Wildland Urban Interface (WUI)
- McKean County Zip Codes

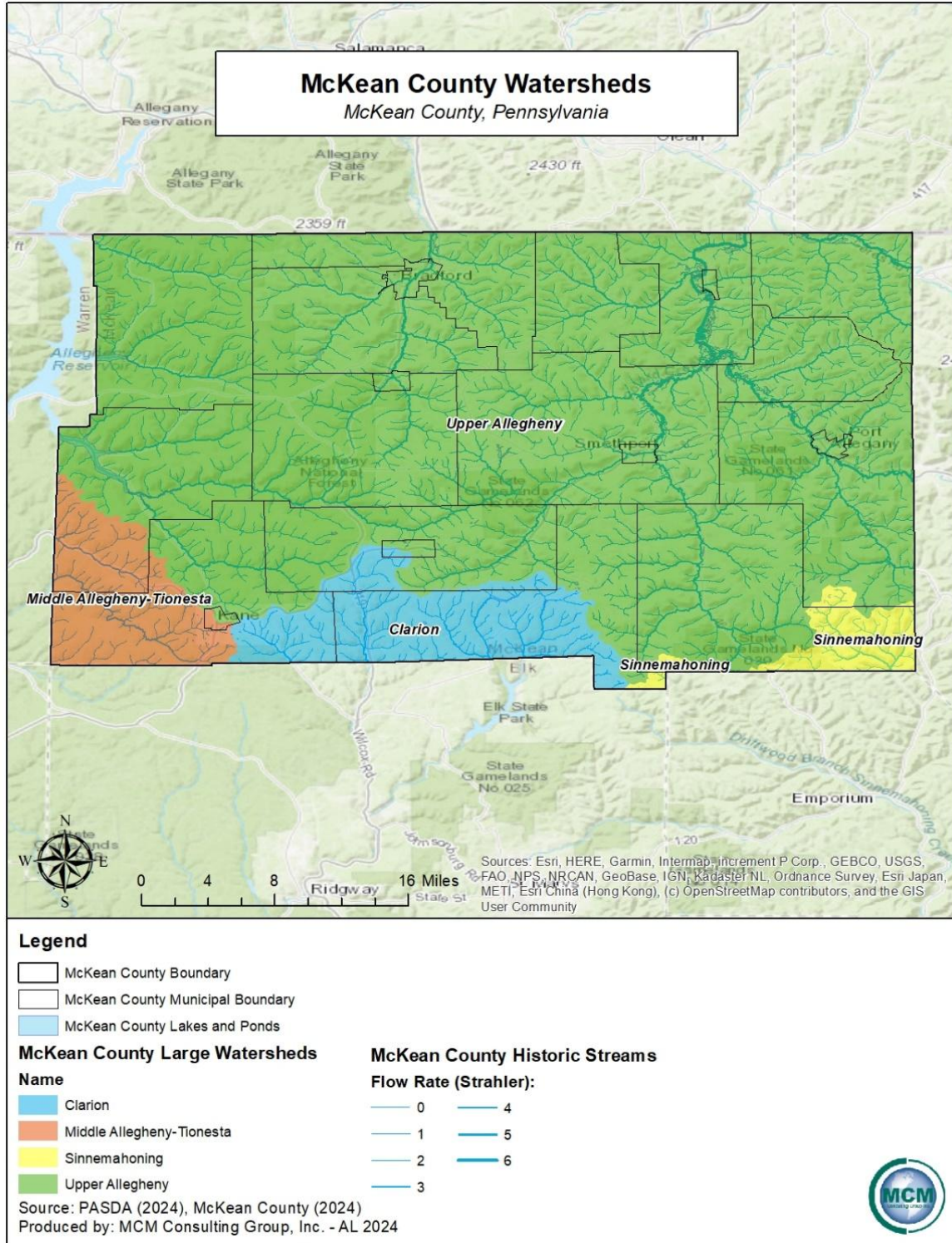
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Figure 3 - McKean County Basemap



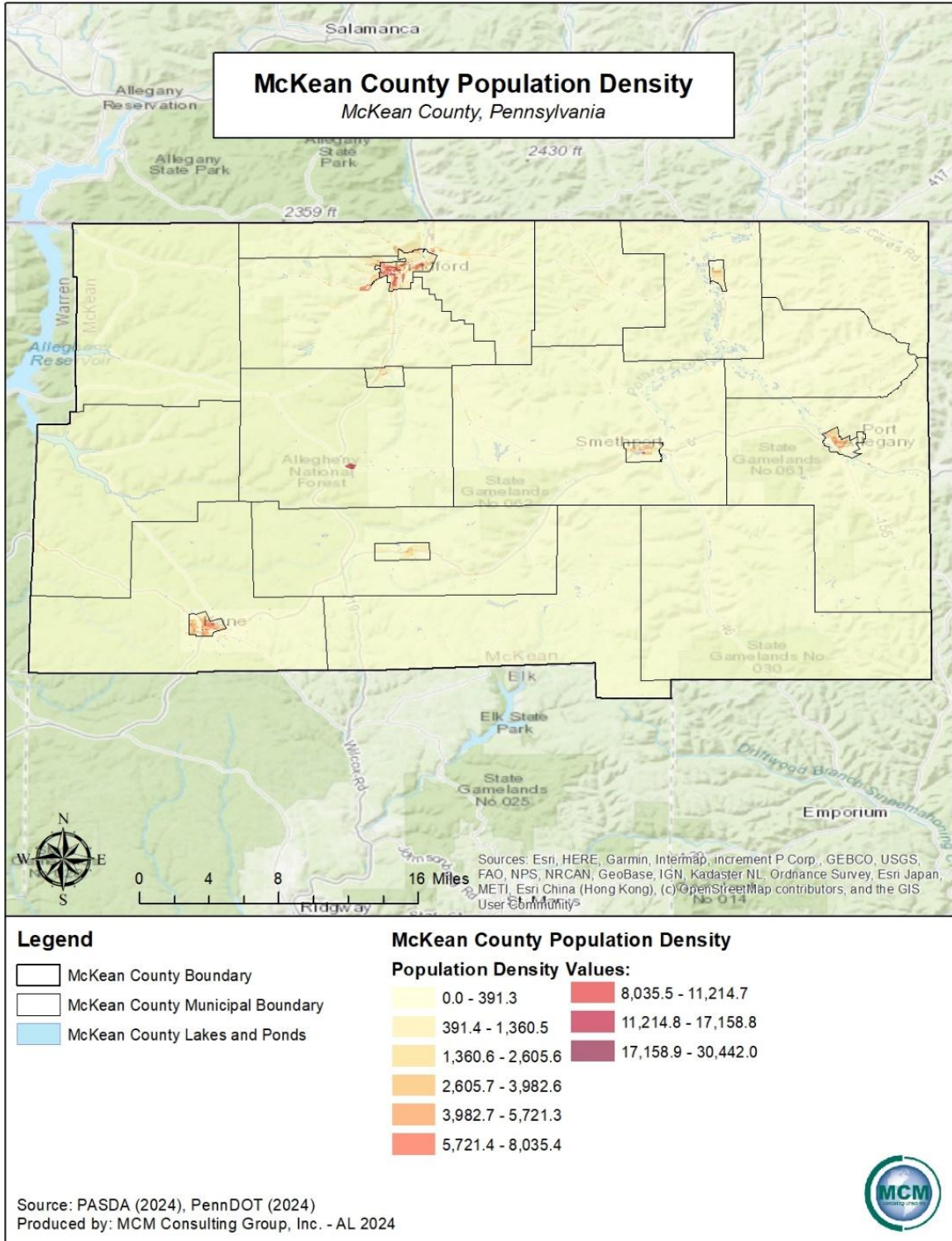
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Figure 4 - McKean County Watersheds



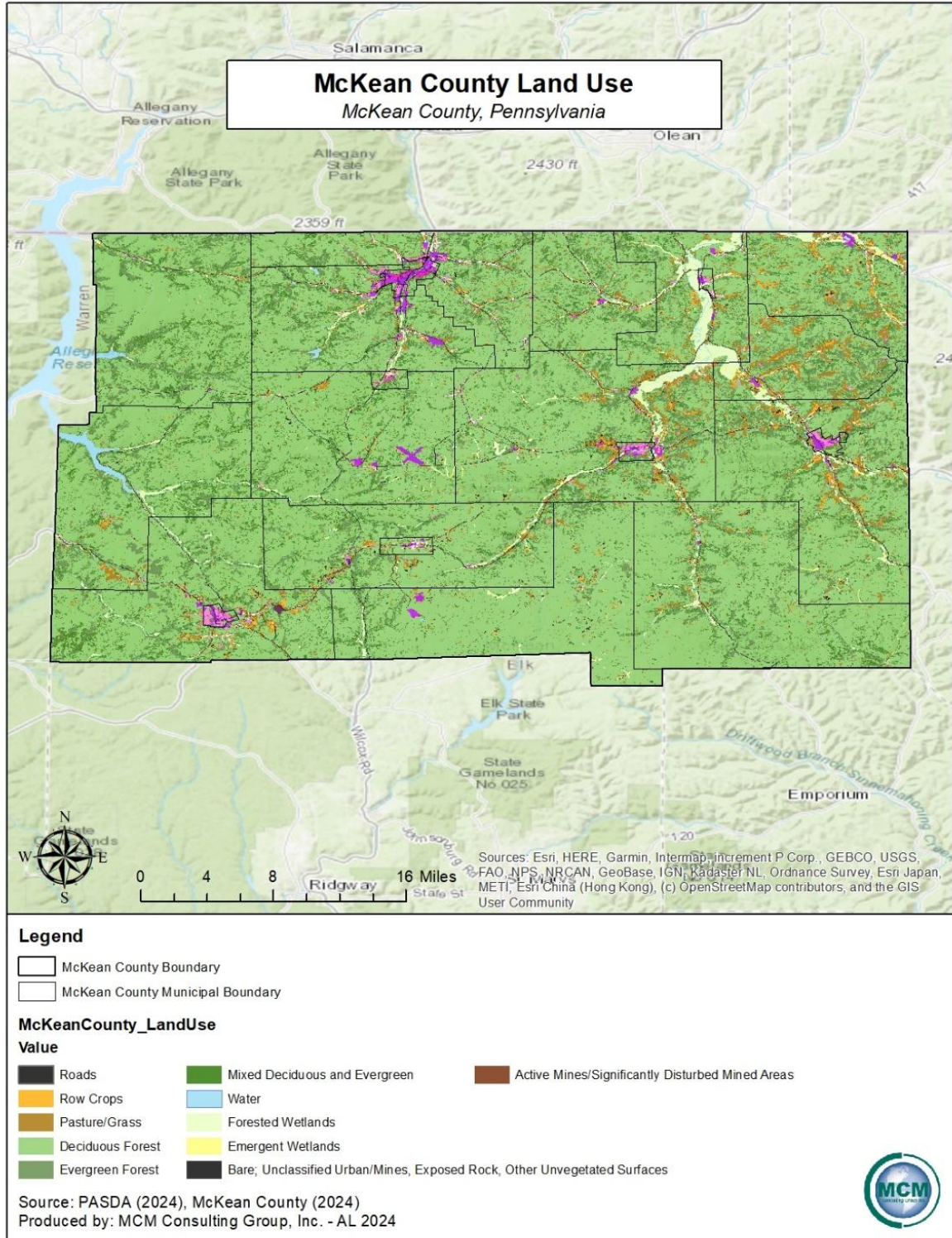
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Figure 5 - McKean County Population Density



# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 6 - McKean County Land Use



### **3. Planning Process**

#### **3.1. Update Process and Participation Summary**

The McKean County Hazard Mitigation Plan update began January 24, 2024. The McKean County Commissioners were able to secure a hazard mitigation grant to start the process. The McKean County Emergency Management Agency was identified as the lead agency for the McKean County Hazard Mitigation Plan update. The planning process involved a variety of key decision makers and stakeholders within McKean County. McKean 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 McKean County Emergency Management Agency 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 McKean County Emergency Management Agency in coordinating and leading public involvement meetings, local planning team meetings, analysis, and the writing of the updated HMP. The McKean 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. 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 McKean 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. McKean County will continue to work with all local municipalities to collect local hazard mitigation project opportunities.

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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 reviewing 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 McKean County Board of Commissioners.
- Plan submission to FEMA and PEMA.

The 2025 McKean County HMP was completed March 31, 2025. The 2025 plan follows an outline developed by PEMA which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. The 2025 HMP format is consistent with the PEMA recommended format. The 2025 McKean 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 2025 McKean County Hazard Mitigation Plan update was led by the McKean County Steering Committee. The McKean 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 6 – Steering Committee* outlines the individuals that comprised this team.

*Table 6 - Steering Committee*

<b>McKean County Hazard Mitigation Plan Update Steering Committee</b>		
<b>Name</b>	<b>Organization</b>	<b>Position</b>
Nathan J. Burgett	McKean County Department of Emergency Services	Director
Rick Fry	McKean County Planning Department	Planner
Gabby Howard	McKean County GIS	GIS Specialist

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<b>McKean County Hazard Mitigation Plan Update Steering Committee</b>		
Gerard Rettger	McKean County Emergency Management Agency	Director

In order to represent the county, the McKean County Steering Committee developed a diversified list of potential local planning team (LPT) members. Members that participated in the 2019 hazard mitigation plan were highly encouraged to join the 2025 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 McKean County Emergency Management Agency utilizing letters, email, and telephone calls. These invitations included local and regional agencies involved in HMP activities, agencies with the authority to regulate development, neighboring communities, businesses and academia, and representatives for county offices and agencies involved in reaching out to socially vulnerable populations. The LPT worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The stakeholders listed in *Table 7 – Local Planning Team* served on the 2025 McKean County Hazard Mitigation Local Planning Team, actively participated in the planning process by attending meetings, completing assessments, surveys, and worksheets and/or submitting comments. All potential local planning team members were presented with an email invitation prior to the local planning team kickoff meeting on February 20, 2024. Those invitation letters for the local planning team are included in Appendix C – Support Documentation of this hazard mitigation plan update.

Individuals representing local interests in dams were presented with the opportunity to participate in the local planning team. Emails were sent to officials involved in the ownership of dams. However, their level of involvement and feedback was limited. The Local Planning Team noted that Bradford Township and Smethport Borough may consider prioritizing closer collaboration with dam owners in the next HMP update. Additionally, regular discussions with the Bradford City Water Authority take place, and these conversations typically extend beyond the scope of dams alone. One HHPD experienced a change in ownership during the HMP update period; the new owner was invited to participate, but chose not to engage.

Increased participation for representatives for socially vulnerable and unserved populations in McKean County is a goal for the next planning period, and mitigation actions can be found in

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Table 7 - Local Planning Team

<b>McKean County Hazard Mitigation Plan Local Planning Team</b>		
<b>Name</b>	<b>Organization</b>	<b>Position</b>
Brice Benson	Smethport Area School District	Superintendent
Amanda Brinker	BRMC Nursing Home	Registered Nurse
Nathan Burgett	McKean County DES	Director
Brandi Buck	Evergreen Elm, Inc.	CEO
Jamie Buckhus	Bradford Regional Medical Center	Manager Plant Services
Vanessa Castano	Bradford YWCA	Executive Director
Alica Dankesreierter	Bradford Regional Airport	Manager
Rob Dickinson	Penn State	Executive Director
Carol Duffy	McKean County	Commissioner
Glen Dun	Potter County DES	911/EMA Coordinator
Bruce Foote	Bradford Flood Control Authority	Flood Control Authority
Rick Fry	McKean County Planning	Director
Linda Howard	Bradford Ecumenical Home	Planned Giving
Gabby Howard	McKean County GIS	GIS Specialist
Scott Kerr	National Fuel Gas Company	Emergency Response Coordinator
Jeannine Kloss	Kane Area School District	Superintendent
Tom Kreiner	McKean County	Commissioner
Bruce Manning	McKean County EMS	EMS Employee
Melissa McGuire	Evergreen Elm, Inc.	Director
Lonny Packard	Journey Health	Director of Facilities
Brian Paganie	FirstEnergy	Manager
Katy Pude	Bradford Area School District	Superintendent
Ann Robinson	Economic Development	Liaison
Stephanie Scrivo	McKean County DES	QA/TC
Matthew Splain	Otto-Eldred School District	Superintendent
Sandy Thompson	Conservation District	Manager
Marty Wilder	McKean County	Commissioner
Alcherrie Williams	McKean County Housing Authority	Executive Director

### **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 8 – HMP Process Timeline* lists the meetings held during the HMP planning process, which organizations and municipalities

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attended and the topic that was discussed at each meeting. All meeting agendas, sign-in sheets, presentation slides, and other documentation are in Appendix C.

The draft plan was made available for public review on October 2, 2024. The draft was advertised on McKean County’s social media page and was made available digitally on the McKean County website at: <https://www.mckeancountypa.gov/index.php>

The public comment period remained open until November 11, 2024. All public comments were submitted via an online survey or in writing to the McKean County Emergency Management Agency. 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 8 - HMP Process Timeline*

<b>McKean County HMP Process Timeline</b>		
<b>Date</b>	<b>Meeting</b>	<b>Description</b>
01/24/2024	McKean County Hazard Mitigation Steering Committee Kickoff Meeting	This meeting was used to determine individuals to invite to the local planning team and to review the draft project schedule.
02/20/2024	McKean County Local Planning Team Kickoff Meeting	This meeting was used to review the project schedule and discuss roles and responsibilities for the hazard mitigation plan. Initial worksheets were introduced and reviewed (Hazard ID, capability assessments, project opportunity, and NFIP survey).
02/20/2024	Municipality Kickoff Meetings	This meeting was used to review the project schedule and discuss roles and responsibilities for the hazard mitigation plan at the municipal level. Initial worksheets were introduced and reviewed (Hazard ID, capability assessment, project opportunity, and NFIP survey).

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<b>McKean County HMP Process Timeline</b>		
<b>Date</b>	<b>Meeting</b>	<b>Description</b>
03/19/2024	Local Planning Team Meeting – Risk Assessment	This meeting was used to discuss the results of the initial documentation request. Selection of hazards for the 2025 hazard mitigation plan was conducted. Risk factor scores were also updated based on changing conditions in McKean County since the 2020 HMP.
04/16/2024	Local Planning Team Meeting – Mitigation Strategy	This meeting was used to review the goals and objectives from the 2020 plan, as well as the mitigation actions.
06/18/2024	Local Planning Team Meeting – Mitigation Strategy	This meeting was used to continue the review of the 2020 mitigation actions, as well as to develop the goals, objectives, and actions of the 2025 plan.
06/18/2024	Municipality Mitigation Opportunity Form Development	This meeting was used to go over the project opportunity forms with the municipalities.
06/18/2024	Draft risk assessment public presentation	This meeting was used to provide the public an opportunity to view the draft risk assessment portion of the HMP.
07/16/2024	Local Planning Team Meeting – Mitigation Strategy	This meeting was used to review the draft 2025 mitigation action plan and update as necessary.
08/20/2024	Local Planning Team Meeting – Mitigation Strategy	This meeting was used to finalize the 2025 mitigation action plan and to complete an evaluation and prioritization of all 2025 mitigation actions.
09/04/2024	Local Planning Team Meeting – Mitigation Strategy	This meeting was used to finalize the 2025 evaluation and prioritization of all 2025 mitigation actions.
10/01/2024	Draft plan public presentation	This meeting was offered to provide the public an opportunity to review the draft hazard mitigation plan, initiating a 30-day public comment period.

**3.4. Public and Stakeholder Participation**

McKean 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 McKean County website. Copies of those advertisements are in Appendix C.

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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 McKean County Emergency Management Agency 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 McKean County Emergency Management Agency.

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 2019 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 2025 municipal project opportunity forms are included as well, located in Appendix G.

In an effort to capture public input, the McKean County LPT held in-person meetings and offered on-line surveys. Members of the public were also encouraged to contact McKean County Emergency Management Agency 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.

McKean County invited all contiguous counties to review the 2025 draft hazard mitigation plan. A letter was sent to the emergency management coordinator in all adjacent counties in Pennsylvania, on. Copies of these letters are included in Appendix C Multi-Jurisdictional Planning.

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### 3.5. Multi-Jurisdictional Planning

McKean 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 9 – Municipality Worksheets, Surveys, and Forms Participation* reflects the municipalities participation by completing worksheets, surveys, and forms.

*Table 9 - Municipality Worksheets, Surveys, and Forms Participation*

<b>McKean County HMP Worksheets, Surveys, and Forms Participation</b>					
<b>Municipality</b>	<b>Capability Assessment Survey</b>	<b>Risk Assessment Hazard Identification and Risk Evaluation Worksheet</b>	<b>NFIP</b>	<b>Risk Factor Assessment</b>	<b>Hazard Mitigation Opportunity Form Review and Updates</b>
Annin Township	X	X	X		
Bradford, City of	X	X	X		
Bradford Township	X	X	X	X	3
Ceres Township	X	X	X		
Corydon Township	X	X	X		
Eldred Borough	X	X	X		
Eldred Township	X		X		
Foster Township	X	X			
Hamilton Township	X	X	X	X	
Hamlin Township	X	X	X		
Kane Borough	X				
Keating Township	X	X			
Lafayette Township	X	X	X		
Lewis Run Borough	X	X	X		
Liberty Township	X	X	X		
Mount Jewett Borough	X	X	X		
Norwich Township	X	X	X		
Otto Township	X	X	X		
Port Allegany Borough	X	X	X		

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<b>McKean County HMP Worksheets, Surveys, and Forms Participation</b>					
<b>Municipality</b>	<b>Capability Assessment Survey</b>	<b>Risk Assessment Hazard Identification and Risk Evaluation Worksheet</b>	<b>NFIP</b>	<b>Risk Factor Assessment</b>	<b>Hazard Mitigation Opportunity Form Review and Updates</b>
Sergeant Township	X	X			
Smethport Borough	X	X	X		
Wetmore Township	X	X	X		

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<b>McKean County Municipal Meeting Tracker</b>						
<b>Municipality</b>	<b>Representative</b>	<b>Title</b>	<b>Meeting Attended</b>			<b>Virtual Meeting with the consultant and or County</b>
Annin Township	Larry Shaffer	Chairman	2/20/2024			
Bradford City	Eric Taylor	Fire Chief/EMC/ City Admin	2/20/2024			
Bradford Township	Susan Gibiser	Sec/Treasury	2/20/2024	6/18/2024		
Ceres Township	Larry Miller	Supervisor				8/29/2024
Corydon Township	Raymond Douglas	Supervisor			9/4/2024	
Eldred Borough	Day Plummir	President	2/20/2024			
Eldred Borough	Andrew Lathry	Mayor	2/20/2024			
Eldred Township	Shelly Batt	Supervisor				8/29/2024
Forster Township	Michael Scrivog	Supervisor	2/20/2024			
Foster Township	George Hocker	Chairman	2/20/2024			
Hamilton Township	Becky Davidson	Sec/Treasury		6/18/2024		
Hamlin Township	Jim Trussell	Supervisor		6/18/2024		
Kane Borough	Don Payne	Borough Manager				2/19/2025
Keating Township	David McClain	Supervisor				8/29/2024
Lafayette Township	John Ryan	Supervisor Chairman	2/20/2024			
Lewis Run Borough	Irv Swartz	Supervisor				8/29/2024
McKean DES	Stephanie Scervo	Fire Chief	2/20/2024			
Mt. Jewett Borough	Francis Auriemm	Council	2/20/2024			
Mt. Jewett Borough	Jason Hughes	Council Member		6/18/2024		
Mt. Jewett Borough	Barbara Harp	Borough Manager	2/20/2024			
Norwich Township	Pual Black	Supervisor	2/20/2024	6/18/2024		
Otto Township	Gerald Rettger	EMC	2/20/2024	6/18/2024	9/4/2024	
Port Alleghany	Jeremy Morey	Borough Manager				2/11/2025
Sergeant Township	Patty Miller	Supervisor				8/29/2024

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<b>McKean County Municipal Meeting Tracker</b>						
<b>Municipality</b>	<b>Representative</b>	<b>Title</b>	<b>Meeting Attended</b>			<b>Virtual Meeting with the consultant and or County</b>
Smethport Borough	Greg Roundsville	Council President	2/20/2024	6/18/2024		
Westmore Township	Jodi Yasurek	Sec/Treasury	2/20/2024			

The majority of the twenty-two municipalities within McKean County adopted the 2019 McKean County Hazard Mitigation Plan as the municipal hazard mitigation plan. The goal of the McKean County Local Planning Team is to have 100% participation by municipalities in adopting the 2025 McKean 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 McKean County which updates their participation status.

## **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 McKean County risk assessment provides in-depth knowledge of the hazards and vulnerabilities that affect McKean 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 McKean County Emergency Operations Plan (EOP), local EOPs and other public and private emergency management plans.

The McKean 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 McKean County Local Planning Team (LPT) reviewed and assessed the change in risk for all natural and human-caused hazards identified in the 2025 hazard mitigation plan. The mitigation planning team then identified hazards that were outlined within the Pennsylvania Hazard Mitigation Plan but not included in the 2025 McKean County Hazard Mitigation Plan

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

The McKean County Steering Committee met with municipalities and provided guidance on how to complete the municipal hazard identification and risk evaluation worksheet. All twenty-two municipalities in McKean 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 McKean County assessment data to estimate loss to particular hazards. Risk factor was then assessed to each of the twenty-five hazards 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 10 – Presidential & Gubernatorial Disaster Declaration* contains a list of all Presidential and Gubernatorial disaster declarations that have affected McKean County and its municipalities from 1955 through 2018, according to the Pennsylvania Emergency Management Agency.

*Table 10 - Presidential & Gubernatorial Disaster Declarations*

<b>Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations</b>		
<b>Date</b>	<b>Hazard Event</b>	<b>Action</b>
06/23/1972	Tropical Storm Anges	Emergency Declarations
08/27/1984	Severe Storms/ Floods	Emergency Declarations
06/03/1985	Tornado	Emergency Declarations
03/16/1993	Severe Snowfall	Emergency Declarations
01/21/1996	Severe Flooding	Emergency Declarations
09/01/1999	Hurricane Floyd	Emergency Declarations
08/23/2003	Severe Storms/ Floods	Emergency Declarations
09/19/2004	Tropical Storm Ivan	Emergency Declarations
09/10/2005	Hurricane Katrina	Proclamation of Emergency
10/29/2012	Hurricane Sandy	Proclamation of Emergency
03/13/2020	COVID-19 Pandemic	Emergency Declarations

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<b>Presidential Disaster Declarations and Gubernatorial Declarations and Proclamations</b>		
<b>Date</b>	<b>Hazard Event</b>	<b>Action</b>
<i>Source: Pennsylvania Emergency Management Agency and Federal Emergency Management Agency</i>		

### **4.2.2. Summary of Hazards**

The McKean County LPT was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2025 HMP Update. Following a review of the hazards considered in the 2019 HMP and the standard list of hazards, the local planning team decided that the 2025 plan should identify, profile, and analyze twenty-five hazards. These twenty-five hazards include all of the hazards profiled in the 2019 plan. The list below contains the hazards that have the potential to impact McKean County as identified through previous risk assessments, the McKean County Hazard Vulnerability Analysis and input from those who participated in the 2025 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 sudden displacement of rock usually within the upper 10-20 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.

##### **Extreme Temperature**

Extreme heat often results in the highest number of annual deaths of all weather-related hazards. In most of the United States, extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. Extremely cold air comes every winter in at least part of the country and affects millions of people across the United States. The arctic air,

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together with brisk winds, can lead to dangerously cold wind chill values. People exposed to extreme cold are susceptible to frostbite and hypothermia in a matter of minutes.

### **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.

### **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 disproportional 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

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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 burns 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.

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### *Identified Human Caused Hazards*

#### **Building/Structural Collapse/Blighted Properties**

Buildings and other engineered structures, including bridges, may collapse if their structural integrity is compromised, especially due to effects from other natural or human-made hazards. Older buildings or structures, structures that are not built to standard codes, or structures that have been weakened are more susceptible to being affected by these hazards.

#### **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.

#### **Disorientation**

Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes such as hiking, camping, hunting, and fishing. As a result, people can become lost or trapped in remote and rugged wilderness areas. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are focused in and around state forest and state park lands.

#### **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:

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- 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.

### **Substance Use Disorder**

Substance use disorder occurs when an individual becomes physically dependent on a drug, either legal or illegal. The most likely focal point of substance use disorder relates to opioid addiction, a class of drugs that reduces pain. “Opioid” is used as a broad term and includes opiates, which are drugs naturally extracted from certain types of poppy plants, and narcotics. Substance abuse can lead to overdose, which can be fatal.

### **Terrorism/Cyberterrorism Incidents**

Terrorism is the 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”.

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### **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.

### **Urban Fire and Explosions**

Urban fires and explosions include those fires and explosions that occur within urban, or developed, regions, and often pose an increased threat due to their tendency to easily spread to neighboring structures. The effects may be minor or severe and include injury, loss of life, property damage, and residential or economic disruption/displacement.

### **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.
- 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)

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- Major Energy, Power, Utility Failure; interruptions of generation and distribution, power outages, for example (United States Department of Energy, 2000).

### *Natural Hazards Not Identified in the 2025 McKean County Hazard Mitigation Plan:*

#### **Hurricane and Tropical Storm**

The local planning team decided not to include hurricane and tropical storm in the 2025 Hazard Mitigation Plan after careful consideration of the county's historical data and risk assessment. While hurricanes and tropical storms have impacted the area in the past, the team determined that the frequency and severity of these events were significantly lower compared to other hazards, such as flooding or wildfires, that pose a more immediate and frequent threat.

#### **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

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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 McKean 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 4.3.4). 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 rainfall 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.

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.

Where applicable, climate change will be discussed for each hazard profile in this hazard mitigation plan. All natural hazards will have a discussion on climate change vulnerability, while certain human-caused hazards may not experience significant vulnerabilities from climate change adaptation and will not have direct narrative addressing those impacts.

Climate change was also taken into account when capabilities were being reviewed and mitigation actions were being developed and updated.

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### **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 McKean 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.

##### **4.3.1.2 Range of Magnitude**

The average annual precipitation of 41.86 inches occurs primarily during the spring and summer months. This value is derived from an average of ten years of mean annual precipitation data for McKean County. Rural farming areas of McKean County are most at risk when a drought occurs. A drought can create a significant financial burden for the community. Approximately 97% of McKean County farms are family-owned and operated. Additionally, 37.8% of the county farmland use is devoted to crop cultivation, 37.7% to woodland, 14.9% to pastureland, and 9.6% to other purposes. 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, thus threatening 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.

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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. McKean County also has a growing agritourism business that would be threatened by long-term drought.

Local municipalities may, with the approval of PEMA, and based on a declaration from the Governor of Pennsylvania, 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 11 – Drought Preparation Phases* shows the FEMA-defined levels of drought severity along with suggested actions, requests, and goals.

*Table 11 - Drought Preparation Phases*

<b>Drought Preparation Phases</b>				
<b>Phase</b>	<b>General Activity</b>	<b>Actions</b>	<b>Request</b>	<b>Goal</b>
<b>Drought Watch</b>	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%.
<b>Drought Warning</b>	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%.
<b>Drought Emergency</b>	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				

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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 several counties (comparing to past month, past year, and historic records)
- Soil moisture via the Palmer Drought Index as seen in *Table 12 – 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 12 - Palmer Drought Severity Index*

<b>Palmer Drought Severity Index (PDSI)</b>	
<b>Severity Category</b>	<b>PDSI Value</b>
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
Incipient Wet 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 those found in *Table 13 – Economic and Environmental Impacts of Drought Events* and qualifies the potential economic and environmental impacts from a drought event.

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Table 13 - Economic and Environmental Impacts of Drought Events

<b>Economic and Environmental Impacts of Drought Events</b>	
<b>Economic</b>	<b>Environmental</b>
<ul style="list-style-type: none"> <li>- Reduced productivity of aquatic resources</li> <li>- Mandatory water use restrictions</li> <li>- Well failures</li> <li>- Cutbacks in industrial production</li> <li>- Agricultural losses</li> <li>- Limited recreational opportunities</li> </ul>	<ul style="list-style-type: none"> <li>- Hydrologic effects</li> <li>- Adverse effects on animal populations</li> <li>- Damage to plant communities</li> <li>- Increased number and severity of fires</li> <li>- Reduced soil quality</li> <li>- Air quality effects</li> <li>- Loss of quality in landscape</li> </ul>

### 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 14 – Past Drought Events in McKean County*.

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 15 – 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 McKean County occurred in the summer of 1999. Extended dry weather spurred Governor Thomas Ridge to declare a drought emergency in fifty-five counties. During this event, precipitation deficits for that summer averaged five to seven inches below normal; the Susquehanna River hit record low flows, streams were dry, and many wells were depleted. Crop damage losses totaled over \$500 million statewide, and those losses equated to 70% to 100% of crop production. There were additional losses from the decline of milk production. Also, the state asked municipal and private water suppliers to restrict local water use.

Table 14 - Past Drought Events in McKean County

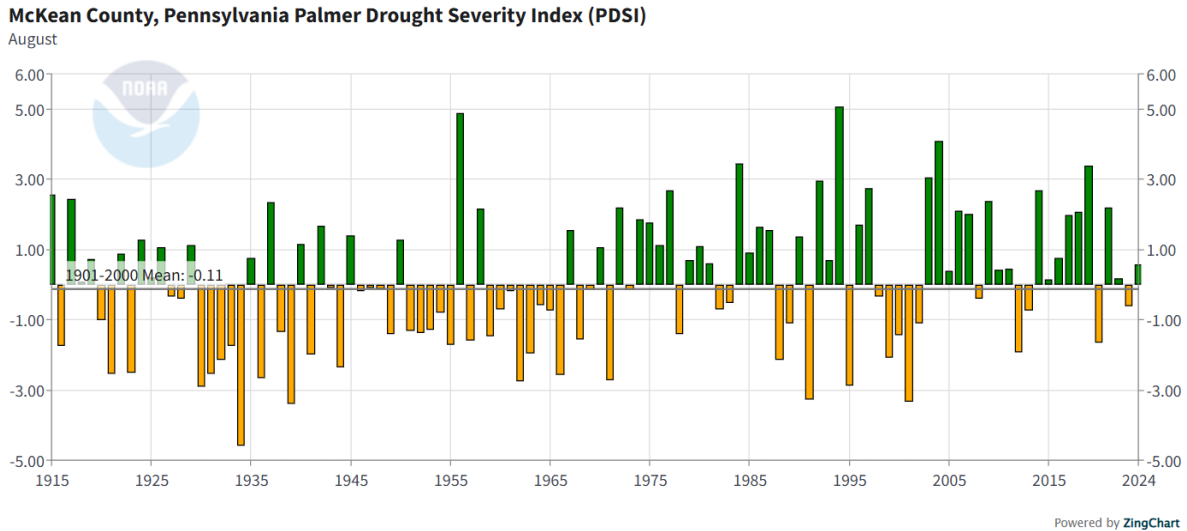
<b>Past Drought Events in McKean County</b>			
<b>Start Date</b>	<b>End Date</b>	<b>Drought Status</b>	<b>Event Duration</b>
11/18/1980	04/20/1982	Emergency – Southeast corner of McKean County	518
04/26/1985	10/22/1985	Watch – Southeast corner of McKean County	179
10/22/1985	12/19/1985	Watch	58
07/07/1988	08/24/1988	Watch	48
08/24/1988	12/12/1988	Warning	110

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<b>Past Drought Events in McKean County</b>			
<b>Start Date</b>	<b>End Date</b>	<b>Drought Status</b>	<b>Event Duration</b>
03/03/1989	05/15/1989	Watch	73
06/28/1991	07/24/1991	Watch	26
07/24/1991	08/16/1991	Warning	23
08/16/1991	04/20/1992	Emergency	248
04/20/1992	06/23/1992	Warning	64
06/23/1992	09/11/1992	Watch	80
09/01/1995	11/08/1995	Watch	68
11/08/1995	12/18/1995	Watch	40
12/03/1998	12/14/1998	Watch	11
12/14/1998	03/15/1999	Warning	91
03/15/1999	09/30/1999	Watch	199
09/30/1999	02/25/2000	Warning	148
02/25/2000	05/05/2000	Watch	70
08/24/2001	05/13/2002	Watch	262
04/11/2006	06/30/2006	Watch	80
08/06/2007	01/11/2008	Watch	158
11/07/2008	01/26/2009	Watch	80
09/16/2010	12/17/2010	Watch	92
08/05/2011	09/02/2011	Warning	28
09/02/2011	10/13/2011	Watch	41
03/24/2015	07/10/2015	Watch	108
08/02/2016	11/03/2016	Watch	93
08/21/2020	09/10/2020	Watch	20
09/10/2020	01/07/2021	Warning	119
08/31/2022	10/17/2022	Watch	47
06/15/2023	08/24/2023	Watch	70
Source: Pennsylvania Department of Environmental Protection, 2024			
**Gubernatorial Disaster Declaration			

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Table 15 - 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.

#### 4.3.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events. Climate change may lead to increased uncertainty and extremity of climate events. McKean County experienced severe drought between 5% to 10% of the time between 1895 and 1995, as seen in *Figure 7 – Palmer Drought Severity Index*. This report can be used to make a rough estimate of the future probability of drought in McKean 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.

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Figure 7 - Palmer Drought Severity Index

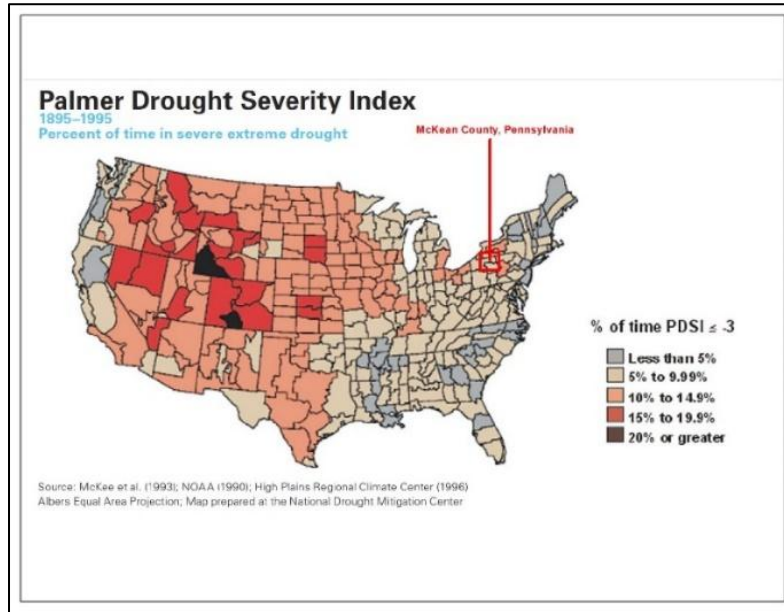
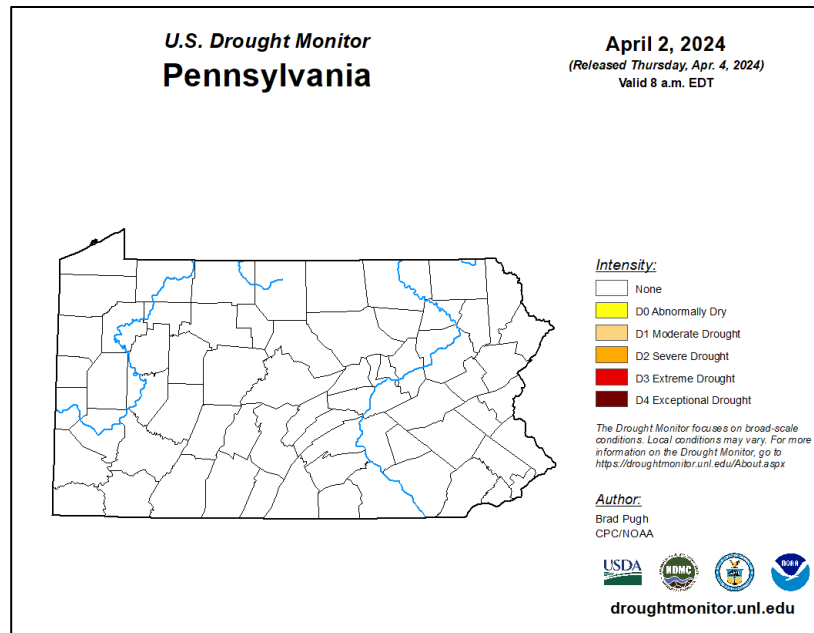


Figure 8 – Current Drought Index for Pennsylvania below shows that McKean County is currently in normal condition.

Figure 8 - Current Drought Index for Pennsylvania



The potential for a drought to occur in McKean County is high. Given the frequency of drought watches issued for McKean County and its municipalities, the county can reasonably expect to

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be under a drought watch at least once per year. While some form of drought condition frequently exists in McKean County, the impact depends on the duration of the event, severity of conditions, and area affected. The map above shows that McKean County, and most of Pennsylvania, is currently (and most often) in normal (non-drought) conditions.

As stated above, trends indicate climate change will influence the frequency of droughts in the future. As global temperatures rise, weather patterns will change, increasing the number of dry days an area experiences. This could result in more drought periods for a local or regional area. Droughts could also become longer in duration, compared to previous patterns.

### **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 the height of the summer growing season.

Land use and major development is a factor that has the potential to impact the vulnerability to drought in McKean County. Land use, especially agricultural land use, can exacerbate dry conditions, and these agricultural areas can be damaged by drought. There are 46,832 acres of farmland in McKean County. If the number of agricultural acres increases, that increases the potential vulnerability for drought impacts. Conversely, if the agricultural acres decrease, the potential vulnerability of agriculture to drought decreases. Drought can also have an adverse effect on forested areas. Approximately 77% of McKean County is undeveloped forest areas, including deciduous, evergreen, mixed deciduous and evergreen, forested wetlands, and emergent wetlands. There are also five state game lands, two state forests, and one national forest that make up a large portion of the county. Long periods of drought can increase the potential for wildfires and invasive species that could damage these forested areas. Economic benefits through the provision of wood products would also be affected.

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

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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 4.3.10.5, 4.3.4.5, and 4.3.6.5 respectively.

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; 46,832 acres of McKean County, or roughly 7.4% of the 629,760 total land acreage, make up farmland (United States Department of Agriculture [USDA], 2022 Census). The total number of farms in McKean County is 309, and the average acreage for farms in McKean County is 152 acres. McKean County ranks 61<sup>st</sup> of sixty-seven counties in the commonwealth for agricultural production, totaling over \$5.2 million annually. Agricultural production from crops, including nursery and greenhouse crops, accounts for more than \$3.2 million in commerce annually. Production from livestock, poultry, and their products accounts for \$2.5 million annually. The livestock that has the greatest potential to be impacted are the cattle, calves, and the poultry layers. There are approximately 3,075 cattle and calves and 1,244 poultry layers. Acreage for farming has increased since the 2017 USDA Census when there was a reported total of 43,084 farming and drought vulnerable acres.

McKean County also has 10,017 domestic wells and three irrigation wells that would be adversely impacted by drought events. This impact would lead to lower water levels for at least 10,017 households and potentially twenty large farms. This well information was obtained by the county on February 6, 2025.

### **Domestic Water Wells by Municipality:**

- Annin Township (450)
- Ceres Township (530)
- Corydon Township (338)
- Eldred Township (820)
- Hamilton Township (669)
- Hamlin Township (717)
- Keating Township (1,537)
- Lafayette Township (889)
- Liberty Township (1,067)
- Norwich Township (664)
- Otto Township (823)
- Sergeant Township (400)
- Wetmore Township (1,113)

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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 9 – Drought-Vulnerable Land Use and Public Water Supply*.

Populations in McKean County, including the socially vulnerable, underserved, and unserved populations, are at different levels of vulnerability. The socially vulnerable have an increased risk due to the unsheltered or homeless not having access to reliable sources of water. Also, those individuals who are considered socially vulnerable because of location in rural areas are also at an increased risk because of agricultural and well status.

As seen in *Table 3 – Population Change in McKean County*, eighteen municipalities have experienced a population loss since the 2010 decennial census. Four municipalities have seen a net population increase from the 2010 decennial census to the 2020 decennial census. Based on this information, it can be speculated that these six may have an increased risk to drought conditions, since 2010, due to the increase in population.

### **Municipalities with high risk due to drought:**

- Ceres Township
- Hamlin Township
- Lewis Run Borough
- Mount Jewett Borough
- Port Allegany Borough
- Wetmore Township

Drought also has the potential to impact historic and cultural resources in McKean County. McKean County has seven historic or cultural properties or buildings, and drought could impact utility delivery to those locations. All properties in McKean County that are part of the National Register of Historic Places have the same vulnerability to drought. No one property has a greater risk than the others, but each of the historic and cultural properties is vulnerable at some level.

Drought events in McKean County can impact certain systems and community lifeline facilities that are tied into the historic or cultural properties. Water utilities can be directly impacted by drought events when prolonged dry weather lowers the available water in reservoirs and water

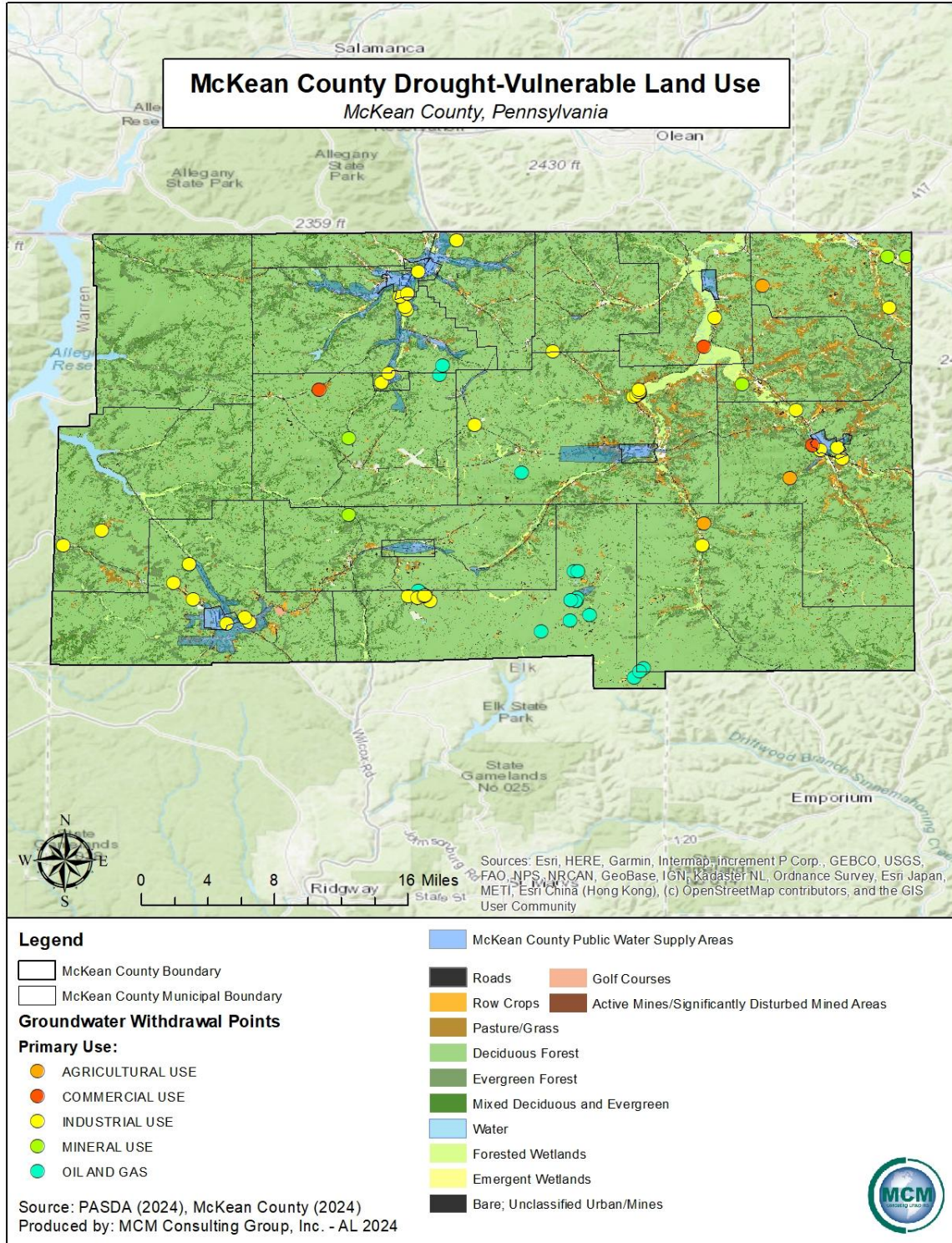
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systems used by a county or a community. Drought could impact electric utilities if moving water is used in electric generation. When water is used for electric generation, drought events could cause lower utilization and efficiency. This is more common in the western United States, but it could occur if any counties in Pennsylvania utilize water for power generation. Currently, McKean County does not use waterpower for electric generation. Other systems that could potentially be impacted by a drought event are wastewater utilities and any nuclear power generation that uses water in its process.

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Figure 9 - Drought-Vulnerable Land Use and Public Water Supply



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## 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 of the earth's tectonic plates, a volcanic eruption, or by a human induced explosion (DCNR, 2007). Earthquake events in Pennsylvania, including McKean County, are usually mild events, impacting areas no greater than 100 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. Today, Eastern North America, including McKean County, Pennsylvania, is far from the nearest plate boundary. That plate boundary is the Mid-Atlantic Ridge and is approximately 2,000 miles to the east, under the Atlantic Ocean. The Ramapo Fault System runs through New York, New Jersey, and eastern Pennsylvania (See *Figure 10 – Ramapo Fault System*) This fault system is associated with some small earthquakes, and it is thought unlikely to produce significant disruption.

Figure 10 - Ramapo Fault System



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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 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 McKean County is to conduct a probabilistic earthquake-hazard analysis with the earthquakes that have already happened in and around the county. (See *Figure 12 - Pennsylvania Earthquake Hazard Zones*). Nevertheless, the United States Geological Survey (USGS) indicates that McKean County has a moderate earthquake risk, and no historical earthquake events have occurred.

Natural gas extraction of the Marcellus/Utica Shale formation (see *Figure 11 - Pennsylvania Oil and Gas Geology*) 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 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 McKean 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 16 - Richter Scale* summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. The Modified Mercalli Intensity Scale (*Table 17 - Modified 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 16 - Richter Scale*

<b>Richter Scale</b>	
<b>Richter Magnitude</b>	<b>Earthquake Effects</b>
<b>Less than 3.5</b>	Not generally felt but recorded.
<b>3.5-5.4</b>	Often felt, but rarely causes damage.

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<b>Richter Scale</b>	
<b>Richter Magnitude</b>	<b>Earthquake Effects</b>
<b>Under 6.0</b>	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
<b>6.1-6.9</b>	Can be destructive in areas where people live up to about 100 kilometers across.
<b>7.0-7.9</b>	Major earthquake; can cause serious damage over large areas.
<b>8.0 or greater</b>	Great earthquake; can cause serious damage in areas several hundred kilometers across.

Table 17 - Modified Mercalli Intensity Scale

<b>Modified Mercalli Intensity Scale</b>			
<b>Scale</b>	<b>Intensity</b>	<b>Earthquake Effects</b>	<b>Richter Scale Magnitude</b>
<b>I</b>	<b>Instrumental</b>	Detected only on seismographs.	<4.2
<b>II</b>	<b>Feeble</b>	Some people feel it.	
<b>III</b>	<b>Slight</b>	Felt by people resting, like a truck rumbling by.	
<b>IV</b>	<b>Moderate</b>	Felt by people walking.	
<b>V</b>	<b>Slightly Strong</b>	Sleepers awake; church bells ring.	<4.8
<b>VI</b>	<b>Strong</b>	Trees sway; suspended objects swing; objects fall off shelves.	<5.4
<b>VII</b>	<b>Very Strong</b>	Mild alarm, walls crack, plaster falls.	<6.1
<b>VIII</b>	<b>Destructive</b>	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged.	<6.9
<b>IX</b>	<b>Ruinous</b>	Some houses collapse, ground cracks, pipes break open.	
<b>X</b>	<b>Disastrous</b>	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread.	<7.3

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<b>Modified Mercalli Intensity Scale</b>			
<b>Scale</b>	<b>Intensity</b>	<b>Earthquake Effects</b>	<b>Richter Scale Magnitude</b>
<b>XI</b>	<b>Very Disastrous</b>	Most buildings and bridges collapse, roads, railways, pipes, and cables destroyed, general triggering of other hazards.	<8.1
<b>XII</b>	<b>Catastrophic</b>	Total destruction, trees fall, ground rises and falls in waves.	>8.1

### **4.3.2.3 Past Occurrence**

According to USGS, no known earthquakes have had an epicenter within McKean County since 1724, before which local seismology cannot be known. However, several seismic events that occurred outside the county boundary may have been felt in the region.

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 strongest recorded earthquake in Pennsylvania history (5.2) occurred on September 25, 1998, in northwestern Pennsylvania and is known as the Pymatuning Earthquake for its epicenter near Pymatuning Lake. The effects of the earthquake were felt across the commonwealth and were blamed for many wells in the region near the epicenter losing their water, while new springs appeared and old wells reemerged. A three-month date range revealed 120 dry household-supply wells on the ridge of Jamestown and Greenville, Pennsylvania. Declines of up to 100 feet were observed on a ridge where at least eighty of the wells resided. The degree of the damage varied. Some of the wells lost all power or could barely hold their yields and some of the water in wells turned black or began to smell of sulfur.

The most likely impetus of the wells drying was due to an increase in hydraulic conductivity 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 McKean County are shown below at *Figure 13 – McKean County*

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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*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 12 – Earthquake Hazard Zones* in 4.3.2.1 shows that McKean County is in a very low 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. (*Table 18 – Recent Earthquake Trends in Northeastern United States*). This uptick in seismicity may be due to hydraulic fracturing activities, and specifically occurs due to 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.

Climate change and its relationship with earthquakes is hard to identify. According to the U.S Geological Survey, climate change and earthquake correlation occurs when there is a large change in atmospheric pressure that can be caused by major storms which then could cause slow, small earthquakes. Over time, the release of energy from small earthquakes can lead to ground

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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shaking earthquakes which can cause severe damage. This theory is not yet proven and is still subject to change but can provide some context to the impact of climate change.

*Table 18 - Recent Earthquake Trends in Northeastern United States*

<b>Earthquake Trends in Northeastern U.S. (USGS, 2020)</b>	
<b>Year</b>	<b>Number of Magnitude 3+ Earthquakes</b>
2015	0
2016	3
2017	4
2018	0
2019	5
2020	3
2021	1
2022	5
2023	5
2024	2

### **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 McKean County, this could include surface faulting, ground shaking, landslides, liquefaction, dried 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 McKean County. The 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 McKean County’s general public during an earthquake. Infrastructure is more at risk on the east coast than the west coast because of aging buildings inventory.

There are 225 bridges publicly documented by the Pennsylvania Department of Transportation that could be damaged and made unusable by a major earthquake event. These locations are evenly distributed throughout the county and damage to any of them would be detrimental to transportation and emergency response in McKean County.

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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The following municipalities have bridges that were categorized as poor in McKean County

- Bradford City (6)
- Bradford Township (9)
- Ceres Township (3)
- Corydon Township (4)
- Eldred Borough (1)
- Eldred Township (4)
- Foster Township (6)
- Hamilton Township (2)
- Hamlin Township (2)
- Keating Township (6)
- Lafayette Township (1)
- Lewis Run Borough (1)
- Liberty Township (2)
- Norwich Township (3)
- Otto Township (3)
- Port Allegany Borough (1)
- Sergeant Township (1)
- Wetmore Township (1)

### **Impact of earthquakes on historic properties in McKean County**

McKean County has a low number of historic and cultural properties that could be adversely impacted by earthquakes. The vulnerability of each is related to the construction practices of the property at the time that it was constructed. Many of the historic properties in McKean County were constructed before 1900 and are of a type of construction vulnerable to increased seismic events (brick and stone). There are seven historic properties in McKean County that are registered with the National Register of Historic Places.

These locations are:

- Rufus Barrett Stone House (Stone)
- New Thomson House
- Bradford Old City Hall
- Thomas L. Kane Memorial Chapel
- Kane Armory
- Bradford Armory
- Lynn Hall

### **Municipalities with high risk due to earthquakes:**

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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- Annin Township
- Bradford, City of
- Bradford Township
- Ceres Township
- Corydon Township
- Eldred Borough
- Eldred Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Kane Borough
- Keating Township
- Lafayette Township
- Lewis Run Borough
- Liberty Township
- Mount Jewett Borough
- Norwich Township
- Otto Township
- Port Allegany Borough
- Sergeant Township
- Smethport Borough
- Wetmore Township

All of the socially vulnerable populations in McKean County are at an increased vulnerability to earthquakes. The homeless and the unsheltered populations are at risk if they are living in structurally unsound buildings and locations. Also, the economically vulnerable of McKean County may not have the capability to fix or rebuild if their homes are damaged from an earthquake event.

As seen in *Table 3 – Population Change in McKean County*, six municipalities in McKean County have experienced a population loss since the 2010 decennial census. Six municipalities have seen a net population increase from the 2010 decennial census to the 2020 decennial census. Based on this information, it can be speculated that these six municipalities with population increase may have an increased/equivalent vulnerability to earthquakes, since 2010, due to the increase in population and construction.

Land use is a factor that has the potential to impact earthquake severity. Land use, in the form of a built environment, such as residential expansion, can cause earthquake impact severity to

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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increase. Impact severity increases because as the built environment expands and becomes more complex, the impact the event can have on that area may also increase due to an influx of people, infrastructure, and critical infrastructure in the hazard area. With only six municipalities seeing population increases between the 2010 decennial census and the 2020 decennial census, there has not been an increase in residential construction in McKean County.

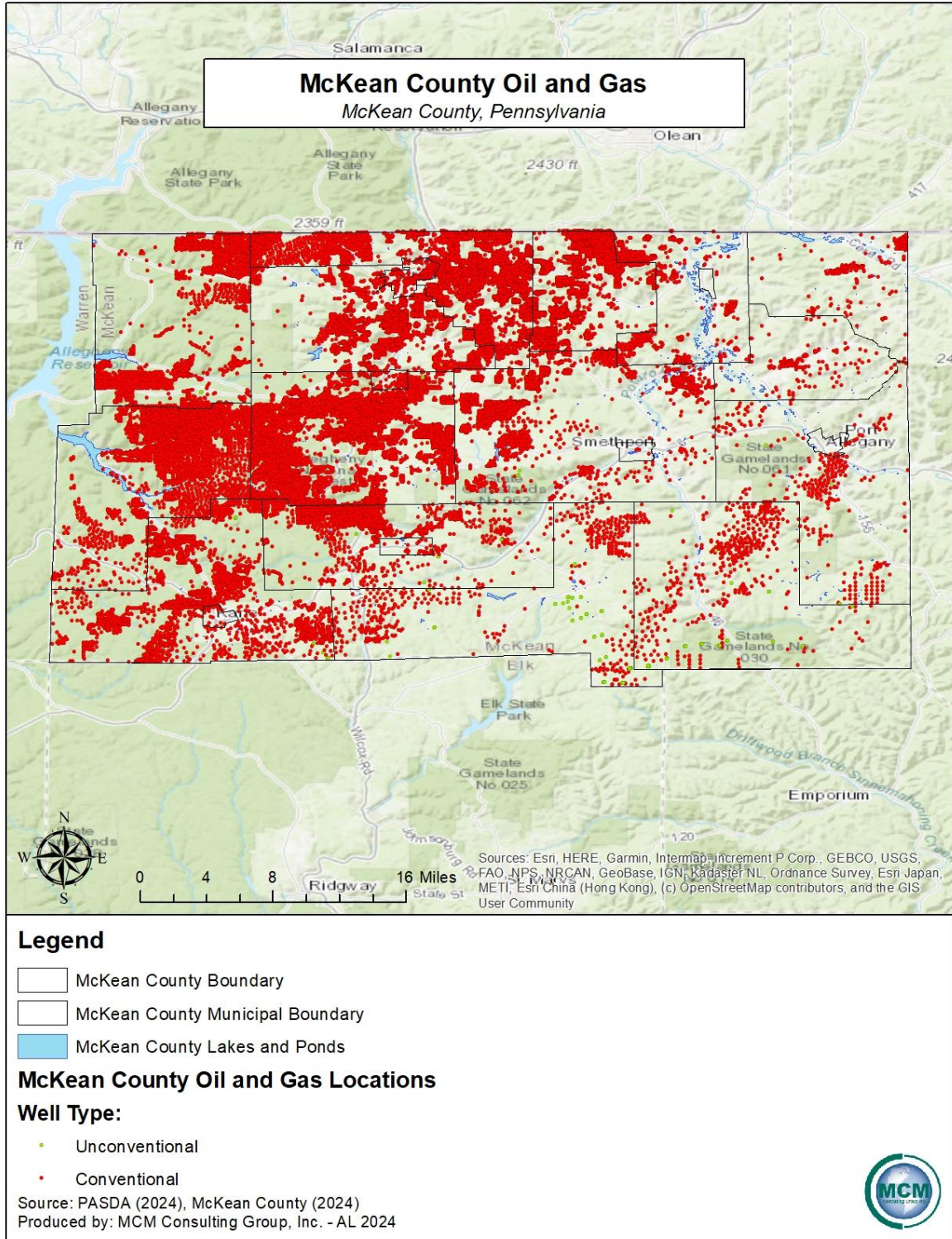
The seismic forces associated with an earthquake pose an immediate threat to telecommunication infrastructure, or other critical infrastructure in a community. When an earthquake occurs, the resulting ground instability can lead to telephone pole collapse, disruption of fiber or copper cables systems, and in severe cases, cellular tower failure. The disruption to these networks, if the earthquake event is significant, can also result in a loss of communication capabilities, hindering response coordination, and leaving communities impacted by the earthquake vulnerable to other natural or human-caused hazards.

Earthquakes can also damage power distribution systems, leading to localized power outages or even widespread blackouts. Fallen power lines, damaged substations, and disrupted transformers may further contribute to the breakdown of the electrical grid surrounding the epicenter of the earthquake, and the consequences can include cascading pressure on essential services and other community lifeline facilities, further impeding emergency operations and the capabilities within the impacted jurisdictions.

Earthquake events can also pose a threat to natural gas, water, and the numerous other materials and chemicals transported through underground water systems in McKean County. During significant earthquakes, underground pipelines may crack, causing the transported material to leak into the ground and contaminate water sources in the county. In severe cases, water line bursts can cause cascading hazards to subsidence and sinkholes, when left unchecked. However, even in more contained scenarios, a small leak can have profound impact if the transported material is toxic or hazardous in nature, leading to degradation of the natural resources in the impacted communities.

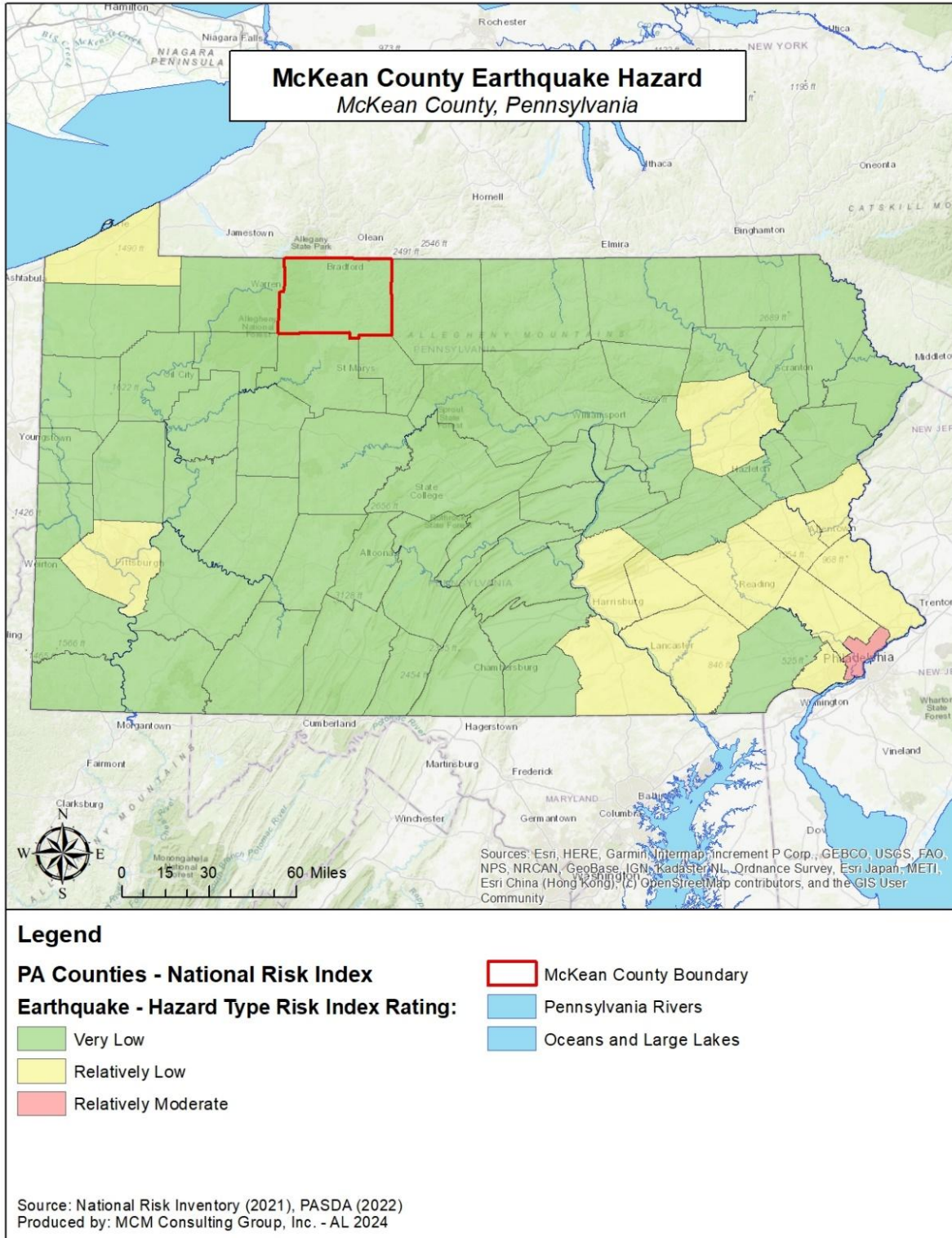
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 11 - Pennsylvania Oil and Gas Geology



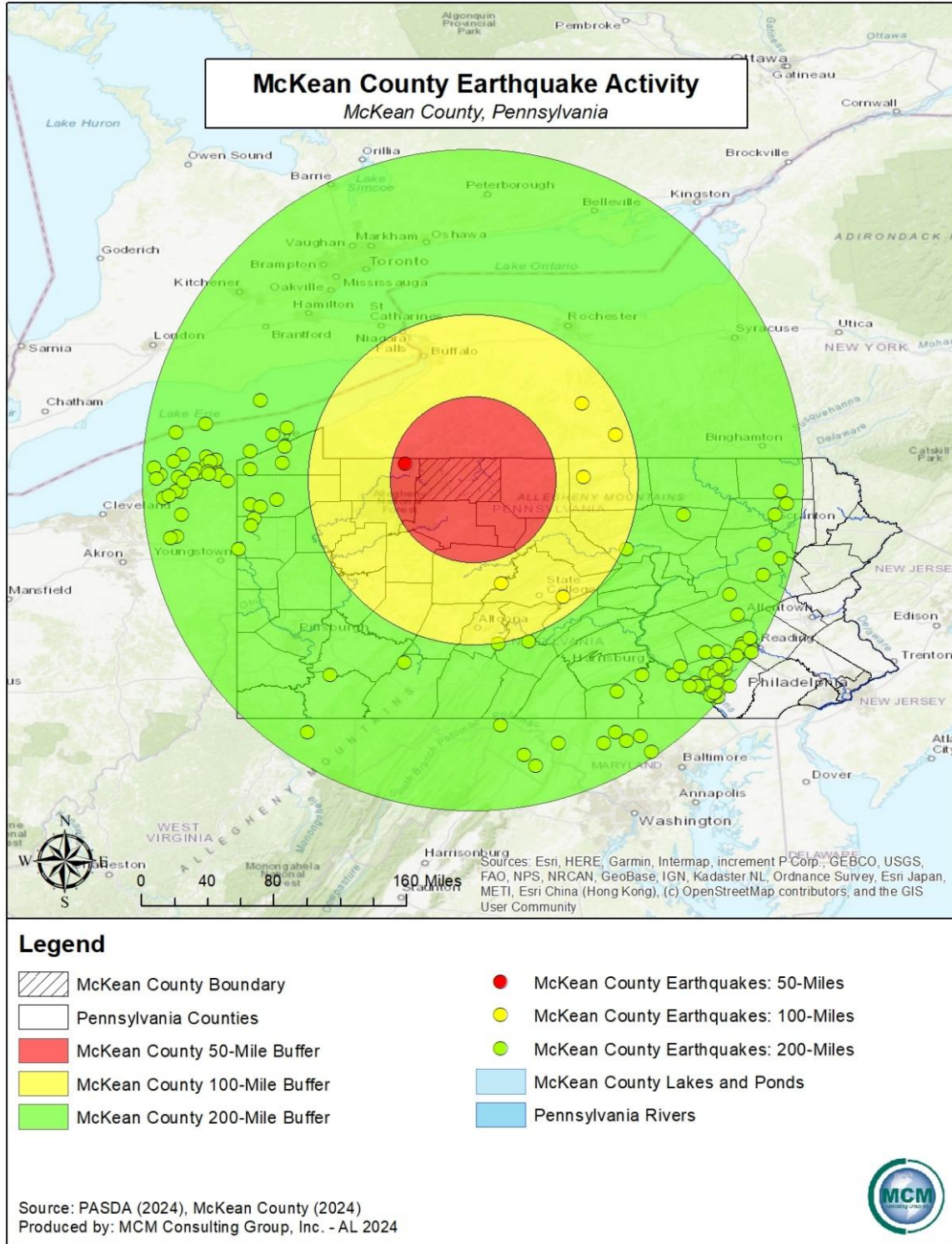
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 12 - Pennsylvania Earthquake Hazard Zones



# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 13 - McKean County Earthquake Activity



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### **4.3.3 Extreme Temperature**

#### **4.3.3.1 Location and Extent**

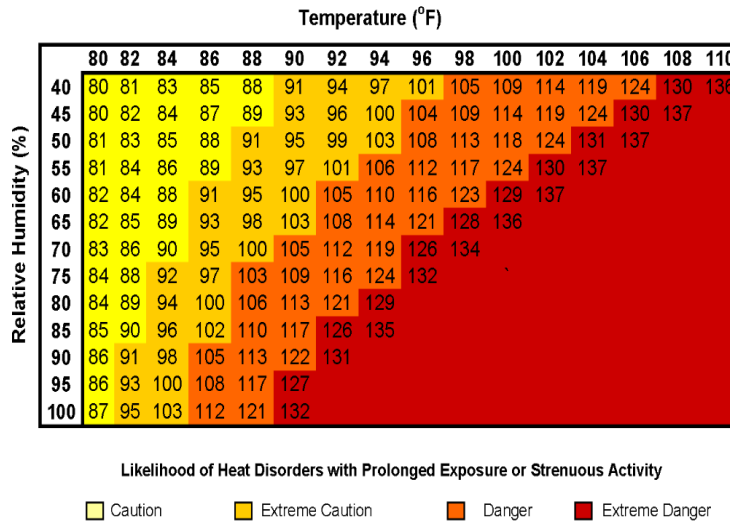
Pennsylvania, and more specifically, McKean County can experience many different temperature extremes. High temperatures occur about ten days per year at any location in Pennsylvania. However, southern parts of the state experience more than twice this number. Freezing temperatures occur on an average of 100 or more days per year with the longest freeze-free period at near sea level locations such as northwest Pennsylvania (adjacent to Lake Erie). Extreme temperatures can be devastating – extreme heat can cause sunburn, heat cramps, heat exhaustion, heat stroke, and dehydration, while extreme cold can cause hypothermia and frostbite. Both can potentially cause long-lasting disabilities. January is typically the coldest month for McKean County, with average temperatures of 22.7°F. *Figure 17 - Average Minimum Temperature Trends for Pennsylvania* shows the average minimum temperatures in Pennsylvania with McKean County identified. July has typically been the warmest month for McKean County, with an average temperature of 66.3°F. *Figure 18 - Average Maximum Temperature Trends for Pennsylvania* shows the average maximum temperatures in Pennsylvania with McKean County identified. Temperatures can vary across McKean County due to elevation changes in topography.

#### **4.3.3.2 Range of Magnitude**

When extreme temperature events occur, they typically impact the entirety of McKean County, including the surrounding region. Extreme heat is described as temperatures that hover at least 10°F above the average high temperature for a region during the summer months. Extreme heat is responsible for more deaths in Pennsylvania than all other natural disasters combined. Temperature advisories, watches, and warnings are issued by the National Weather Service relating impacts to the range of temperatures typically experienced in Pennsylvania. Heat advisories are issued when the heat index temperature is expected to be equal to 100°F, but less than 105°F. Excessive heat warnings are issued when heat indices are expected to reach or exceed 105°F and are issued within twelve hours of the onset. Excessive heat watches are issued when there is a possibility that excessive heat warning criteria may be experienced within twenty-four to seventy-two hours, but their occurrence and timing are still uncertain. A potential worst-case extreme temperature scenario would occur if widespread areas of the Commonwealth experienced 90°F or higher temperatures for an extended number of days. The heat could overwhelm the power grid and cause widespread blackouts, cutting off vital HVAC services for residents. It could create crisis management issues for senior citizens on fixed incomes, the homeless, and other vulnerable populations. The heat index is a measurement that takes into account both the temperature and relative humidity, and it is calculated as shown in *Figure 14 - National Weather Service's Heat Index Matrix*.

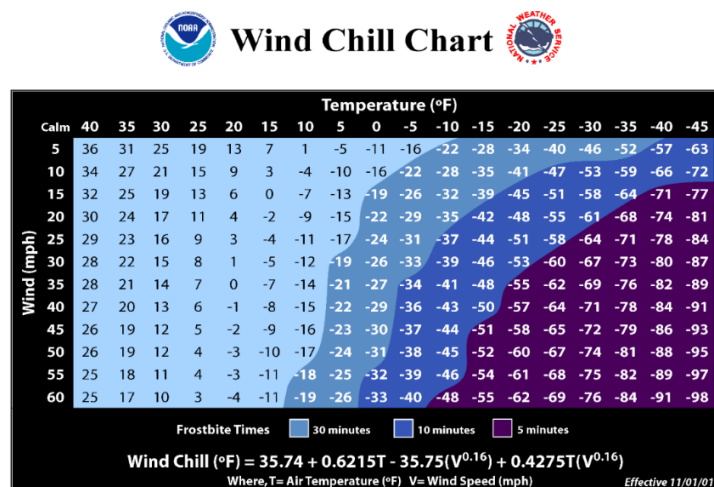
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 14 - National Weather Service's Heat Index Matrix



Extreme cold temperatures drop well below typical temperatures and are often associated with winter storm events. Wind can make the apparent temperature drop further, and exposure to such extreme cold temperatures can cause hypothermia, frost bite, and death. Wind chill warnings are issued when wind chills drop to -25°F or lower. While this threshold applies to the entire state, the threshold for advisories varies based on regions. Wind chill advisories are issued in the south and western sections of Pennsylvania, when wind chill values drop to -10°F to -24°F. Wind chill advisories are issued in the southern-central to northern sections of the Commonwealth when wind chills drop to -15°F to -24°F. The National Weather Service created a wind chill chart which shows the time frostbite takes to set in depending on temperature and wind speed as shown in *Figure 15 - National Weather Service's Wind Chill Matrix*.

Figure 15 - National Weather Service's Wind Chill Matrix



Source: (NOAA NWS, 2001)

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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### 4.3.3.3 Past Occurrence

McKean County has had more past occurrences of extreme cold incidents than extreme heat due to the geographic location of the county. *Table 19 - Past Extreme Temperature Occurrences for McKean County* shows the past occurrence events associated with extreme temperature (hot and cold) that have occurred in McKean County. The data in the table was reported from the early 2000s to the year 2023. Due to the source used, no further events have been documented since 2022, however, events most likely have occurred without being documented. With a total of twenty-one different extreme temperature events that have occurred, all of the events were extreme cold related and there have been no extreme heat related events in McKean County. There were no reports of death or injury related to the occurrences. However, numerous sources have provided information regarding past occurrences and losses associated with extreme temperatures in McKean County and the Commonwealth as a whole. Due to the number of sources available for information, number of events and losses could vary slightly in number.

Data from the National Climatic Data Center reports that there have been 787 extreme temperature episodes in Pennsylvania from 01/01/2000 to 12/31/2023, resulting in a total of ninety-seven deaths and 103 injuries. Out of the 787 events, 525 of them were extreme cold related with four deaths. The other 262 events were extreme heat related with ninety-three deaths and 103 injuries across the state. The biggest event was on July 21, 2011, and ended on July 24, 2011. This event did not have a significant effect on McKean County itself. In the 2011 event, there was a total of twenty-two deaths and forty-eight injuries during the course of the event. Record-breaking heat temperatures were experienced in over thirty different counties, but McKean County was not one of them.

*Table 19 - Past Extreme Temperature Occurrences for McKean County*

<b>Past Extreme Temperature Occurrences for McKean County</b>		
<b>Location</b>	<b>Date</b>	<b>Type</b>
McKean County	01/26/2007	Extreme Cold/Wind Chill
McKean County	02/03/2007	Extreme Cold/Wind Chill
McKean County	02/07/2007	Extreme Cold/Wind Chill
McKean County	02/16/2007	Extreme Cold/Wind Chill
McKean County	03/06/2007	Extreme Cold/Wind Chill
McKean County	01/19/2008	Extreme Cold/Wind Chill
McKean County	02/10/2008	Extreme Cold/Wind Chill
McKean County	12/21/2008	Extreme Cold/Wind Chill
McKean County	01/15/2009	Extreme Cold/Wind Chill
McKean County	03/02/2009	Extreme Cold/Wind Chill
McKean County	01/06/2014	Extreme Cold/Wind Chill
McKean County	01/28/2014	Extreme Cold/Wind Chill
McKean County	02/12/2015	Extreme Cold/Wind Chill

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

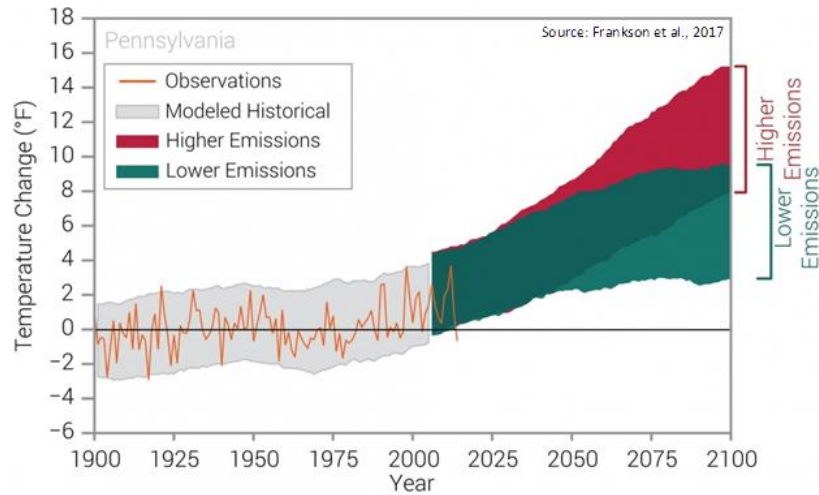
<b>Past Extreme Temperature Occurrences for McKean County</b>		
<b>Location</b>	<b>Date</b>	<b>Type</b>
McKean County	02/14/2015	Extreme Cold/Wind Chill
McKean County	02/19/2015	Extreme Cold/Wind Chill
McKean County	02/23/2015	Extreme Cold/Wind Chill
McKean County	02/13/2016	Extreme Cold/Wind Chill
McKean County	01/05/2018	Extreme Cold/Wind Chill
McKean County	01/20/2019	Extreme Cold/Wind Chill
McKean County	01/30/2019	Extreme Cold/Wind Chill
McKean County	12/23/2022	Extreme Cold/Wind Chill
Source: NOAA, 2024		

### **4.3.3.4 Future Occurrence**

Extreme temperatures will continue to impact McKean County in the future. Anthropogenic climate change is causing extreme climatic events to occur more frequently, suggesting that extreme temperatures are becoming a more threatening hazard as the impacts of climate change intensify. The annual average temperature has increased by 1.2°F across the continental United States during the years 1986 to present compared to the time period 1901 to 1960, and temperatures are expected to continue rising. *Figure 16 – Observed and Projected Temperature Change for Pennsylvania* shows these projected changes in temperature for Pennsylvania based on climate models considering the possibilities of increased and decreased levels of greenhouse gas emissions. In recent years, record high temperatures have outnumbered record low temperatures 2:1, so it is expected that the risk of extreme heat will be amplified whereas the risk of extreme cold will be attenuated. The Northeastern United States is expected to experience twenty to thirty more days with temperatures above 90°F, and twenty to thirty fewer days below freezing by approximately 2050. While there may be fewer extreme cold events, those that do occur are expected to reach record-setting low temperatures more often. Historically, McKean County has had more extreme cold events than extreme heat events due to the geographic location of the county; however, this balance is expected to shift somewhat in the coming years to include a greater proportion of extreme heat events.

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Figure 16 - Observed and Projected Temperature Change for Pennsylvania



Source: Frankson et al., 2017

### 4.3.3.5 Vulnerability Assessment

Extreme temperatures are usually a regional hazard when they occur. The very old (sixty-five years or older, accounting for 20.0% of McKean County population) and the very young (five years or younger, accounting for 4.7% of McKean County population) are most vulnerable to extreme temperatures due to risk factors, mobility challenges, and disabilities. Extreme temperatures can increase the demand for utility services, often resulting in an increased cost which some consumers may be unable to afford. The increased demand for services may cause a decrease in the availability of these services or failure of the system. A decrease or failure of the utility system during extreme temperature events would put a large population at great risk. Extreme temperature events can also drastically increase the volume of emergency calls, potentially overwhelming the public safety communications center. Extreme heat events can also contribute to drought conditions, which in turn increase the risk of wildfire, as discussed in Section 4.3.10.

All properties in McKean County that are part of the National Register of Historic Places have the same risk to extreme temperature. No one property has a greater risk than the others, but each of the historic and cultural properties is vulnerable at some level.

#### **Municipalities with high risk due to extreme temperature:**

- Annin Township
- Bradford City
- Bradford Township
- Ceres Township
- Corydon Township

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- Eldred Borough
- Eldred Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Kane Borough
- Keating Township
- Lafayette Township
- Lewis Run Borough
- Liberty Township
- Mount Jewett Borough
- Norwich Township
- Otto Township
- Port Allegany Borough
- Sergeant Township
- Smethport Borough
- Wetmore Township

Extreme temperatures can have a significant impact on land use within McKean County. Higher temperatures can affect the mountain snowpacks and vegetation land. It is important to note that higher land use and irrigation can cause more intense extreme temperatures. Based on this information it can be speculated that higher land use within the municipalities in McKean County will be impacted.

As seen in *Table 3 – Population Change in McKean County*, sixteen of the twenty-two municipalities in McKean County have experienced a population loss since the 2010 decennial census. Sixteen municipalities have seen a net population increase from the 2010 decennial census to the 2020 decennial census. Based on this information, it can be speculated that Ceres Township, Hamlin Township, Lewis Run Borough, Mount Jewett Borough, Port Allegany Borough, and Wetmore Township may have an increased vulnerability to extreme temperatures, since 2010, due to the increase in population. Populations in McKean County, including the socially vulnerable and unserved populations, are at different levels of vulnerability. The socially vulnerable have an increased risk due to the unsheltered or homeless not having proper, and adequate, access to shelter and heating, ventilation, and air conditioning (HVAC) to protect them from extreme temperature events.

Extreme temperatures can have a significant impact on natural areas. Consecutive days of excessive heat or extreme cold can lead to the diminishment of natural habitats such as forests,

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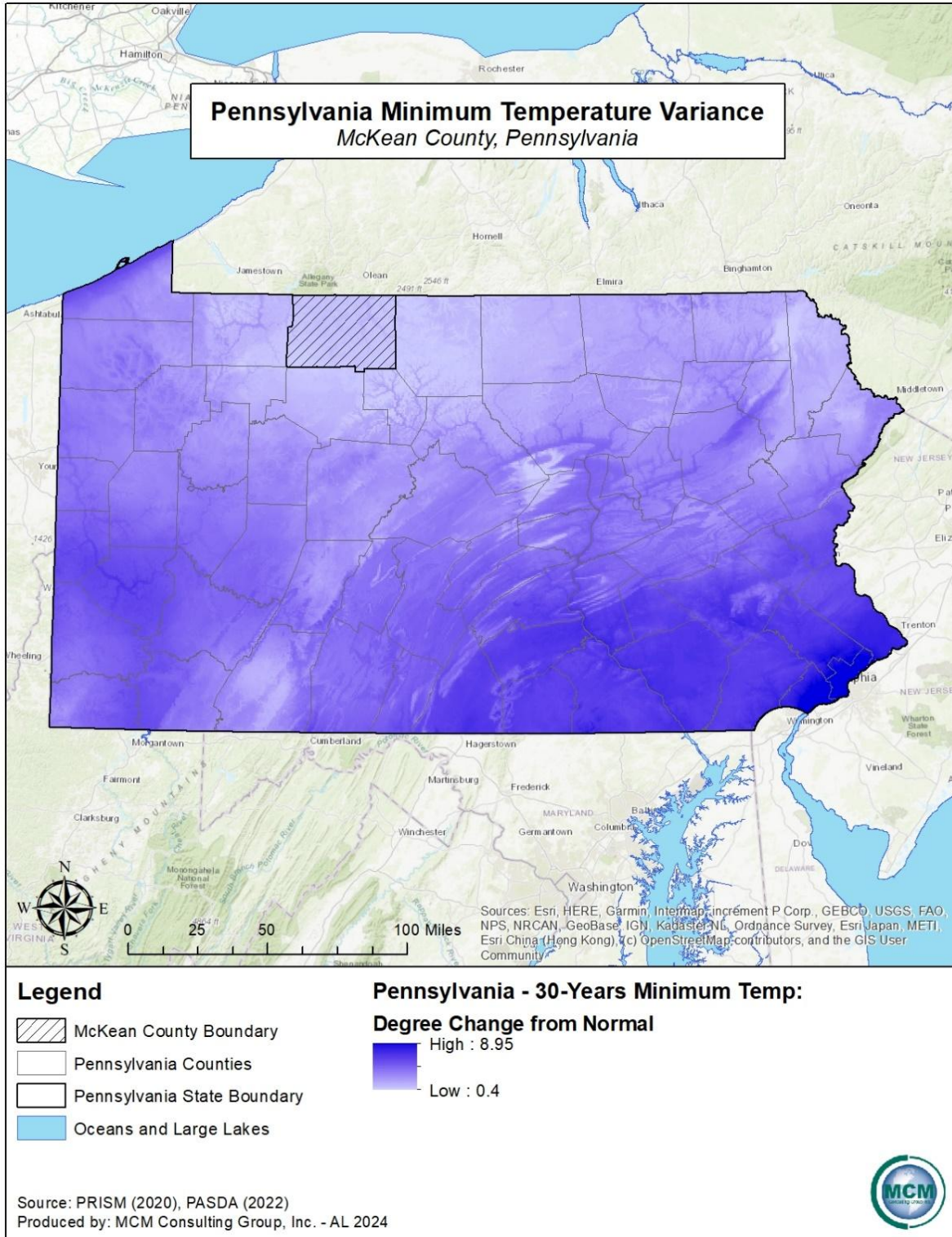
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rivers, and mountains as seen in McKean County. Excessive heat and extreme cold can cause these areas to lose the nourishment that is needed for these areas to survive and destroy the equilibrium within them. If trends continue there will be more days of excessive heat in the coming years that could impact the equilibrium in these natural areas and change their geographic features. Extreme temperatures and lack of rainfall can lead to drought and the diminishment of rivers and vegetation within the area.

Extreme temperatures can have significant impacts on systems and community lifelines that are essential for the operations of an area. The changing nature of extreme temperature events could account for different levels of impact for every system in an area. For example, excessive cold may disrupt water systems, potentially resulting in frozen or broken pipes due to water freezing in the system because of the lower temperatures. Extreme heat events may increase the demand for potable water for consumption and water for irrigation. This could result in lower reservoir levels and increased concern for water rationing. If extreme temperatures continue for an extended period, or if the extreme temperatures occur while a drought event is ongoing, the vulnerability of an area could be critical. Extreme temperatures could impact the power system by causing an increase for air conditioning in extreme heat events. When power demand is high for an already over-taxed power system, rolling power interruptions or brownouts can occur. This is more typical in the western United States but could occur in Pennsylvania if the conditions are met.

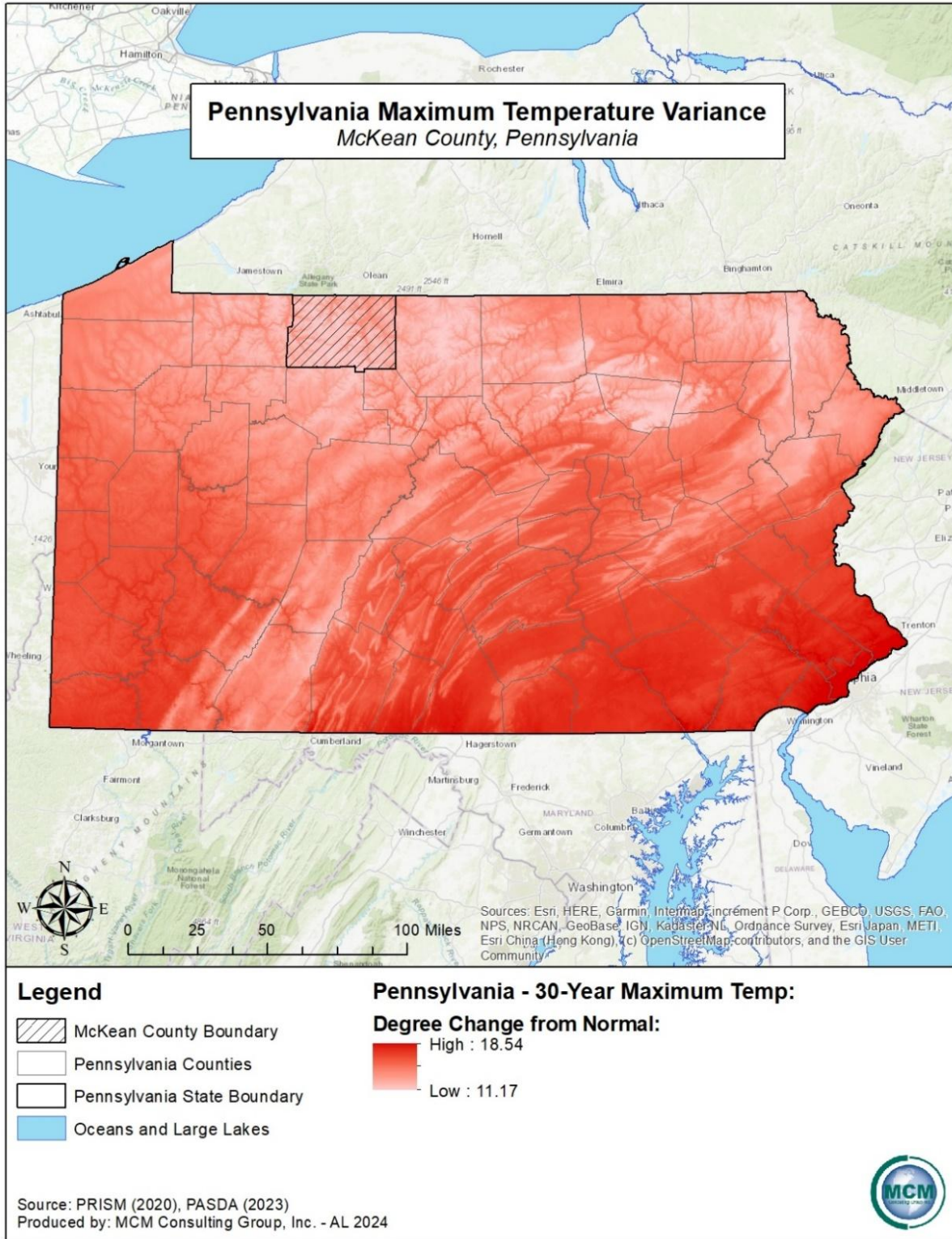
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Figure 17 - Average Minimum Temperature Trends for Pennsylvania



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Figure 18 - Average Maximum Temperature Trends for Pennsylvania



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### **4.3.4. Flooding, Flash Flooding, and Ice Jam Flooding**

#### **4.3.4.1 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 McKean 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 4.3.4.4. 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.

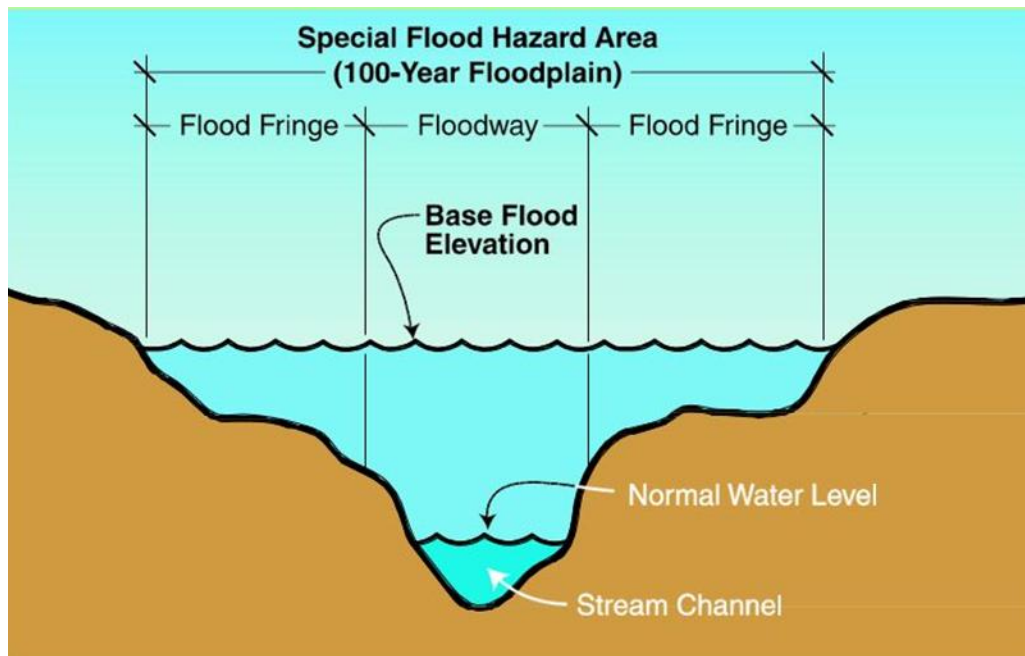
The National Flood Insurance Program (NFIP) publishes digital flood insurance rate maps (DFIRMs). These maps identify the 1% annual chance of flood area. The special flood hazard area (SFHA) and base flood elevations (BFE) are developed from the 1% annual chance flood event as seen in *Figure 19 – Flooding 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 McKean 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 20 – Flood Hazard High Risk Zones*. Appendix D of this hazard mitigation plan includes a flooding vulnerability map for each municipality in McKean County with vulnerable structures

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

and community lifeline facilities identified using the most current DFIRM data for McKean 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 19 - Flooding and Floodplain Diagram*



*Table 20 - Flood Hazard High Risk Zones*

<b>Flood Hazard High Risk Zones</b>	
<b>Zone</b>	<b>Description</b>
<b>A</b>	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.
<b>AE</b>	Areas subject to inundation by the 1% annual chance flood event determined by detailed methods. BFEs are shown within these zones.

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<b>Flood Hazard High Risk Zones</b>	
<b>Zone</b>	<b>Description</b>
<b>AH</b>	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.
<b>AO</b>	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.
<b>AR</b>	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	

**4.3.4.2 Range of Magnitude**

The Allegheny River basin has caused significant flooding in McKean County, specifically on the following streams, creeks, and their tributaries:

- Allegheny River
  - Potato Creek
  - Tunungwant Creek
  - Portage 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 McKean 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 McKean 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

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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 McKean 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 McKean 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 businesses 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 McKean 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 21 – HAZUS Building Loss Figures*. The total business interruption values occurring from a proposed 100-year flood based on FEMA HAZUS data is illustrated in *Table 22 – HAZUS Business Interruption Economic Loss Figures*. *Figure 20 – Loss by Occupancy Type* illustrates the breakdown of economic losses by either residential, commercial, industrial, or other use type.

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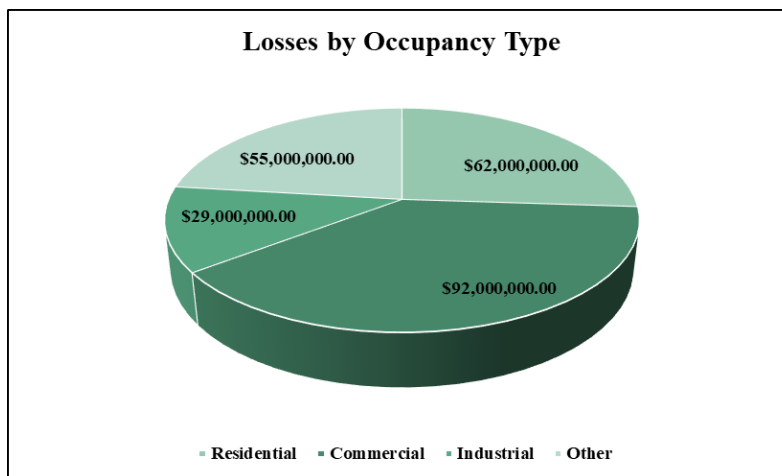
Table 21 - HAZUS Building Loss Figures

HAZUS Building Economic Loss Figures					
	Residential	Commercial	Industrial	Other	Total
<b>Building:</b>	\$26,570,000.00	\$6,630,000.00	\$6,450,000.00	\$950,000.00	\$40,600,000.00
<b>Content:</b>	\$13,510,000.00	\$22,540,000.00	\$16,900,000.00	\$5,600,000.00	\$58,550,000.00
<b>Inventory:</b>	\$0.00	\$630,000.00	\$3,260,000.00	\$60,000.00	\$3,950,000.00
<b>Subtotal:</b>	<b>\$40,080,000.00</b>	<b>\$29,800,000.00</b>	<b>\$26,610,000.00</b>	<b>\$6,610,000.00</b>	<b>\$103,100,000.00</b>
Source: HAZUS, 2024					

Table 22 - HAZUS Business Interruption Economic Loss Figures

HAZUS Business Interruption Economic Loss Figures					
	Residential	Commercial	Industrial	Other	Total
<b>Income:</b>	\$1,030,000.00	\$23,540,000.00	\$680,000.00	\$3,670,000.00	\$28,920,000.00
<b>Relocation:</b>	\$13,490,000.00	\$6,700,000.00	\$760,000.00	\$2,180,000.00	\$23,130,000.00
<b>Rental Income:</b>	\$5,380,000.00	\$4,870,000.00	\$190,000.00	\$350,000.00	\$10,790,000.00
<b>Wage:</b>	\$2,440,000.00	\$26,680,000.00	\$1,030,000.00	\$41,820,000.00	\$71,970,000.00
<b>Subtotal:</b>	<b>\$22,340,000.00</b>	<b>\$61,790,000.00</b>	<b>\$2,660,000.00</b>	<b>\$48,020,000.00</b>	<b>\$134,810,000.00</b>
Source: HAZUS, 2024					

Figure 20 - 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 improve soil fertility. However, human development often disrupts natural riparian buffers by

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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.

### **4.3.4.3 Past Occurrence**

McKean 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 McKean County from January 2000 to December 2023 is found in *Table 23 – 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 McKean County’s WebEOC information from 2020 to 2023.

*Table 23 - Past Flood and Flash Flood Events*

<b>Past Flood and Flash Flood Events</b>			
<b>Event Location</b>	<b>Event Date</b>	<b>Event Type</b>	<b>Property Damage Estimate</b>
City of Bradford	07/31/2000	Flash Flood	\$0.00*
City of Bradford	07/21/2003	Flash Flood	\$900,000.00*
McKean County (Entire County)	07/22/2003	Flood	\$0.00*
Eldred Township	08/09/2003	Flash Flood	\$0.00*
Eldred Township	08/12/2003	Flash Flood	\$0.00*
City of Bradford	11/19/2003	Flash Flood	\$0.00*
City of Bradford	08/10/2004	Flash Flood	\$0.00*
City of Bradford	08/30/2004	Flash Flood	\$0.00*
McKean County (Entire County)	09/08/2004	Flood	\$0.00*
McKean County (Entire County)	09/17/2004	Flood	\$0.00*
McKean County (Entire County)	06/27/2006	Flash Flood	\$0.00*
McKean County (Entire County)	07/12/2006	Flash Flood	\$0.00*
Bradford Township	03/15/2007	Flood	\$0.00*
City of Bradford	08/07/2007	Flash Flood	\$0.00*
City of Bradford	05/28/2009	Flash Flood	\$10,000.00*
Port Allegany Borough	08/09/2009	Flash Flood	\$0.00*
Kane Borough	08/21/2009	Flash Flood	\$0.00*
Port Allegany Borough	01/25/2010	Flood	\$0.00*
Wetmore Township	12/01/2010	Flood	\$200,000.00*
Foster Township	05/19/2011	Flash Flood	\$0.00*
Foster Township	07/12/2012	Flash Flood	\$0.00*

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<b>Past Flood and Flash Flood Events</b>			
<b>Event Location</b>	<b>Event Date</b>	<b>Event Type</b>	<b>Property Damage Estimate</b>
Corydon Township	05/28/2013	Flood	\$0.00*
Eldred Township	09/11/2013	Flash Flood	\$0.00*
Bradford Township	01/12/2018	Flood	\$0.00*
Smethport Borough	08/15/2019	Flash Flood	\$0.00*
Port Allegany Borough	07/17/2021	Flash Flood	\$0.00*
		<b>Total:</b>	<b>\$1,110,000.00*</b>
Source: NCEI NOAA, 2024			
*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 24 – Repetitive Loss Properties* illustrates the communities that have repetitive loss properties, the total building payments, the contents payments, and the number of losses and properties. There are twelve repetitive loss properties in McKean County. *Table 25 – Summary of Type of Repetitive Loss Properties by Municipality* illustrates the breakdown of type of repetitive loss properties in McKean County. The data used in the table is based on data provided by FEMA.

Most municipalities in McKean County participate in the NFIP. Information of each participating municipality can be found in *Table 26 – Municipal NFIP Policies & Vulnerability*.

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Table 24 - Repetitive Loss Properties

Repetitive Loss Properties						
Community Name	Community Number	Cumulative Building Payment	Cumulative Contents Payment	Sum of Total Paid	Losses	Properties
City of Bradford	420665	\$12,305.16	\$1,580.35	\$13,885.51	3	1
City of Bradford	420665	\$11,804.44	\$1,674.89	\$13,479.33	2	1
City of Bradford	420665	\$77,361.69	\$0.00	\$77,361.69	2	1
City of Bradford	420665	\$5,206.21	\$0.00	\$5,206.21	2	1
Bradford Township	422245	\$20,477.59	\$11,531.39	\$32,008.98	4	1
Bradford Township	422245	\$6,745.02	\$0.00	\$6,745.02	2	1
Bradford Township	422245	\$421.74	\$3,326.77	\$3,748.51	2	1
Bradford Township	422245	\$12,553.76	\$1,784.55	\$14,338.31	2	1
Foster Township	421855	\$8,540.98	\$5,513.73	\$14,054.71	2	1
Foster Township	421855	\$126,000.00	\$0.00	\$126,000.00	2	1
Norwich Township	421859	\$4,784.64	\$0.00	\$4,784.64	2	1
Norwich Township	421859	\$38,280.30	\$8,888.79	\$47,169.09	3	1
<b>Total:</b>		<b>\$324,481.53</b>	<b>\$34,300.47</b>	<b>\$358,782.00</b>	<b>28</b>	<b>12</b>
Source: FEMA, 2024						

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Table 25 - Summary of Type of Repetitive Loss Properties by Municipality

<b>Summary of Type of Repetitive Loss Properties by Municipality</b>					
<b>Municipality</b>	<b>Type</b>				
	<b>Non-Residential</b>	<b>2-4 Family</b>	<b>Single Family</b>	<b>Condo</b>	<b>Other Residential</b>
Bradford, City of	2	0	2	0	0
Bradford Township	0	0	4	0	0
Foster Township	1	0	1	0	0
Norwich Township	0	0	2	0	0
Source: FEMA, 2024					

Table 26 - Municipal NFIP Policies & Vulnerability

<b>Municipal Participation in the National Flood Insurance Program</b>			
<b>Municipal Name</b>	<b>Community Number</b>	<b>Initial FHBM</b>	<b>Latest Mapping Dates</b>
Annin Township	421850	11/08/1974	12/22/2016
Bradford, City of	420665	04/05/1974	12/22/2016
Bradford Township	422245	05/10/1974	12/22/2016
Ceres Township	421853	11/01/1974	12/22/2016
Corydon Township	422473	04/04/1975	12/22/2016
Eldred Borough	420666	04/12/1974	12/22/2016
Eldred Township	421854	11/15/1974	12/22/2016
Foster Township	421855	05/03/1974	12/22/2016
Hamilton Township	421856	02/14/1975	12/22/2016
Hamlin Township	421857	02/14/1975	12/22/2016
Keating Township	420667	07/26/1974	12/22/2016
Lafayette Township	421858	01/31/1975	12/22/2016
Lewis Run Borough	420669	11/08/1974	12/22/2016
Liberty Township	420668	07/26/1974	12/22/2016
Mount Jewett Borough	420670	05/07/1976	12/22/2016
Norwich Township	421859	01/24/1975	12/22/2016
Otto Township	421860	11/15/1974	12/22/2016
Port Allegany Borough	420671	06/28/1974	12/22/2016
Sergeant Township	422474	02/14/1975	12/22/2016
Smethport Borough	420672	12/21/1973	12/22/2016

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<b>Municipal Participation in the National Flood Insurance Program</b>			
<b>Municipal Name</b>	<b>Community Number</b>	<b>Initial FHBM</b>	<b>Latest Mapping Dates</b>
Wetmore Township	421861	07/25/1975	12/22/2016
Source: FEMA, 2024			
Note: FHBM: Flood Hazard Boundary Map			

#### **4.3.4.4 Future Occurrence**

Flooding is a frequent problem throughout the Commonwealth of Pennsylvania. McKean County will certainly be impacted by flooding events in the future, as McKean 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 27 – Flood Probability Summary*.

*Table 27 - Flood Probability Summary*

<b>Flood Probability Summary</b>	
<b>Flood Recurrence Intervals</b>	<b>Annual Chance of Occurrence</b>
10-year	10.00%
50-year	2.00%
100-year	1.00%
500-year	0.20%

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<b>Flood Probability Summary</b>	
<b>Flood Recurrence Intervals</b>	<b>Annual Chance of Occurrence</b>
Source: FEMA, 2009	

The future occurrences of flooding, flash flooding, and ice jam flooding in McKean County are expected to increase due to the rate of climate change in the Commonwealth of Pennsylvania, and the world. Climate change will include ocean temperature rise, which result in more intense hurricane and tropical storm seasons in the Atlantic Ocean. This intensity could result in an increase in the number of hurricanes and tropical storms that could impact Pennsylvania and McKean County. These hurricanes and tropical storms could result in a large volume of precipitation occurring over a short period of time, resulting in a flood or flash flood event. It is important to note that these impacts are the secondary result of other hazards, increased by climate change, that could result in flooding events.

**4.3.4.5 Vulnerability Assessment**

**Riverine and Stream Flooding**

McKean 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 McKean County, with vulnerable structures and community lifeline facilities that are located within the special flood hazard area.

*Table 28 – 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 eight 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 McKean County. Of those four facilities that are estimated to be moderately damaged by the scenario, three of those facilities will undergo a loss of use. Three fire stations will experience a loss of use. No hospital will experience a loss of use. Also, two schools will be moderately damaged by a

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flooding event. 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 28 - Expected Damage to Essential Facilities (HAZUS)*

<b>Expected Damage to Essential Facilities</b>				
<b>Classification</b>	<b>Number of Facilities</b>			
	<b>Total:</b>	<b>At Least Moderate:</b>	<b>At Least Substantial:</b>	<b>Loss of Use:</b>
Emergency Operations Center	1	0	0	0
Fire Stations	21	4	0	3
Hospitals	3	0	0	0
Police Stations	11	2	0	0
Schools	20	2	0	0

*Table 29 - 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 McKean County GIS Department.

*Table 29 - County Structures Within Special Flood Hazard Area*

<b>County Structures Within Special Flood Hazard Area</b>		
<b>Municipality</b>	<b>Site Structure Address Points Within Flood Area</b>	<b>Community Lifeline Facilities within Flood Area</b>
Annin Township	6	0
Bradford City	691	5
Bradford Township	118	1
Ceres Township	61	0
Corydon Township	9	0
Eldred Borough	205	2
Eldred Township	85	1
Foster Township	259	1
Hamilton Township	9	0
Hamlin Township	6	0
Kane Borough	0	0
Keating Township	62	0
Lafayette Township	29	0

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<b>County Structures Within Special Flood Hazard Area</b>		
<b>Municipality</b>	<b>Site Structure Address Points Within Flood Area</b>	<b>Community Lifeline Facilities within Flood Area</b>
Lewis Run Borough	75	1
Liberty Township	70	0
Mount Jewett Borough	0	0
Norwich Township	65	0
Otto Township	8	0
Port Allegany Borough	59	4
Sergeant Township	2	0
Smethport Borough	153	5
Wetmore Township	2	0
<b>Totals:</b>	<b>1,974</b>	<b>20</b>

Table 30 – *Community Lifeline Facilities Additional Information* illustrates the additional information including the type of community lifeline, facility name, and the municipality that falls within the Special Flood Hazard Area for McKean County. This information was compiled using McKean County’s GIS information with the assistance of the McKean County GIS Department.

Table 30 - *Community Lifeline Facilities Additional Information*

<b>Community Lifeline Facilities Additional Information</b>		
<b>Community Lifeline:</b>	<b>Facility Name:</b>	<b>Municipality:</b>
Health and Medical	Bradford Area Transport Service	Bradford City
Safety and Security	Bradford Fire Department – Station 1	
	Bradford City Police Department	
Food, Hydration, Shelter	ALDI	
	TOPS Friendly Market	
Safety and Security	University of Pittsburgh at Bradford PD	Bradford Township
Safety and Security	Eldred Borough Volunteer Fire Department	Eldred Borough
Water Systems	Eldred Sewage Treatment Plant	Eldred Township
Safety and Security	Eldred Township Volunteer Fire Department	
Safety and Security	Derrick City Fire Department – Station 1	Foster Township

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<b>Community Lifeline Facilities Additional Information</b>		
<b>Community Lifeline:</b>	<b>Facility Name:</b>	<b>Municipality:</b>
Safety and Security	Lewis Run Volunteer Fire Department	Lewis Run Borough
Safety and Security	Port Allegany Fire Department	Port Allegany
Safety and Security	Port Allegany Borough Police Department	
Water Systems	Port Allegany Sewage Treatment Plant	
Water Systems	Port Allegany Water Treatment Plant	
Safety and Security	Smethport Fire Department	Smethport Borough
Food, Hydration, Shelter	Costa's Super Market, Inc.	
	Dollar General	
Water Systems	Smethport Sewage Treatment Plant	
Water Systems	Smethport Water Treatment Plant	

In addition to the items listed above, there are three properties that are considered historic and cultural for McKean County that are registered with the National Register of Historic Places that are in the Special Flood Hazard Area. These properties are the Rufus Barrett Stone House, the Bradford Armory, and the Bradford Old City Hall. These locations are at an increased risk of flooding due to annual flood events unless mitigated.

**Flash Flooding**

Flash flooding is a common occurrence in McKean 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 McKean 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 is reflected in *Table 23 – Past Flood and Flash Flood Events* above.

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

- City of Bradford
- Eldred Township
- Port Allegany Borough

Although the above locations were identified as vulnerable areas in McKean County, they are not the only locations that are vulnerable to flash flooding. The McKean County Hazard

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Mitigation Team will continue to work with municipalities to identify vulnerable flash flooding locations and identify vulnerable populations and community lifelines.

#### **Municipalities with an increased risk to flooding, flash flooding, and ice jam flooding (due to the intersection with the Special Flood Hazard Area):**

- Annin Township
- City of Bradford
- Bradford Township
- Ceres Township
- Corydon Township
- Eldred Borough
- Eldred Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Keating Township
- Lafayette Township
- Lewis Run Borough
- Liberty Township
- Norwich Township
- Otto Township
- Port Allegany Borough
- Sergeant Township
- Smethport Borough
- Wetmore Township

Land use, in the form of a built environment, such as residential expansion, can cause flooding, flash flooding, and ice jam flooding impact severity to increase. Impact severity increases because as the built environment expands and becomes more complex, the impact the event will have on that area also increases. This can be attributed to an influx of people, infrastructure, and critical infrastructure in harm's way.

Impacts of flooding, flash flooding, and ice jam flooding can also be increased by population change. Six municipalities in McKean County have experienced population growth between the 2010 decennial census and the 2020 decennial census. This can be seen in *Table 3 – Population Change in McKean County*. These locations are Ceres Township, Hamlin Township, Lewis Run Borough, Mount Jewett Borough, Port Allegany Borough, and Wetmore Township.

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### **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

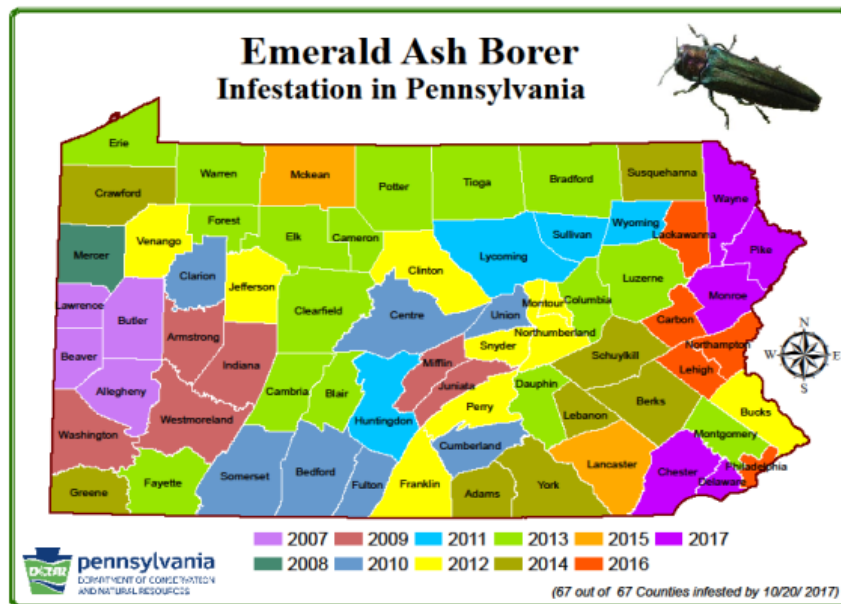
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widespread invasive species threat. Other species' spread, such as the spotted lantern fly, has been limited by state agency activity. First discovered in Berks County in 2014, the spotted lantern fly was placed under a quarantine by the Pennsylvania Department of Agriculture in thirteen counties. *Table 31 - Prevalent Invasive Species* lists invasive species that have been found in McKean 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 agricultural pests 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 McKean County and the surrounding region (see *Figure 21 - Emerald Ash Borer Infestation in Pennsylvania*).

Figure 21 - Emerald Ash Borer Infestation in Pennsylvania

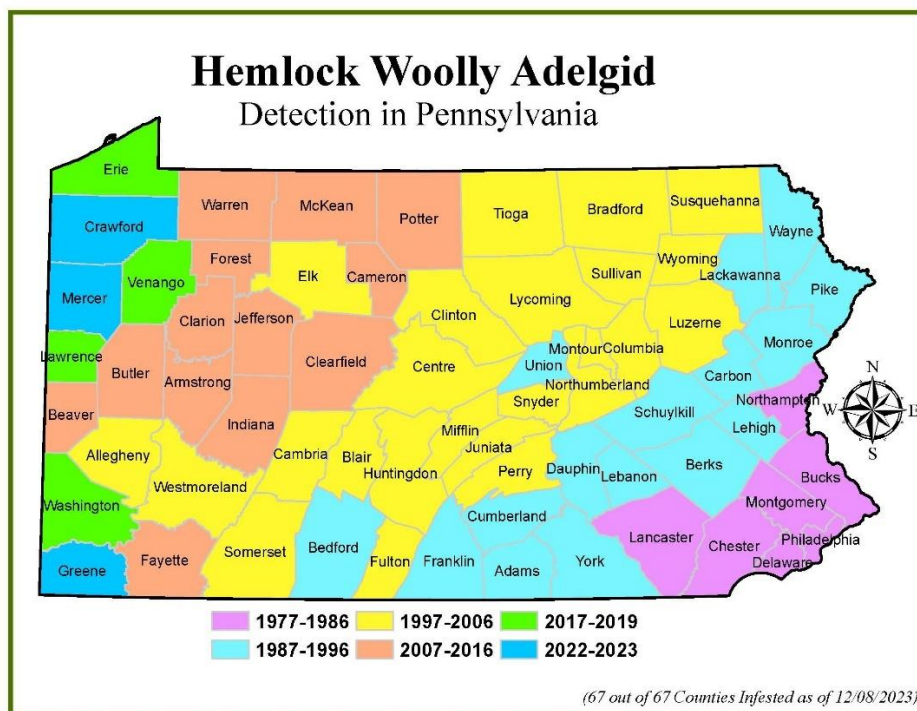


Another example of an invasive pest is the hemlock woolly adelgid. Hemlock woolly adelgid is a fluid-feeding insect that feeds on hemlock trees throughout eastern North America, including

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Pennsylvania. The egg sacs of these insects look like the tips of cotton swabs clinging to the undersides of hemlock branches. Hemlock woolly adelgid was introduced from Asia into the Pacific Northwest in 1924. It is likely to have been introduced into the northeastern United States in the 1950s, and it was first discovered in Pennsylvania in 1967. To date sixty-four counties in Pennsylvania, including McKean County, have been infested with this insect. See *Figure 22 - Hemlock Woolly Adelgid Infestation in Pennsylvania*. Currently, Crawford, Mercer, and Greene counties are the three counties in the commonwealth not reporting an infestation. Eastern hemlock (Pennsylvania's state tree) and Carolina hemlocks (found further south in the Smoky Mountain sections of the Appalachians) are more susceptible to hemlock woolly adelgid damage than Asian and western hemlock trees due to feeding tolerance and predators that protect the latter species. Hemlock woolly adelgid sucks fluid from the base of hemlock needles. It may also inject toxins into the tree as it feeds, accelerating needle drop and branch dieback. Although some trees die within four years, trees often persist in a weakened state for many years. Hemlocks that have been affected by hemlock woolly adelgid often have a grayish-green appearance (hemlocks naturally have a shiny, dark green color).

*Figure 22 - Hemlock Woolly Adelgid Infestation in Pennsylvania*



A final 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

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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 Spotted Lanternfly has not yet been found in McKean County. However, the Spotted Lanternfly is undoubtedly continuing to spread. The State Department of Agriculture gives the total number of infected counties as fifty-one, as of 2024. *Figure 23 – Pennsylvania Spotted Lanternfly Infestation* illustrates the counties in Pennsylvania that are considered to be in the quarantine zone for this pest.

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. A worst-case example could be the Hemlock Woolly Adelgid causing reduced biodiversity, increased wildfire potential, and thermal harm to small stream cold water fisheries and habitats.

### **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. McKean County is known for its great number of geographic features. There are various state game lands within the area which include state game lands 30, 59, 61, 62, 301. Other locations, such as state forests, recreation areas, and other well-known areas in the county that have significant amounts of forest land and lakes may be especially vulnerable to invasive species. Due to the vast area of forests, there are many invasive terrestrial species that have been widespread in McKean County that are common problems throughout the Commonwealth. Some of the most popular problematic species in McKean County include:

- Hemlock Woolly Adelgid
- Spongy Moth

Many of the extreme problematic species have been around for many years. However, the most recent problematic species are the Emerald Ash Borer, Hemlock Woolly Adelgid, and the Spotted Lanternfly. In 2007, both the Emerald Ash Borer and Hemlock Woolly Adelgid were both newly spotted species that caused extreme damage. In 2014, the spotted lanternfly was found in the commonwealth.

*Table 31 - Prevalent Invasive Species* lists problematic non-native species that are established in McKean County. While all species listed here are not native to McKean County, those species highlighted in red are considered to pose a more severe ecological threat than some of the others.

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Table 31 - Prevalent Invasive Species

<b>Prevalent Invasive Species (iMapInvasives, 2024)</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>Type</b>
Alsike Clover	Trifolium hybridum	Plant
Autumn Olive	Elaeagnus umbellata	Plant
Beech leaf disease nematode	Litylenchus crenatae mccannii	Animal
Bird's Foot Trefoil	Lotus corniculatus	Plant
Bishop's Goutweed	Aegopodium podagraria	Plant
Bitter Dock	Rumex obtusifolius	Plant
Black Bindweed	Fallopia convolvulus	Plant
Black Locust	Robinia pseudoacacia	Plant
Blue Cattail, Hybrid Cattail	Typha x glauca	Plant
Buckthorn	Rhamnus cathartica	Plant
Bull Thistle	Cirsium vulgare	Plant
Burning Bush	Euonymus alatus	Plant
Callery Pear	Pyrus calleryana	Plant
Canada Bluegrass	Poa compressa	Plant
Canada Thistle	Cirsium arvense	Plant
Climbing Nightshade	Solanum dulcamara	Plant
Colt's-foot	Tussilago farfara	Plant
Common Carp	Cyprinus carpio	Animal
Common Crown-vetch	Coronilla varia	Plant
Common Reed	Phragmites australis ssp. australis	Plant
Common Speedwell	Veronica officinalis	Plant
Common St. John's-wort	Hypericum perforatum	Plant
Common Velvetgrass	Holcus lanatus	Plant
Creeping Buttercup	Ranunculus repens	Plant
Creeping Jenny	Lysimachia nummularia	Plant
Creeping Smartweed	Polygonum caespitosum var. longisetum	Plant
Creeping Yellowcress	Rorippa sylvestris	Plant
Dame's Rocket	Hesperis matronalis	Plant
Eastern Helleborine	Epipactis helleborine	Plant
English Ivy	Hedera helix	Plant
English Plantain	Plantago lanceolata	Plant
European Alder	Alnus glutinosa	Plant
Five-leaf Akebia	Akebia quinata	Plant
Garlic Mustard	Alliaria petiolata	Plant
Glossy False Buckthorn	Frangula alnus	Plant

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<b>Prevalent Invasive Species (iMapInvasives, 2024)</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>Type</b>
Goatsrue	Galega officinalis	Plant
Hemlock Woolly Adelgid	Adelges tsugae	Animal
Honeysuckle	Lonicera spp.	Plant
Japanese Barberry	Berberis thunbergii	Plant
Japanese Honeysuckle	Lonicera japonica	Plant
Japanese Knotweed	Reynoutria japonica var. japonica	Plant
Japanese Stiltgrass	Microstegium vimineum	Plant
Japanese Tree Lilac	Syringa reticulata	Plant
Japanese-spurge	Pachysandra terminalis	Plant
Knotweed	Reynoutria spp.	Plant
Lesser Burdock	Arctium minus	Plant
Lesser Periwinkle	Vinca minor	Plant
Meadow Timothy	Phleum pratense	Plant
Morrow's Honeysuckle	Lonicera morrowii	Plant
Mud Bithynia	Bithynia tentaculata	Animal
Mugwort	Artemisia vulgaris	Plant
Multiflora Rose	Rosa multiflora	Plant
Norway Maple	Acer platanoides	Plant
Orange Daylily	Hemerocallis fulva	Plant
Orange Hawkweed	Hieracium aurantiacum	Plant
Poison-hemlock	Conium maculatum	Plant
Privet	Ligustrum spp.	Plant
Purple Loosestrife	Lythrum salicaria	Plant
Reed Canary Grass	Phalaris arundinacea	Plant
Scribner's Bluegrass	Poa trivialis	Plant
Smooth Brome	Bromus inermis	Plant
Spotted Cat's-ear	Hypochaeris radicata	Plant
True Forget-me-not	Myosotis scorpioides	Plant
Watercress	Rorippa nasturtium-aquaticum	Plant
Wild Chervil	Anthriscus sylvestris	Plant
Wild Parsnip	Pastinaca sativa	Plant

**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

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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 unknown 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](https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/GISC/Pages/default.aspx).

There are several invasive species that are found near McKean County but have not yet been detected inside the county (see *Table 32 – 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. Therefore, all invasive species that are present in counties near to McKean County, but not yet in McKean County, are highly problematic for future vulnerability (as shown in *Table 32 – Future Vulnerable Species*). 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 McKean County.

Climate change and its relationship with invasive species has a major correlation. According to the U.S Geological Survey, climate change has been creating a new pathway for invasive species to be introduced into the environment. As an example, the rise in temperature allows existing invasive species to expand their geographic area. Also, climate change hinders the tools for eliminating invasive species.

*Table 32 - Future Vulnerable Species*

<b>Future Vulnerable Species (iMapInvasives, 2024)</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>Type</b>
Allegheny Crayfish	Faxonius obscurus	Animal
Amur Honeysuckle	Lonicera maackii	Plant
Asiatic Clam	Corbicula fluminea	Animal
Banded Mysterysnail	Viviparus georgianus	Animal

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<b>Future Vulnerable Species (iMapInvasives, 2024)</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>Type</b>
Bohemian Knotweed	Reynoutria x bohemica	Plant
Bouncing-bet	Saponaria officinalis	Plant
Brittle Naiad	Najas minor	Plant
Butter-and-eggs	Linaria vulgaris	Plant
Chicory	Cichorium intybus	Plant
Chinese Wisteria	Wisteria sinensis	Plant
Colonial Bentgrass	Agrostis capillaris	Plant
Common Buckthorn	Rhamnus cathartica	Plant
Common Chickweed	Stellaria media	Plant
Common Frogbit	Hydrocharis morsus-ranae	Plant
Common Mullein	Verbascum thapsus	Plant
Common Valerian	Valeriana officinalis	Plant
Common Velvetgrass	Holcus lanatus	Plant
Curly Dock	Rumex crispus	Plant
Curly Pondweed	Potamogeton crispus	Plant
Curly-leaf Pondweed	Potamogeton crispus	Plant
Didymo	Didymosphenia geminata	Animal
Elm zigzag sawfly	Aproceros leucopoda	Animal
Emerald Ash Borer	Agrilus planipennis	Animal
Eurasian Water-milfoil	Myriophyllum spicatum	Plant
European Fly honeysuckle	Lonicera xylosteum	Plant
European Frogbit	Hydrocharis morsus-ranae	Plant
European Lily-of-the-valley	Convallaria majalis	Plant
Field Bindweed	Convolvulus arvensis	Plant
Freshwater Jellyfish	Craspedacusta sowerbyi	Animal
Fullers Teasel	Dipsacus fullonum	Plant
Garden Bird's-foot-trefoil	Lotus corniculatus	Plant
Goldfish	Carassius auratus	Animal
Green Sunfish	Lepomis cyanellus	Animal
Greenside Darter	Etheostoma blennioides	Animal
Ground-ivy	Glechoma hederacea	Plant
Hammerhead worm	Bipalium spp.	Animal
Hawthorn	Crataegus monogyna	Plant
Japanese Knotweed	Reynoutria japonica var. japonica	Plant

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<b>Future Vulnerable Species (iMapInvasives, 2024)</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>Type</b>
Jumping Worms	Amyntas-Metaphire	Animal
Kentucky Bluegrass	Poa pratensis	Plant
Knapweed	Centaurea spp	Plant
Lady's Thumb	Persicaria maculosa	Plant
Leafy Spurge	Euphorbia virgata	Plant
Lesser Celandine	Ranunculus ficaria	Plant
Marshpepper Knotweed	Persicaria hydropiper	Plant
Meadow Goat's-beard	Tragopogon dubius	Plant
Mimosa	Albizia julibrissin	Plant
Narrowleaf Cattail	Typha angustifolia	Plant
Norway Spruce	Picea abies	Plant
Orchard Grass	Dactylis glomerata	Plant
Oriental Bittersweet	Celastrus orbiculatus	Plant
Oxeye Daisy	Leucanthemum vulgare	Plant
Peppermint	Mentha x piperita	Plant
Perennial Pea	Lathyrus latifolius	Plant
Periwinkle	Vinca minor	Plant
Purple Foxglove	Digitalis purpurea	Plant
Purpletop Vervain	Verbena bonariensis var. bonariensis	Plant
Queen Anne's Lace	Daucus carota	Plant
Ragged Robin	Silene flos-cuculi	Plant
Rudd	Scardinius erythrophthalmus	Animal
Rusty Crayfish	Faxonius rusticus	Animal
Sheep Sorrel	Rumex acetosella	Plant
Slider	Trachemys scripta	Animal
Spongy Moth	Lymantria dispar	Animal
St. Johnswort	St. Johnswort	Plant
Starry Stonewort	Nitellopsis obtusa	Plant
Sweet Cherry	Prunus avium	Plant
Sweet Vernal Grass	Anthoxanthum odoratum	Plant
Sweetclover	Melilotus officinalis	Plant
Teasel	Dipsacus spp.	Plant
Water Chestnut	Trapa natans	Plant
White Moth Mullein	Verbascum blattaria	Plant

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<b>Future Vulnerable Species (iMapInvasives, 2024)</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>Type</b>
White River Crayfish	Procambarus acutus	Animal
White Sweet-clover	Melilotus albus	Plant
White Willow	Salix alba	Plant
Wild Basil	Clinopodium vulgare	Plant
Yellow Iris	Iris pseudacorus	Plant
Zebra Mussel	Dreissena polymorpha	Animal

### **4.3.5.5 Vulnerability Assessment**

McKean 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 McKean 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 McKean County, there is a risk of future damage from invasive species that are present in the area. With almost 984 square miles of total land in McKean County, there is vulnerability to various land sites and waterways. If an invasive species were to invade the popular terrestrial areas or waterways in McKean 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 McKean 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 McKean 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

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Ash Borer, Hemlock Woolly Adelgid, the Spotted Lanternfly, and plants like the Tree-of-Heaven which have been identified in *Table 31 - 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 open 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 McKean County, but not yet present in the county (priority species in *Table 32 – 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.

All of the socially vulnerable populations in McKean County are at an increased vulnerability to invasive species. The homeless and the unsheltered populations are at risk due to not having a structure to reside in. Also, the economically vulnerable of McKean County may not have the capability to fix or hire pest control if their homes are damaged or overrun by invasive species.

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As seen in *Table 3 – Population Change in McKean County*, four municipalities have seen a net population increase from the 2010 decennial census to the 2020 decennial census. Based on this information, it can be speculated that these municipalities may have an increased risk to invasive species, since 2010, due to the increase in population and construction.

The historic properties in McKean County are at different levels of vulnerability to invasive species. Historic properties in McKean County that are made of brick and masonry construction and are at a lower risk of vulnerability from invasive species. There are approximately nine buildings that are historic in McKean County that are of brick and masonry construction. Eight out of the nine historic properties are made of stone and could be damaged by invasive species, but it is low.

Land use changes in McKean County could be a factor in the potential impact invasive species have on native species. Land use is a major factor with the severity of invasive species. Land use, in the form of a built environment, such as residential expansion, can cause invasive species impact severity to increase. Impact severity increases because as the built environment expands and becomes more complex, the impact the event will have on that area also increases because there is an influx of people, infrastructure, and critical infrastructure in the hazard area. According to Smithsonian Environmental Research Center, invasive species thrive on major land use disturbances, as an example the logging of a forest or flooding to a wetland can create conditions that invasive species thrive on to move into a specific area.

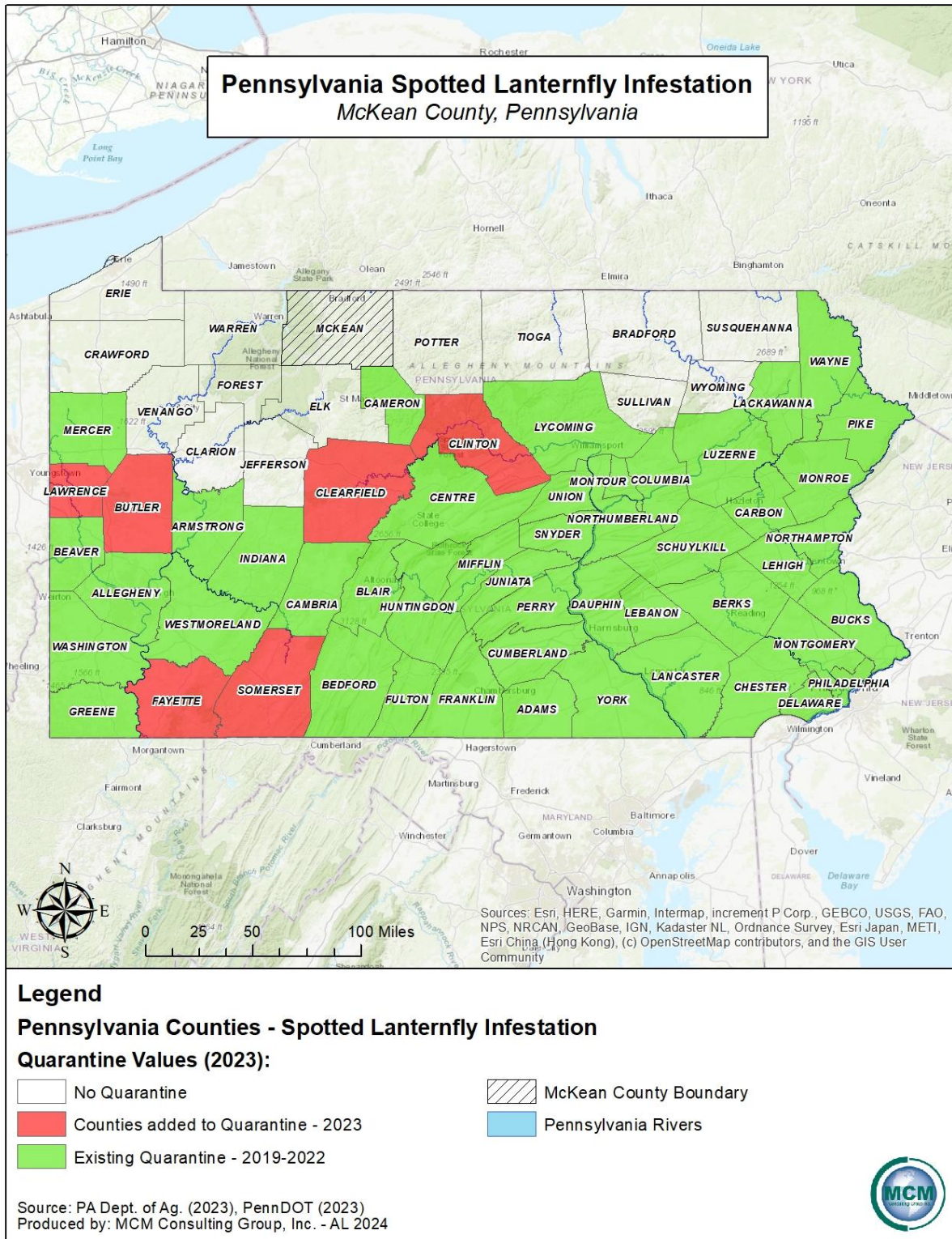
Invasive species in McKean County pose a significant threat to infrastructure systems through various mechanisms. Invasive plants like kudzu or Japanese knotweed can damage infrastructure such as roads, bridges, and buildings by infiltrating cracks and causing structural damage. Their aggressive growth can also obstruct drainage systems, leading to flooding and erosion, thus compromising the integrity of roads and bridges.

Invasive animals, such as feral hogs or zebra mussels, can disrupt infrastructure by burrowing into embankments, weakening them and increasing the risk of collapse. Additionally, animals like rodents or insects may gnaw on electrical wiring and utility cables, leading to malfunctions or even fires, posing risks to both infrastructure and public safety.

Furthermore, invasive species can interfere with transportation systems by clogging waterways. For example, invasive aquatic plants can impede navigation channels, necessitating costly scouring operations. Invasive insects like the emerald ash borer can devastate tree populations, including those lining roads or railways, posing hazards from falling trees and impacting transportation routes.

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Figure 23 - Pennsylvania Spotted Lanternfly Infestation



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### **4.3.6. Landslides**

#### **4.3.6.1 Location and Extent**

Rock falls and other slope failures can occur in areas of McKean 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 McKean County as generally low but includes local areas of high to moderate susceptibility. *Figure 24 – Landslide Hazard Areas* shows areas of landslide susceptibility in McKean County. A majority of McKean County is located in the Appalachian Plateaus physiographic province which is known for moderate vulnerability based on physiographic region 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 affect traffic and roadways throughout the commonwealth occur intermittently throughout the year. A 7,500-pound rockslide

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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 McKean County.

The 2023 Pennsylvania Hazard Mitigation Plan lists McKean County as having low incidence in the northwest portion of the county, low incidence with high susceptibility in the southwest portion of the county, low incidence with moderate susceptibility in the central portion of the county, moderate incidence with high susceptibility in the south-central portion of the county, and moderate incidence in the southeast portion of McKean County. McKean 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 McKean County is available, and 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.

### **4.3.6.4 Future Occurrence**

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.

Climate change could increase the frequency of landslides in McKean County, due to increasing rain and runoff. With climate change, hurricanes and tropical storms could become more frequent and more intense. This higher volume of precipitation, falling in a shorter time period, could dramatically increase the number of landslide events. This is related to flash flooding events as well. Soil movement will likely increase with a higher volume of precipitation.

### **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 damage. 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

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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 McKean 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 McKean County are vulnerable to landslides. *Table 33 – 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 33 - Structure Vulnerability Data*

<b>Structure Vulnerability Data</b>		
<b>Municipality</b>	<b>Number of Addressable Structures Per Municipality</b>	<b>Number of Structures in Slope Area</b>
Annin Township	448	0
Bradford City	3,640	1
Bradford Township	2,044	0
Ceres Township	529	0
Corydon Township	338	0
Eldred Borough	443	0
Eldred Township	821	0
Foster Township	2,180	1
Hamilton Township	669	0
Hamlin Township	716	0
Kane Borough	1,831	0
Keating Township	1,534	0

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<b>Structure Vulnerability Data</b>		
<b>Municipality</b>	<b>Number of Addressable Structures Per Municipality</b>	<b>Number of Structures in Slope Area</b>
Lafayette Township	888	0
Lewis Run Borough	323	0
Liberty Township	1,068	2
Mount Jewett Borough	509	0
Norwich Township	664	0
Otto Township	823	0
Port Allegany Borough	1,051	0
Sergeant Township	398	0
Smethport Borough	822	0
Wetmore Township	1,111	0
<b>Totals:</b>	<b>22,850</b>	<b>4</b>

There are no historic or cultural properties in McKean County that are registered with the National Register of Historic Places that are within a slope area of greater than 23°.

**Municipalities with an increased risk to landslide (due to slope areas over 23°):**

- Annin Township
- Bradford, City of
- Bradford Township
- Ceres Township
- Corydon Township
- Eldred Borough
- Eldred Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Kane Borough
- Keating Township
- Lafayette Township
- Lewis Run Borough
- Liberty Township
- Mount Jewett Borough
- Norwich Township
- Otto Township

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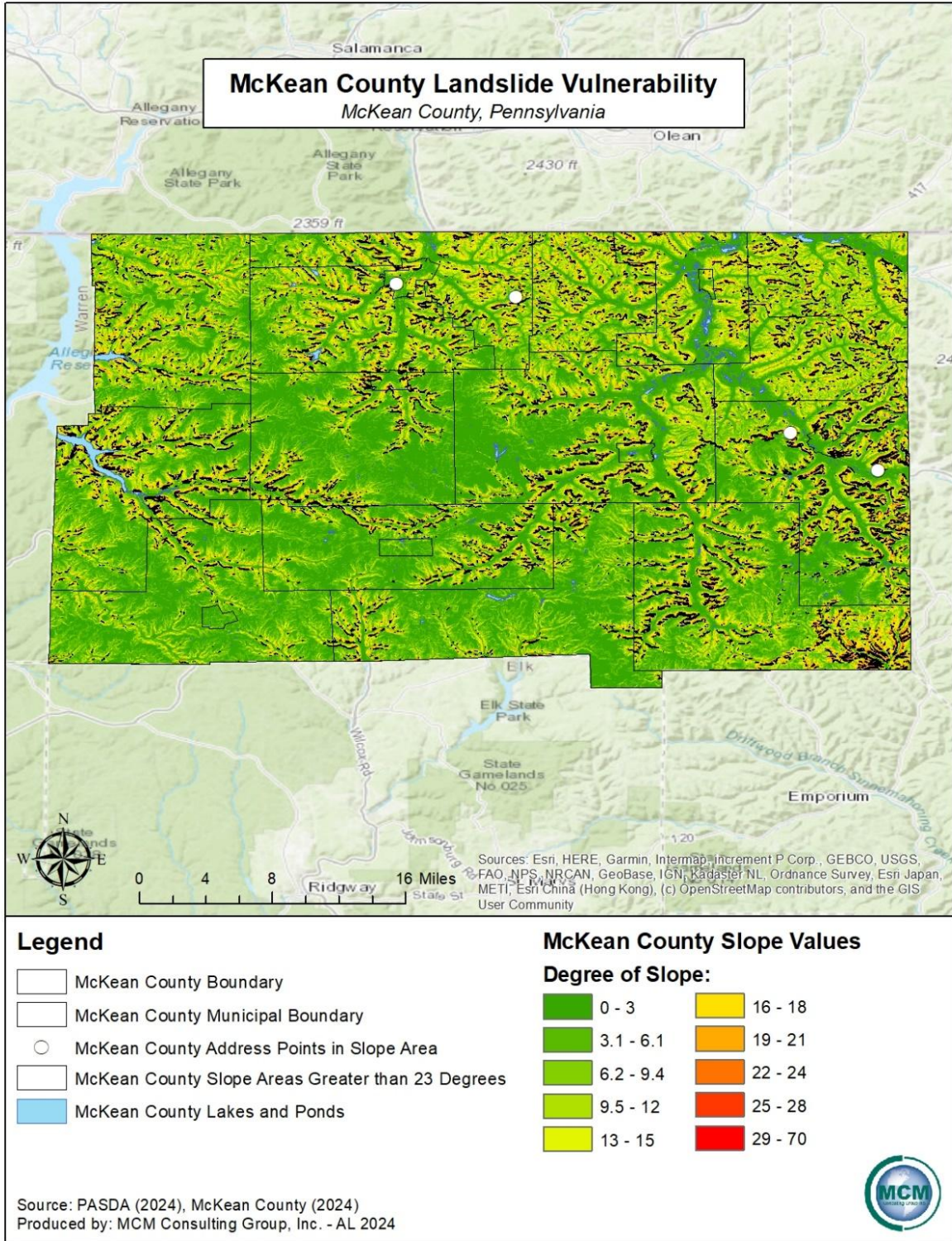
- Port Allegany Borough
- Sergeant Township
- Smethport Borough
- Wetmore Township

Population change can increase the impacts of landslides in McKean County, especially the six that have shown a population increase between 2010 and 2020. These municipalities are Ceres Township, Hamlin Township, Lewis Run Borough, Mount Jewett Borough, Port Allegany Borough, and Wetmore Township. This population change can also be seen in *Table 3 – Population Change in McKean County*.

Another impact of landslide could be land use changes. As trees are harvested for farmland, the potential for landslides increases in municipalities listed above that have an increased risk due to slope areas over 23°.

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Figure 24 - Landslide Hazard Areas



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### **4.3.7. Pandemic, Epidemic, Endemic, 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 they do not always spread 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 McKean 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

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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).

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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 34 - Pandemic Influenza Phases*.

*Table 34 - Pandemic Influenza Phases*

<b>Pandemic Influenza Phases</b>	
<b>Phase</b>	<b>Characteristics</b>
<b>Phase 1</b>	No animal influenza virus circulating among animals has been reported to cause infection in humans.
<b>Phase 2</b>	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.
<b>Phase 3</b>	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.
<b>Phase 4</b>	Human-to-human transmission (H2H) of an animal or human-animal influenza virus able to sustain community-level outbreaks has been verified.
<b>Phase 5</b>	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.
<b>Phase 6</b>	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.

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Pandemic Influenza Phases	
Phase	Characteristics
<b>Post-Peak Period</b>	Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.
<b>Possible New Wave</b>	Level of pandemic influenza activity in most countries with adequate surveillance rising again.
<b>Post-Pandemic Period</b>	Levels of influenza 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 McKean County but the United States as a whole. *Table 35 - 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 McKean 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 McKean County. There is a lack of data which provides exact numbers of deaths that occurred in McKean County from the Spanish Flu, however there were a total of 60,000 deaths in Pennsylvania. Deaths occurring in McKean 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.

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### 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.

McKean 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 of 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 McKean County.

### COVID-19

McKean County was directly impacted by the COVID-19 pandemic. As of June 2023, Pennsylvania had an estimated 3.57 million total cases and 51,344 deaths related to the COVID-19 pandemic. The first cases in Pennsylvania were reported on March 6, 2020, in Delaware and Wayne counties. The first confirmed case of COVID-19 in McKean County was in August 2020. Beginning in December of 2020, there was a large-scale vaccination effort to combat COVID-19. Municipalities in McKean County indicated a decrease in the pandemic and infectious disease section of the risk factor assessment municipal comparison.

Table 35 - 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 McKean County experienced pandemic events, but the county has also experienced infectious disease events. The two major infectious disease events experienced across McKean County and Pennsylvania as a whole are the West Nile Virus and Lyme Disease. Due to the

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climatic traits of Pennsylvania these infectious diseases thrive in McKean 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 McKean County, 2018 had the most positive cases in McKean County since 2018. Over the past five years, no human has tested positive for West Nile Virus in McKean County. *Table 36 - West Nile Virus Control Program in McKean County since 2018* outlines the West Nile Virus within McKean County from 2018 to 2024.

*Table 36 - West Nile Virus Control Program in McKean County since 2018*

<b>West Nile Virus Control Program in McKean County Since 2018</b>				
<b>Year</b>	<b>Total Positives</b>	<b>Human Positives</b>	<b>Mosquito Positives</b>	<b>Bird Positives</b>
2018	4	0	2	2
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
2022	0	0	0	0
2023	0	0	0	0
2024	0	0	0	0
Source: PA Department of Environmental Protection, 2024				

### **Lyme Disease**

Lyme Disease has been present in the United States and McKean 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. McKean County has an overall approximately 838 confirmed cases of Lyme disease from 2000 until 2020, although actual totals may be significantly higher due to under reporting. McKean 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. McKean County experienced the highest number of positive cases in 2016 and 2017. 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

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represent a rough estimate of the Lyme disease burden in McKean County. *Table 37 - Lyme Disease Data for McKean County* outlines the total positive cases of Lyme Disease within McKean County from 2000 to 2020. Data after 2020 was not available for this report.

*Table 37 - Lyme Disease Data for McKean County*

<b>Lyme Disease Data for McKean County</b>	
<b>Year</b>	<b>Total Positives</b>
2000	4
2001	6
2002	7
2003	14
2004	5
2005	6
2006	7
2007	13
2008	18
2009	22
2010	31
2011	42
2012	30
2013	50
2014	61
2015	66
2016	129
2017	127
2018	83
2019	87
2020	30
Source: PA Tick Check, 2024	

### **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

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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 McKean 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 McKean 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 McKean 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 repellent, 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 McKean County in the future.

Climate change can result in a wider range of pandemic, epidemics, and infectious diseases that can impact larger areas of the globe. As climate change continues, more populations have the potential to come into contact with vectors for diseases. The migration of animals could also increase vulnerability to this hazard for populations in McKean County. Climate change is discussed below in Section 4.3.7.5.

### **4.3.7.5 Vulnerability Assessment**

McKean County is considered to be a low vulnerability county in regard to the pandemic events. It is extremely difficult to predict the occurrence and the magnitude of a pandemic or epidemic

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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.

All critical infrastructure facilities and community lifeline facilities are vulnerable to pandemic, epidemic, and infectious disease. The people working and operating these facilities are at an increased vulnerability based on location and dispersion of disease vectors. This includes all of the critical infrastructure in the county and the community lifeline facilities, a total of 104 locations. This includes but is not limited to two hospitals, six EMS stations, eleven police stations, and twenty-two fire stations. These locations are spaced evenly throughout the county but are clustered primarily in the boroughs of the county.

A pandemic can vastly impact historic resources by disrupting routine maintenance, leading to physical deterioration of structures and artifacts. The closure of cultural institutions, including museums and archives, hinders public access and educational activities. Economic downturns may reduce funding for preservation efforts, while a decline in tourism threatens the financial sustainability of historic sites. Community engagement may suffer if events and traditional practices are disrupted, affecting the transmission of cultural knowledge.

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#### **Municipalities with high risk due to pandemic, epidemic, and infectious diseases:**

- Annin Township
- Bradford City
- Bradford Township
- Ceres Township
- Corydon Township
- Eldred Borough
- Eldred Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Kane Borough
- Keating Township
- Lafayette Township
- Lewis Run Borough
- Liberty Township
- Mount Jewett Borough
- Norwich Township
- Otto Township
- Port Allegany Borough
- Sergeant Township
- Smethport Borough
- Wetmore Township

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 25 - Pennsylvania Department of Health Districts*). McKean County is in the northwest health district.

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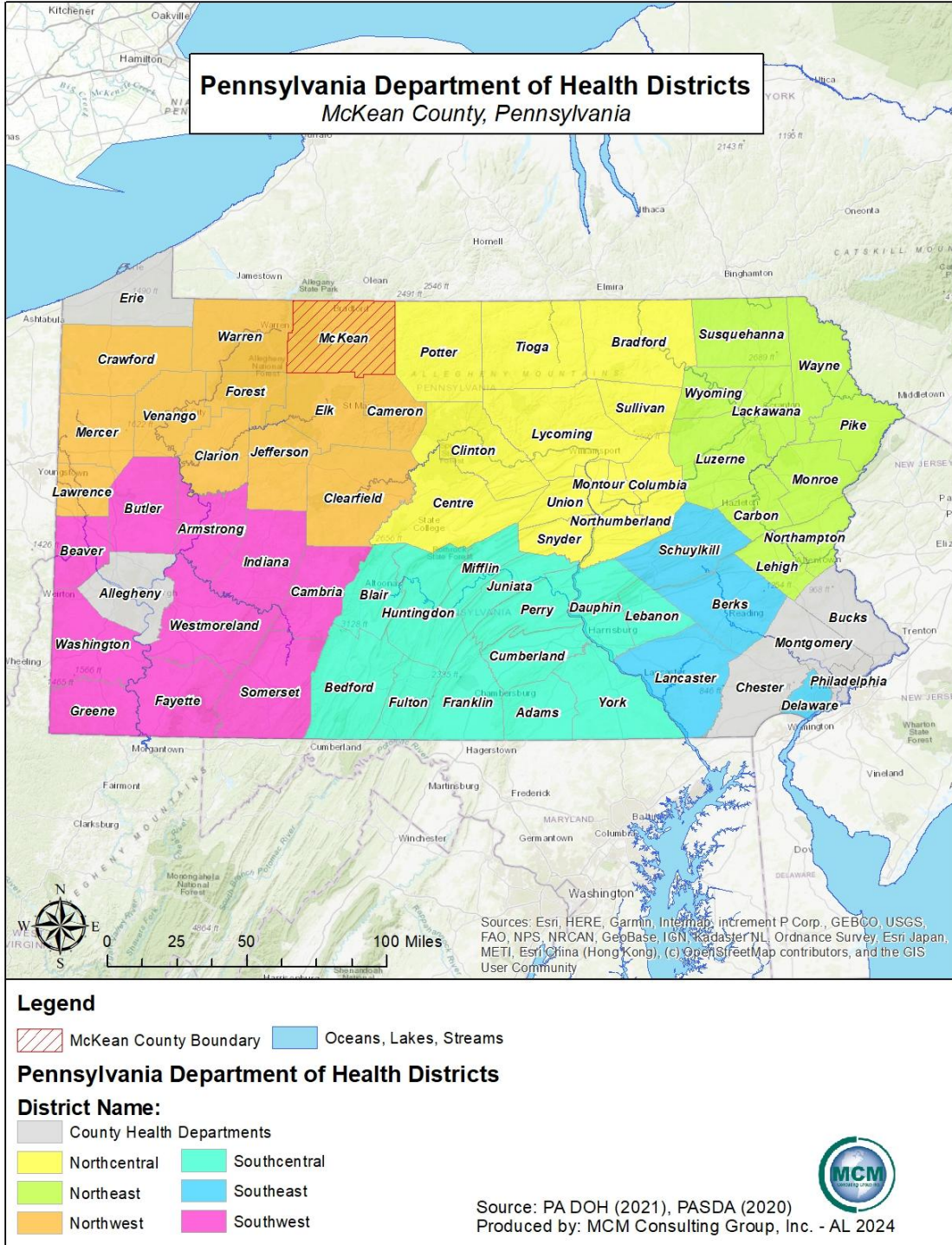
Land use and land development could directly impact the vulnerability of McKean County to pandemic, epidemic, and infectious disease. Development of forested and rural areas could result in populations coming into direct contact with vectors for infectious disease including, most prominently, Lyme Disease and West Nile Virus. When areas that are rural and natural habitats for wildlife are developed, those vectors that live along and with wildlife have the potential to come into contact with the individuals developing the properties and the populations that will occupy or live in those areas. An increase in development could also lead to an increase in the number of individuals living in McKean County, increasing the county's vulnerability to pandemic events, like COVID-19.

Climate change can significantly impact the dynamics of pandemics, epidemics, and infectious diseases. Rising temperatures and altered precipitation patterns can expand the geographic range of disease vectors, such as mosquitoes carrying diseases like malaria and dengue fever. Changes in climate can also affect the behavior and distribution of animal hosts, potentially facilitating the transmission of zoonotic diseases to humans. Extreme weather events, intensified by climate change, can also disrupt healthcare systems and infrastructure, hindering the response to outbreaks. Additionally, shifts in temperature and humidity can influence the survival and spread of pathogens, potentially leading to the emergence of new infectious diseases. Overall, climate change exacerbates the complexity and challenges of managing and preventing pandemics and epidemics, making it crucial to address both environmental and public health concerns in a coordinated manner to mitigate the impact on global health.

Population changes can directly impact the vulnerability of McKean County to pandemic events, like COVID-19. With increased populations there is a greater risk of the spread of communicable diseases, especially in areas where the population density is high. There are six municipalities in McKean County that have seen an increase in population between 2010 and 2020. This information is shown in *Table 3 – Population Change in McKean County*. McKean County should monitor population growth in the boroughs and cities of the county. The socially vulnerable populations in McKean County are at a higher vulnerability of pandemic, epidemic, and infectious diseases than lesser vulnerable populations. This is due to lack of health care services for homeless, unsheltered, and transient populations in McKean County and the difficulty in receiving treatment for health issues stemming from pandemics, epidemics, and infectious diseases. The national social vulnerability index for McKean County from CDC/ATSDR (Center for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry) is 0.4091 which represents a low to medium level of vulnerability.

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Figure 25 - Pennsylvania Department of Health Districts



Source: (PA DOH, 2019)

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#### **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:  $^{222}\text{Rn}$  and  $^{220}\text{Rn}$ . The  $^{220}\text{Rn}$  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  $^{222}\text{Rn}$  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  $^{222}\text{Rn}$ , 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:

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- 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.

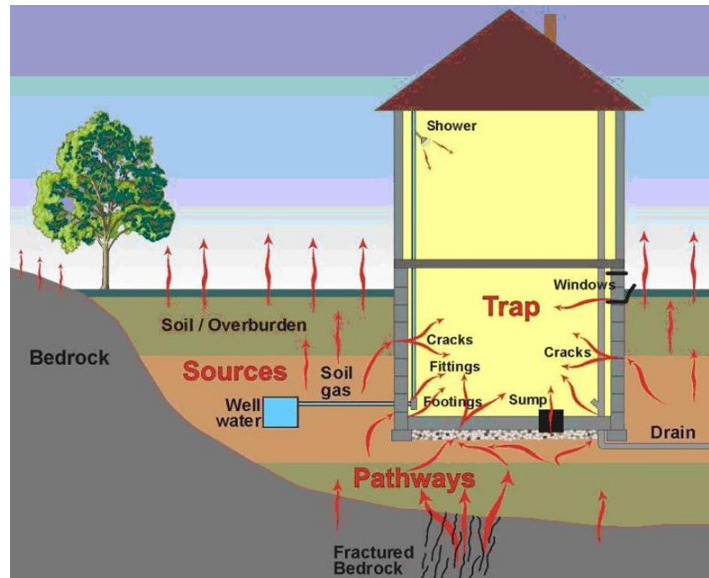
The following three sources of radon in houses are now recognized (see *Figure 26 - Sketch of Radon Entry Points into a House* below):

- 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.

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Figure 26 - 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 McKean 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 ( $^{218}\text{Po}$ ,  $^{214}\text{Pb}$ ,  $^{214}\text{Bi}$ ) 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

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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 38 - 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 34 - Radon Risk for Smokers and Nonsmokers* below, a smoker exposed to radon has a much higher risk of lung cancer.

*Table 38 - Radon Risk for Smokers and Nonsmokers*

<b>Radon Risk for Smokers and Nonsmokers</b>			
<b>Radon Level (pCi/L)</b>	<b>If 1,000 People Were Exposed to this level over a lifetime...*</b>	<b>Risk of cancer from radon exposure compares to...***</b>	<b>Action Threshold</b>
<b>SMOKERS</b>			
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)	
<b>NON-SMOKERS</b>			
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	
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	

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<b>Radon Risk for Smokers and Nonsmokers</b>			
<b>Radon Level (pCi/L)</b>	<b>If 1,000 People Were Exposed to this level over a lifetime...*</b>	<b>Risk of cancer from radon exposure compares to...***</b>	<b>Action Threshold</b>
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 986 zip codes. The missing zip codes that report in the database as “N/A” for insufficient data either had fewer than thirty test results or no test results at all.

*Table 39 – Radon Test Results in McKean County* shows a total of five zip codes in McKean County where tests were reported to the PA DEP to report their findings; those with no available

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data were not included in the table. The highest average radon level was reported from the 16701 zip code, which is in the north of the county, with an average reading of 15.1 pCi/L within location of the basement. Most reporting zip codes in McKean 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 12.1 pCi/L, and the average first floor reading is 5.1 pCi/L.

*Table 39 - Radon Test Results in McKean County*

<b>Radon Level Test Results (PA DEP, 2020)</b>					
<b>Zip Code</b>	<b>Postal Community</b>	<b>Location</b>	<b>Number of Tests</b>	<b>Max Result pCi/L</b>	<b>Average Result pCi/L</b>
16701	Bradford	Basement	386	678.1	15.1
		First Floor	89	6.8	1.2
16735	Kane	Basement	193	282.4	9.4
		First Floor	31	138.1	6.5
16738	Lewis Run	Basement	33	62.0	11.8
16743	Port Allegany	First Floor	64	97.0	8.1
16749	Smethport	First Floor	84	107.7	4.9
Source: PA DEP, 2024					

### **4.3.8.4 Future Occurrence**

Radon exposure is likely given the geologic and geomorphic conditions in McKean 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 27 – Pennsylvania Radon Levels*. Each zone reflects the average short-term measurement of radon that can be expected in a building without radon controls. McKean County is located within Zone Two 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.

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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 40 - 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 40 - Suggested Actions and Time Frame for Exposure to Radon Daughters*

<b>Suggested Actions and Timeframe for Exposure to Radon Daughters</b>		
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

Climate change will have minor impacts on radon exposure in McKean County, if any. Climate change will have an increased impact on the vulnerability of individuals to radon if those individuals live in an area where permafrost is a feature of the climate. With rising global temperatures, permafrost can melt, resulting in increased soil and bedrock erosion. This can result in higher rates of radon exposure. This is of primary concern to those areas located in the northern latitudes and will not have a significant impact on the bedrock or soils of McKean County. It is possible that climate change could impact soil and bedrock erosion rates in McKean County, but these impacts would be minor or unknown, at this time.

#### **4.3.8.5 Vulnerability Assessment**

Proper testing for radon levels should be conducted across McKean County, especially in the areas of higher incidence levels, and for those individuals and households that are susceptible to 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.

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McKean County is in the EPA Radon Hazard Zone Two, 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 to which they are exposed. Additionally, older homes that have crawl spaces or unfinished basements are more vulnerable to high radon levels. Average basement radon levels for homes that reported their results to the PA DEP are often found to be above the EPA action level of 4 pCi/L. *Figure 28 – Radon Levels by Zip Code* shows the best available data from the EPA about the percentage 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 provides short- and long-term tests to determine radon levels, as well as information on how to mitigate high levels of radon in buildings.

The historic properties in McKean County are at varying levels of risk to radon levels. There are three historic properties that are at an increased risk of radon exposure if those locations have not already been mitigated for radon levels. The Rufus Barrett Stone House, the Bradford Armory, and the Bradford Old City Hall are in an area an area that has had at least an average of 12.7 pCi/L based on tests reported to the state of Pennsylvania. There are three historic properties listed with the National Register of Historic Places that are located in areas that have had at least an average of between 8.11 pCi/L and 9.40 pCi/L of measured radon levels. Those properties include the Kane Armory, the Thomas L. Kane Memorial Chapel, and the New Thomson House.

The cultural resources in McKean County could be adversely impacted by radon exposure. The areas around McKean County have previously tested with average radon levels between 4.9 pCi/L and 15 pCi/L. If these locations have not been properly mitigated, the visitors to these locations could be at risk of radon exposure, even for a short time.

The direct hazard to radon exposure at these locations is not related to the buildings, but to the individuals who live, work, visit, and maintain these structures.

The vulnerability of natural areas to radon exposure is negligible. Since radon exposure typically is a natural hazard to humans when in enclosed spaces, and over a large portion of time, natural areas are at a lower risk. Most individuals are doing activities when outdoors and are usually not stationary for hours and days. The local parks, state game lands, state forests, and state parks are at low risk and low vulnerability.

### **Municipalities with an increased risk of radon exposure (with areas with a basement pCi/L over 11.81):**

- Annin Township
- Bradford, City of
- Bradford Township

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- Ceres Township
- Corydon Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Keating Township
- Lafayette Township
- Lewis Run Borough
- Liberty Township
- Norwich Township
- Otto Township
- Wetmore Township

### **Municipalities without an increased risk of radon exposure (with areas with a basement pCi/L under 11.81):**

- Eldred Borough
- Eldred Township
- Kane Borough
- Mount Jewett Borough
- Port Allegany Borough
- Sergeant Township
- Smethport Borough

Socially vulnerable populations in McKean County are at an increased vulnerability to radon exposure than other groups in McKean County. Approximately 86.97% of the population of McKean County is in poverty, and those individuals may be located in areas of high radon risk. Those individuals may also be unable to purchase or install radon remediation kits and systems due to economic factors. Information from the Pennsylvania Department of Environmental Protection states that installing a radon reduction system can cost between \$500.00 to \$2,000.00 with the average costing \$1,000.00 (PA DEP, 2023). Radon exposure may also impact the health of those considered to be socially vulnerable. With unequal access or opportunity to health care, potential health effects related to radon exposure can go unreported and unaddressed in socially vulnerable populations.

Population changes, especially any increase in population, in McKean County pose an increased risk to vulnerability of radon exposure to individuals in each municipality. Between the 2010 and the 2020 US Census, six municipalities in McKean County experienced population growth. These increases can be seen in *Table 3 – Population Change in McKean County*. Another risk to

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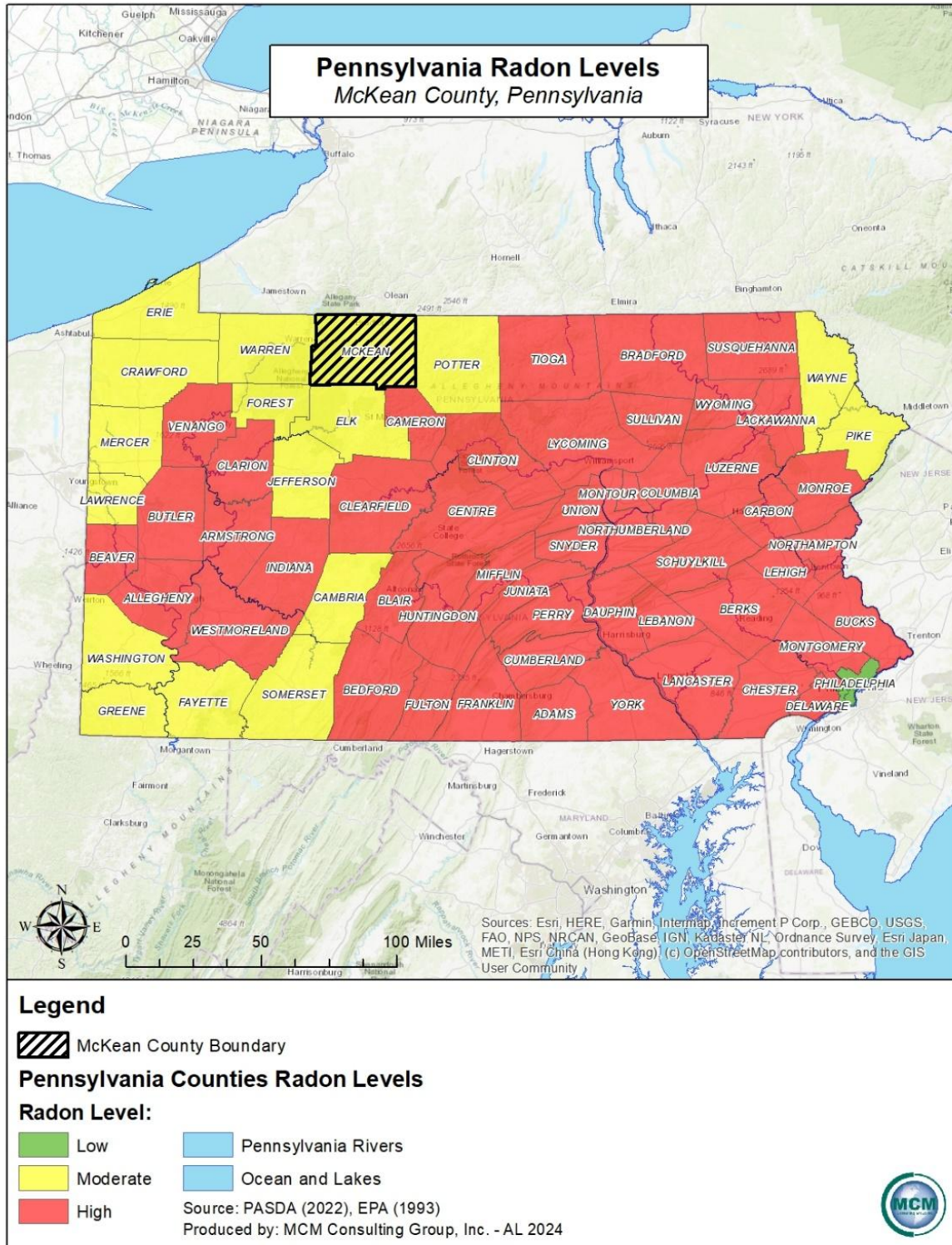
radon exposure due to population changes could occur from people moving into structures with basements that have been empty for extended periods of time or converting camps into homesteads. Education about the dangers of radon exposure should occur at the municipal level when existing homes are purchased. New construction can be built with radon prevention systems in place costing between \$500.00 to \$2,000.00 per building.

Land use could result in more rapid radon exposure if the areas being used for different land uses are over areas of high radon levels. If new land use results in exposure of the bedrock to weathering, increased radon exposure and leakage will occur. This could include the development of new or commercial properties in an area. New development may be built and constructed with radon reduction systems already in place, reducing the vulnerability for each new location with these systems. New development may have clean aggregate in construction, piping below the foundation slab, sealing of openings in foundations, or electric boxes in the attic for radon reduction system fans (PA DEP, 2023).

Radon can impact McKean County infrastructure systems by accelerating corrosion in metal components of buildings such as steel reinforcements in concrete, leading to weakening of structural elements over time. This corrosion can compromise the stability of bridges, tunnels, and other critical infrastructure. Additionally, radon-induced degradation of building materials like concrete can cause cracks, spalling, and overall degradation of structural integrity. Radon can infiltrate underground utility tunnels that can corrode pipes, conduits and electrical wiring which can lead to the potential of leaks and electric failures. Radon has the ability to compromise both structural and operational functions of infrastructure systems.

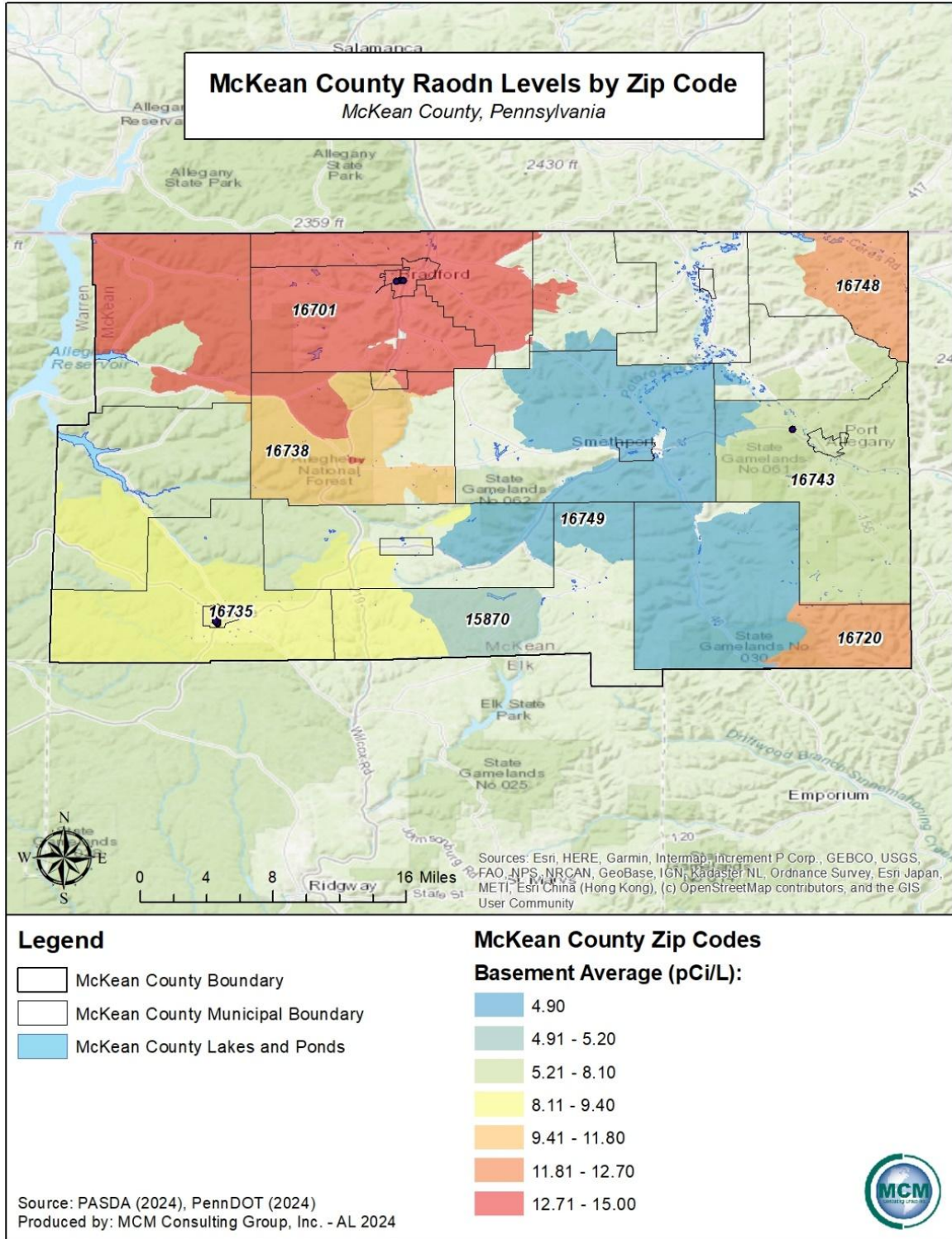
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Figure 27 - Pennsylvania Radon Levels



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Figure 28 - Radon Levels by Zip Code



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### **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 caves. 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, and McKean County is not located in a karst vulnerable area. Subsidence in McKean County is primarily due to surface extraction and mining activity. This plan will focus on surface extraction, disturbance, and mining activity. McKean 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 in 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

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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 damage 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 McKean 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 McKean County local planning team assigned a risk factor assessment score of 2.5 to subsidence and sinkhole formation. This places the hazard at a high risk factor. *Figure 29 – 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. McKean County has a large portion of mining areas and is therefore one of these regions.

### **4.3.9.3 Past Occurrence**

It was noted by McKean County There is no comprehensive list of mine subsidence in McKean 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 2024. Of these sinkholes, none fall within McKean County. However, the fact that no sinkholes were identified does not necessarily mean there are no sinkholes in McKean County. Additionally, the Pennsylvania Department of Environmental Protection indicates that some small incidences of sinkholes occur several times per week and cause limited

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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 McKean County. The PA DEP has noted that mine subsidence events are constant though they vary in intensity and damage. It was noted by McKean County that no mining locations exist in the county, nor has there been a historic occurrence of mining operations. Hence, the annual occurrence of subsidence and sinkholes is considered unlikely. Although precise locations of future occurrences are 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 geological conditions and mining activity, subsidence events are unlikely to occur in McKean 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 30 – 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 McKean County.

Climate change may increase the frequency of subsidence in McKean County. Climate change could result in more intense rainfall from more frequent hurricanes and tropical storms, or it could result in hot, dry areas becoming increasingly dry. The increase in precipitation could result in ground swelling, due to soils that contain clay minerals absorbing the rainfall. This swelling is seen as an increase in vertical land motion, while shrinking is the decrease in vertical land motion. Shrinking occurs when there are high temperatures that cause the land to dry out, resulting in more movement in the soil, which can be seen as a gradual settling or sudden sinking of Earth's surface. The combination of shrinking and swelling could increase with climate change and ultimately increase the frequency of subsidence and sinkholes in McKean County.

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### **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 McKean 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 is 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 McKean 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 30 – Abandoned Mined Sites in McKean County*. Subsidence cannot be ruled out as a potential hazard for McKean County. There are no state or county critical infrastructure facilities at risk in the county due to sinkholes.

Within McKean County there are multiple assets that are vulnerable to subsidence and sinkhole impacts including historical and cultural resources, critical infrastructure, and community lifeline facility. For example, there is one critical infrastructure and community lifeline facility within 500 feet of abandoned mine areas in McKean County. This facility is a fire station. There are no historic and cultural resources recognized by the National Register of Historic Places that are within 500 feet of an abandoned mine area.

#### **Municipalities with the highest risk of subsidence or sinkholes (abandoned mine areas and areas unsuitable for mining):**

- None

#### **Municipalities with an increased risk of subsidence or sinkholes (abandoned mine areas):**

- Keating Township
- Lafayette Township
- Liberty Township
- Norwich Township
- Sergeant Township
- Wetmore Township

#### **Municipalities without an increased risk of subsidence or sinkholes (no abandoned mine areas):**

- Annin Township
- Bradford, City of
- Bradford Township

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- Ceres Township
- Corydon Township
- Eldred Borough
- Eldred Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Kane Borough
- Lewis Run Borough
- Mount Jewett Borough
- Otto Township
- Sergeant Township
- Smethport Borough

Underserved, unserved, and socially vulnerable populations face heightened impacts from subsidence and sinkholes. Limited resources often result in substandard infrastructure, exacerbating susceptibility to ground collapse. Housing in these areas is prone to structural damage, posing threats to lives and livelihoods. Displacement becomes a critical concern as sinkholes disrupt communities, challenging access to safe shelter. Vulnerable populations may lack the financial means for adequate recovery, perpetuating economic hardships.

Population change can increase the impacts of subsidence or sinkholes in McKean County. Three of the twenty-two municipalities in McKean County experienced a population increase between the 2010 and the 2020 US Census. This population change can also be seen in *Table 3 – Population Change in McKean County*. Based on this information, it can be speculated that these municipalities may have an increased/equivalent risk to subsidence and sinkholes since 2010, due to the increase in population and construction.

Current land use in McKean County can affect the vulnerability of the county to subsidence and sinkholes. Impervious surfaces allow pollutants from aerial and terrestrial sources to accumulate. During stormwater runoff, these pollutants will run into stormwater drains and directly to local waterbodies. When impervious surfaces increase, so does the quantity, speed, temperature, and pollutant load of the storm water runoff.

Subsidence and sinkholes present dual threats to both natural and cultural areas. Ecologically, these alter landscapes, compromising soil stability and disrupting ecosystems. Sinkholes can swallow habitats, impacting land use for the county. Culturally, the collapse of terrain endangers heritage sites, structures, and artifacts, erasing historical landscapes. Subsidence may threaten traditional agricultural practices linked to specific terrains.

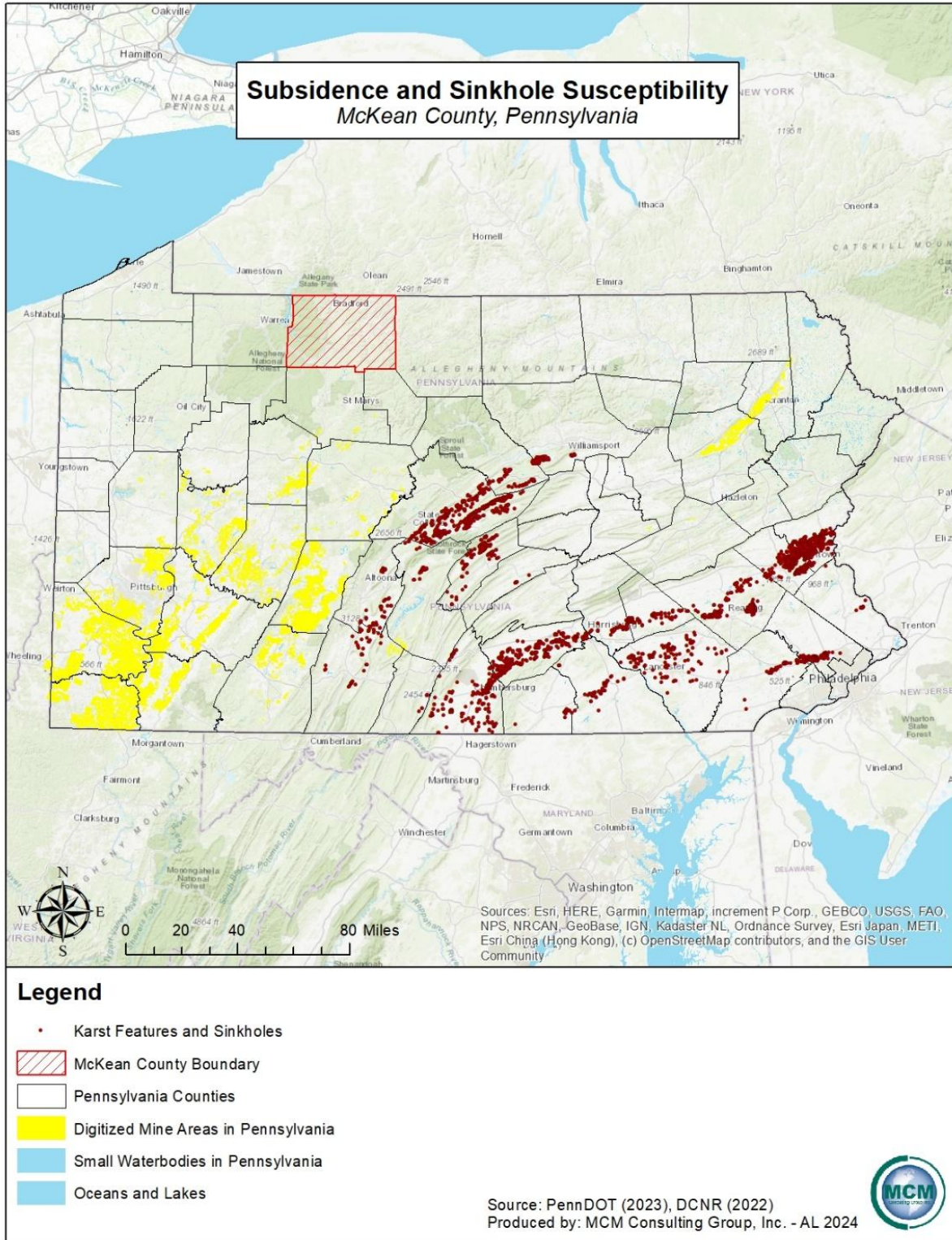
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Subsidence and sinkhole events can also pose a threat to systems within McKean County. Some systems that may be affected by subsidence and sinkhole events are natural gas, water, and the numerous other materials and chemicals transported through underground water systems in McKean County. During significant subsidence and sinkhole events, underground pipelines may crack, causing the transported material to leak into the ground and contaminating water sources in the county. Even in more contained scenarios, a small leak can have profound impact if the transported material is toxic or hazardous in nature, leading to degradation of the natural resources in the impacted communities. Subsidence and sinkhole events can also cause above ground localized transportation issues if an event were to occur along a transportation route through McKean County. This can cause a delay in daily transportation and may require alternate transportation routes to be established for an extended period of time.

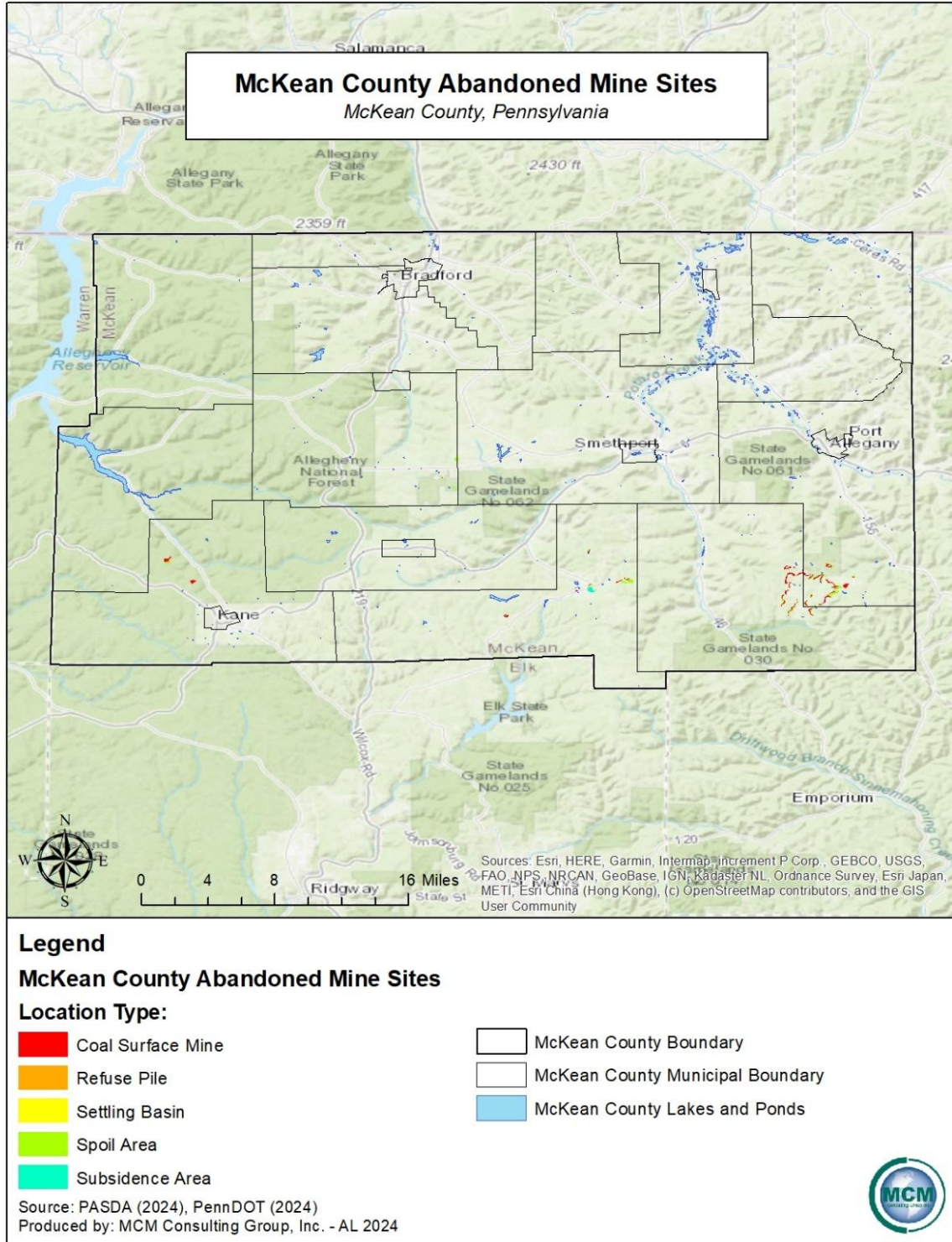
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Figure 29 - Sinkhole Susceptibility in Pennsylvania



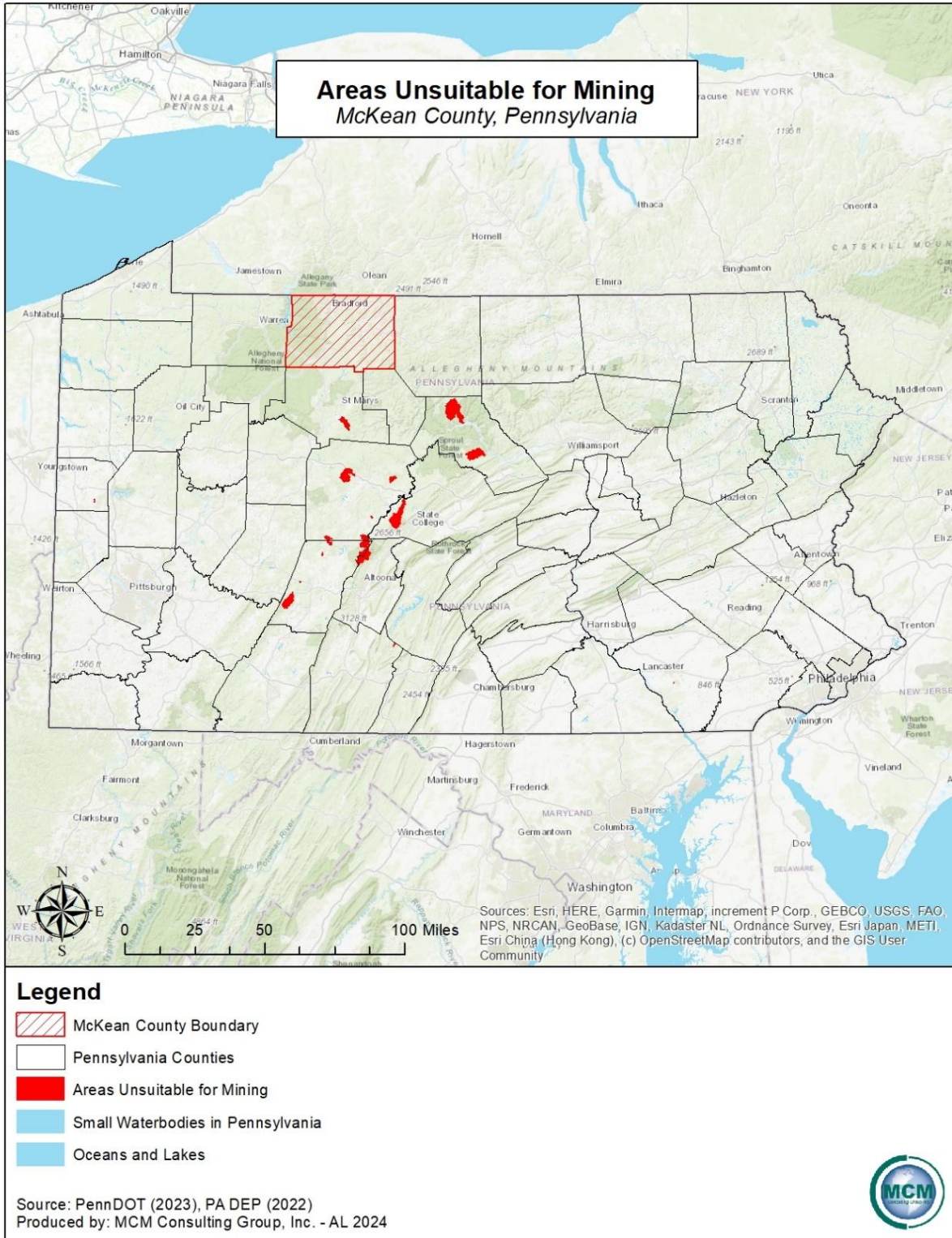
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Figure 30 - Abandoned Mined Sites in McKean County



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Figure 31 - Unsuitable Areas for Mining in Pennsylvania



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### **4.3.10. Tornado/Windstorm**

#### **4.3.10.1 Location and Extent**

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

#### **Tornadoes**

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 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 without a rotating updraft, which causes the spinning motion common with tornadoes to appear near the ground.

#### **Windstorms**

Windstorms are experienced on a region-wide scale. The most frequent cause of windstorms in Pennsylvania are thunderstorms, although they may also be caused by hurricanes and winter storms. 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 McKean County.

#### **4.3.10.2 Range of Magnitude**

#### **Tornadoes**

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 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

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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.

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 65 to more than 200 miles per hour (mph). The speed of forward motion can range from 0 mph to 50 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 tornado’s 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.

The destruction from tornadoes can range from minor to severe depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage 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 41 – Enhanced Fujita Scale*. The EF-Scale became effective on February 1, 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 41 – Enhanced Fujita Scale* shows F-Scale categories with corresponding EF-Scale wind speeds.

*Figure 32 – Pennsylvania Wind Zones* identifies wind speeds that could occur across the state, which may 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 the design of 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.

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Since McKean County falls within Zone III to the east and Zone IV to the west, shelters and critical facilities should be designed to withstand up to 200 and 250 mph winds, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm 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 McKean 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 or damage.
- Trees down or snapped off high above the ground/tree debris-fire fuel.
- Toppled high profile vehicles, including those containing hazardous materials.

*Table 41 - Enhanced Fujita Scale*

Enhanced Fujita Scale			
EF-Scale Number	Wind Speed (MPH)	F-Scale Number	Description of Potential Damage
EF0	65–85	F0-F1	<b>Minor damage:</b> 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	<b>Moderate damage:</b> Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111–135	F1-F2	<b>Considerable damage:</b> 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.

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Enhanced Fujita Scale			
EF-Scale Number	Wind Speed (MPH)	F-Scale Number	Description of Potential Damage
EF3	136–165	F2-F3	<b>Severe damage:</b> 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	<b>Devastating damage:</b> Well-constructed houses and whole frame houses completely leveled; cars thrown, and small projectiles generated.
EF5	>200	F3-F6	<b>Extreme damage:</b> 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 McKean County have occurred countywide. 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. McKean County was impacted by the 1985 outbreak.

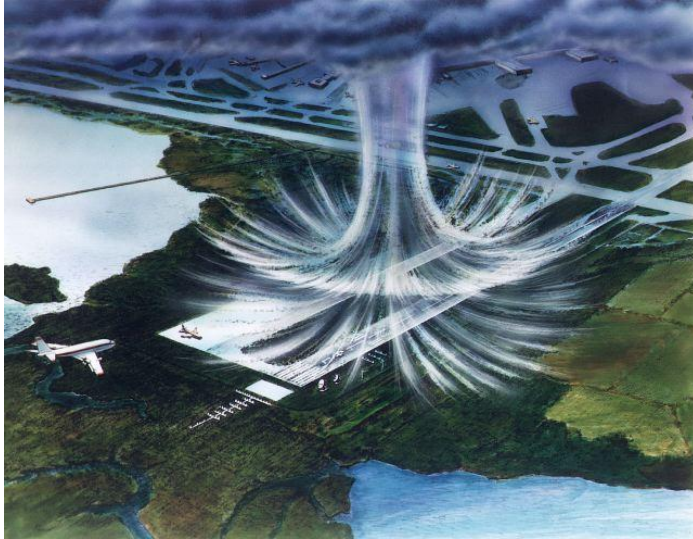
### Windstorms

Windstorms can be broken down into multiple categories. Straight-line winds are the most common wind event and are different from tornadic winds. It is a ground level, non-rotational, wind that comes out of a thunderstorm. Downdrafts are columns of air that rapidly sinks toward the ground and are classified as either a microburst or microburst. A macroburst is the outward burst of strong winds that are near or at the surface with horizontal dimensions greater than 2 ½ miles. Macroburst winds may begin over a smaller area and then spread out to a 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,

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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 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.

### **4.3.10.3 Past Occurrence**

McKean County has experienced five tornado events since 1954, and 192 wind incidents between 1968 and summer of 2023 as seen in *Table 42 – McKean County Tornado History* and *Table 43 – McKean County High Wind History*. Numerous sources provide information in regard to past occurrences and losses associated with tornadoes/windstorms in McKean 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 present until 2003, while windstorm data was available until 2023, even though more recent events could have possibly occurred. Historically, the county has experienced both severe windstorms and tornadoes.

The most recent tornado impacted Mt Jewett on July 21, 2003. On July 21, 2003, a tornado touched down in McKean County that was over five miles in length and had a width of 600 yards. This tornado caused the collapse of the historic Kinzua Viaduct Bridge, nine of the twenty bridge supports were destroyed by the wind speeds. The second touchdown of this tornado damaged two barns and destroyed a third. Two homes and a church were also damaged. No injuries or deaths were reported from the impact of this tornado.

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Table 42 - McKean County Tornado History

<b>McKean County Tornado History</b>					
<b>Location</b>	<b>Date</b>	<b>Magnitude (F/EF Scale)</b>	<b>Deaths</b>	<b>Injuries</b>	<b>Property Damage</b>
McKean County	05/31/1985	F2	0	0	\$0.00
McKean County	05/31/1985	F4	0	0	\$0.00
McKean County	05/31/1985	F4	4	40	\$0.00
Custer City	06/02/1998	F1	0	0	\$0.00
MT Jewett	07/21/2003	F1	0	0	\$45,700,000.00
Source: NOAA NCEI, 2024 Estimated Values are marked*					

Table 43 - McKean County High Wind History

<b>McKean County High Wind History</b>				
<b>Location</b>	<b>Date</b>	<b>Magnitude (knots)</b>	<b>Injuries</b>	<b>Property Damage</b>
McKean County	08/24/1968	52	0	\$0.00
McKean County	04/14/1974	72	0	\$0.00
McKean County	06/28/1980	56	0	\$0.00
McKean County	07/29/1980	50	0	\$0.00
McKean County	04/16/1993	51	0	\$0.00
Kane	04/15/1994	56	0	\$0.00
Bradford	07/05/1994	56	0	\$0.00
Bradford	07/08/1996	50	0	\$0.00
Port Allegany	08/08/1996	50	0	\$0.00
Bradford	08/08/1996	50	0	\$0.00
Kane	08/15/1996	50	0	\$0.00
Bradford	08/20/1996	50	0	\$0.00
Bradford	08/20/1996	50	0	\$0.00
Port Allegany	09/12/1996	50	0	\$0.00
Bradford	06/25/1997	51	0	\$0.00
Duke center	06/25/1997	51	0	\$0.00
Lantz corners	06/25/1997	51	0	\$0.00
Myrtle	07/07/1997	51	0	\$0.00
Bradford	07/15/1997	51	0	\$0.00
Bradford	07/15/1997	51	0	\$0.00

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<b>McKean County High Wind History</b>				
<b>Location</b>	<b>Date</b>	<b>Magnitude (knots)</b>	<b>Injuries</b>	<b>Property Damage</b>
Crosby	07/18/1997	51	0	\$0.00
Mt Jewett	08/16/1997	51	0	\$0.00
Bradford	08/16/1997	51	0	\$0.00
Kane	05/16/1998	51	0	\$0.00
Rew	05/29/1998	51	0	\$0.00
Kane	05/29/1998	51	0	\$0.00
Smethport	05/29/1998	51	0	\$0.00
Smethport	05/31/1998	51	0	\$0.00
Kane	06/30/1998	51	0	\$0.00
Bradford	08/24/1998	51	0	\$0.00
Lafayette	09/27/1998	51	0	\$0.00
Eldred	06/21/2001	50	0	\$0.00
Lantz Corners	08/19/2001	50	0	\$0.00
Bradford	06/04/2002	50	0	\$0.00
Kane	06/05/2002	50	0	\$0.00
Smethport	07/28/2002	50	0	\$0.00
Kane	08/02/2002	50	0	\$0.00
Kane	09/03/2002	50	0	\$0.00
Kane	07/21/2003	55	0	\$0.00
Bradford	06/14/2004	50	0	\$0.00
Kane	06/17/2004	50	0	\$0.00
Mt Jewett	07/30/2004	50	0	\$0.00
Kane	08/10/2004	50	0	\$0.00
Bradford	08/10/2004	50	0	\$0.00
Kane	06/06/2005	50	0	\$2,000.00
Eldred	06/06/2005	50	0	\$0.00
Marshburg	06/06/2005	50	0	\$0.00
Mt Jewett	06/06/2005	50	0	\$0.00
Kane	06/06/2005	50	0	\$0.00
Kane	06/14/2005	50	0	\$0.00
Bradford	06/14/2005	50	0	\$0.00
Kane	07/26/2005	50	0	\$0.00
Bradford	07/26/2005	50	0	\$0.00

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<b>McKean County High Wind History</b>				
<b>Location</b>	<b>Date</b>	<b>Magnitude (knots)</b>	<b>Injuries</b>	<b>Property Damage</b>
Smethport	07/26/2005	50	0	\$0.00
Ludlow	07/29/2005	50	0	\$0.00
Crosby	08/31/2005	50	0	\$0.00
Bradford	09/29/2005	50	0	\$0.00
Westline	09/29/2005	50	0	\$0.00
Port Allegany	11/06/2005	50	0	\$0.00
Crosby	11/09/2005	60	0	\$20,000.00
Marshburg	06/19/2006	50	0	\$0.00
Bradford	08/03/2006	50	0	\$0.00
Eldred	08/03/2006	50	0	\$0.00
Eldred	08/25/2006	50	0	\$0.00
Smethport	12/01/2006	50	0	\$0.00
Smethport	06/02/2007	50	0	\$0.00
Kane	06/08/2007	50	0	\$0.00
Bradford	08/25/2007	50	0	\$0.00
Farmers Vly	05/31/2008	50	0	\$0.00
Larabee	05/31/2008	50	0	\$0.00
Bradford	06/28/2008	50	0	\$0.00
Ludlow	07/26/2008	50	0	\$0.00
Bradford	08/09/2009	50	0	\$5,000.00
Cyclone	06/06/2010	50	0	\$5,000.00
Rew	06/28/2010	50	0	\$5,000.00
Larabee	07/17/2010	50	0	\$5,000.00
Duke Center	07/24/2010	50	0	\$5,000.00
Bradford	07/24/2010	50	0	\$5,000.00
Bradford	07/24/2010	50	0	\$5,000.00
Degolia	07/24/2010	50	0	\$5,000.00
Bradford	05/25/2011	50	0	\$5,000.00
Duke Center	05/25/2011	61	0	\$10,000.00
Mt Jewett	09/03/2011	50	0	\$5,000.00
Bradford	11/14/2011	50	0	\$5,000.00
West Eldred	11/14/2011	50	0	\$5,000.00
Bradford	01/17/2012	50	0	\$10,000.00

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<b>McKean County High Wind History</b>				
<b>Location</b>	<b>Date</b>	<b>Magnitude (knots)</b>	<b>Injuries</b>	<b>Property Damage</b>
Turtlepoint	05/02/2012	61	0	\$10,000.00
Custer City	06/03/2012	50	0	\$5,000.00
Duke Center	07/07/2012	50	0	\$5,000.00
Lewis Run	07/26/2012	78	0	\$15,000.00
Smethport	07/26/2012	50	0	\$5,000.00
East Kane	08/09/2012	50	0	\$2,500.00
Duke Center	08/09/2012	50	0	\$5,000.00
East Smethport	04/10/2013	52	0	\$10,000.00
Duke Center	05/22/2013	50	0	\$5,000.00
South Bradford	05/28/2013	50	0	\$2,500.00
West Branch	08/13/2013	50	0	\$1,000.00
Bellrun	09/11/2013	50	0	\$2,000.00
Ludlow	06/12/2015	50	0	\$1,000.00
Bradford	06/12/2015	50	0	\$1,000.00
East Kane	06/12/2015	50	0	\$2,000.00
Mt Jewett	06/12/2015	50	0	\$1,000.00
Bradford	06/23/2015	50	0	\$500.00
Port Allegany Airport	06/23/2015	60	0	\$2,000.00
JoJo	07/07/2015	50	0	\$1,000.00
JoJo	07/07/2015	50	0	\$1,000.00
Riderville	07/07/2015	50	0	\$2,000.00
Kane	07/14/2015	50	0	\$1,000.00
East Kane	07/14/2015	50	0	\$1,000.00
Bradford	07/19/2015	50	0	\$2,000.00
West Branch	06/05/2016	50	0	\$1,000.00
Marshburg	06/05/2016	50	0	\$1,000.00
Bradford	06/05/2016	50	0	\$1,000.00
Cyclone	07/25/2016	52	0	\$2,000.00
Smethport	04/30/2017	52	0	\$2,000.00
Howard	05/01/2017	78	0	\$30,000.00
South Bradford	06/18/2017	52	0	\$1,000.00
Bradford	06/18/2017	52	0	\$1,000.00
East Bradford	06/18/2017	52	0	\$2,000.00

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<b>McKean County High Wind History</b>				
<b>Location</b>	<b>Date</b>	<b>Magnitude (knots)</b>	<b>Injuries</b>	<b>Property Damage</b>
Sawyer City	06/18/2017	52	0	\$3,000.00
Summit	06/18/2017	52	0	\$3,000.00
Rixford	06/18/2017	52	0	\$3,000.00
Duke Center	06/18/2017	52	0	\$1,000.00
West Eldred	06/18/2017	52	0	\$1,000.00
(Bfd)Bradford Airport	06/18/2017	52	0	\$1,000.00
Bradford	09/04/2017	52	0	\$4,000.00
East Bradford	09/04/2017	52	0	\$4,000.00
West Bradford	10/15/2017	52	0	\$2,000.00
South Bradford	10/15/2017	52	0	\$4,000.00
Bradford	11/05/2017	52	0	\$0.00
Westline	05/04/2018	52	0	\$1,000.00
Gibbs Hill	05/04/2018	52	0	\$1,000.00
Aiken	05/04/2018	52	0	\$4,000.00
East Smethport	05/04/2018	52	0	\$5,000.00
Big Shanty	08/29/2018	52	0	\$0.00
Cyclone	08/29/2018	52	0	\$3,000.00
South Bradford	09/21/2018	52	0	\$0.00
Lewis Run	09/21/2018	52	0	\$3,000.00
Hazelhurst	09/21/2018	52	0	\$1,000.00
Derrick City	04/14/2019	52	0	\$12,000.00
Bradford	04/14/2019	52	0	\$10,000.00
Eldred	04/14/2019	52	0	\$2,000.00
Kane	04/14/2019	52	0	\$4,000.00
Ahain Creek	05/25/2019	52	0	\$3,000.00
East Kane	05/29/2019	52	0	\$4,000.00
Port Allegany	08/15/2019	52	0	\$0.00
Bradford	05/29/2020	52	0	\$8,000.00
East Smethport	06/03/2020	52	0	\$4,000.00
East Smethport	06/03/2020	52	0	\$7,000.00
East Smethport	06/03/2020	52	0	\$4,000.00
(Bfd)Bradford Rgnl A	08/27/2020	57	0	\$0.00
East Kane	11/15/2020	52	0	\$12,000.00

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<b>McKean County High Wind History</b>				
<b>Location</b>	<b>Date</b>	<b>Magnitude (knots)</b>	<b>Injuries</b>	<b>Property Damage</b>
Bradford	06/09/2021	52	0	\$6,000.00
Lewis Run	07/07/2021	52	0	\$2,000.00
Rew	07/07/2021	52	0	\$5,000.00
Ludlow	07/13/2021	52	0	\$4,000.00
East Smethport	07/13/2021	52	0	\$6,000.00
Port Allegany Arpt	07/16/2021	52	0	\$1,000.00
East Kane	07/24/2022	61	0	\$60,000.00
Kane	07/24/2022	52	0	\$3,000.00
Port Allegany Arpt	07/24/2022	52	0	\$1,000.00
East Kane	04/01/2023	52	0	\$1,000.00
West Eldred	04/01/2023	52	0	\$4,000.00
Mt Jewett	04/01/2023	52	0	\$4,000.00
Summit	04/01/2023	52	0	\$4,000.00
Sawyer City	04/01/2023	52	0	\$3,000.00
Marshburg	04/01/2023	52	0	\$1,000.00
Lewis Run	07/20/2023	52	0	\$0.00
Smethport	07/20/2023	52	0	\$4,000.00
Port Allegany	07/20/2023	52	0	\$3,000.00
Lewis Run	08/24/2023	52	0	\$4,000.00
McKean County	03/25/1996	52	0	\$0.00
McKean County	02/27/1997	30	0	\$0.00
McKean County	11/26/1997	50	0	\$0.00
McKean County	01/04/2000	50	0	\$0.00
McKean County	12/12/2000	50	0	\$13,900.00
McKean County	02/10/2001	50	0	\$5,550.00
McKean County	02/01/2002	63	0	\$0.00
McKean County	03/09/2002	50	0	\$0.00
McKean County	11/13/2003	60	0	\$0.00
McKean County	12/01/2004	60	0	\$0.00
McKean County	12/23/2004	60	0	\$0.00
McKean County	02/17/2006	52	0	\$0.00
McKean County	12/01/2006	45	0	\$0.00
McKean County	01/30/2008	50	0	\$0.00

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<b>McKean County High Wind History</b>				
<b>Location</b>	<b>Date</b>	<b>Magnitude (knots)</b>	<b>Injuries</b>	<b>Property Damage</b>
McKean County	09/14/2008	50	0	\$0.00
McKean County	04/04/2018	52	0	\$0.00
McKean County	02/24/2019	52	0	\$0.00
Source: NOAA NCEI, 2024 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 on which activity occurs, but an increase in the number of tornadoes on those days. This indicates an increase in tornado outbreaks. The future probability of a disastrous tornado occurring in McKean County is ranked as possible, but not highly likely. While the chance of being hit by a tornado in McKean 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 in Pennsylvania. As jurisdictions within the county 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, such as the majority of Pennsylvania. 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, increasing the frequency and intensity of tornadoes and windstorms. There remains some uncertainty regarding the recurrence of tornadoes. Therefore, the number of future tornadoes and windstorm events could potentially increase due to known and unknown 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 McKean County, as shown in *Figure 32 – Tornado Activity in McKean County* below, 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

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tornado occurrences within McKean 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. McKean 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.

Climate change and its relationship with tornado outbreaks is hard to identify. Some recent studies suggest that as average temperatures begin to rise, so will the intense storms that often lead to the creation of tornadoes. Warm, moist air is the most important aspect for developing strong tornadoes. Climate change can exacerbate this, and it could potentially lead to an increase in frequency and the severity of the events. Although not yet proven, this is one of the most prevalent theories on how climate change can impact tornado frequency and intensity.

### **4.3.10.5 Vulnerability Assessment**

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 include 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 cascading impacts 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 during such events.

Additional dangers that accompany tornado-associated thunderstorms, and which increase the vulnerability of McKean County, include:

- 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 McKean County is highly vulnerable to tornadoes. While there may be severe impact on financial and commercial systems of the economy, these storms, and the damage they cause, can disrupt business long-term. The local economy is vulnerable due to the possibility of

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being crippled by tornadoes and windstorms and their cascading effects when buildings and supporting infrastructure are destroyed in a 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.

McKean 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. This includes uprooting or total destruction of trees and an increased threat of wildfire in areas where dead trees are not removed. 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 impacted and can cause extensive cleanup and mitigation efforts. McKean County is considered to be a rural county that has a large amount of tourism that occurs in the surrounding hills, mountains, and state parks. 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 can result in high vulnerability. A storm has the ability, potentially, to destroy structures, damage private and public property, and injure citizens and tourists in the area. People with disabilities, the elderly, functional needs, and non-English speaking residents are more vulnerable to tornadoes, windstorms, and their cascading effects. Without assistance to evacuate and/or seek shelter, and with potential difficulty understanding information, these at-risk populations may be unable to prepare themselves, or their homes and other possessions, to safely endure the storm.

Tornadoes, windstorms, and cascading events may affect a small portion, or the entirety, of the county. Therefore, it is important to identify specific critical facilities and assets that are most vulnerable to this hazard. Critical facilities are highly vulnerable to windstorms and tornado events. While many severe storms can cause exterior damage to structures, tornadoes can destroy structures, along with their surrounding infrastructure, immediately halting their function. Tornadoes are often accompanied by severe storms which can be threatening to critical facilities within the county. Many secondary effects from these disasters can jeopardize the operation of these critical facilities as well. Critical facilities are particularly vulnerable to power outages which can leave facilities functionless, potentially crippling infrastructure supporting the population of the county. Due to Pennsylvania Uniform Construction Code Act 45, trailers and mobile homes built before 2004, because of their lightweight construction and often unanchored design, are more vulnerable to high winds/tornadoes and will generally sustain more damage than will mobile homes built after 2004.

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As seen in *Table 3 – Population Change in McKean County*, Annin Township, Corydon Township, Hamilton Township, and Sergeant Township have seen a net population increase from the 2010 decennial census to the 2020 decennial census. Based on this information, it can be speculated that these municipalities may have an increased/equivalent vulnerability to tornado and windstorms, since 2010, due to the increase in population and construction.

Tornadoes and windstorm events may disproportionately affect underserved, unserved, and socially vulnerable populations, amplifying existing hardships. Fragile infrastructure in these areas is more prone to damage, which can hinder evacuation and rescue efforts. Limited access to resources exacerbates challenges during and after the storms, from securing safe shelter to obtaining essential supplies. Vulnerable communities often lack financial resilience, facing prolonged economic setbacks as local businesses may suffer.

Land use, in the form of a built environment, such as residential expansion, can cause tornado impact severity to increase. Impact severity increases when built environment expansion provides an influx of people, infrastructure, and critical infrastructure in harm's way. Since the population in McKean County had a minor overall increase between 2010 and 2020, it can be speculated that the built environment did not increase significantly.

There are no properties that are listed in the National Register of Historic Places that are at an increased risk of tornadoes in McKean County. This analysis was run off of the previous tornado paths in the county and 500 feet vulnerability zones.

Tornadoes and windstorms exert profound impacts on both natural and cultural areas. Ecologically, these intense weather events can result in habitat destruction, altering landscapes, and threatening biodiversity. Culturally, these storms endanger heritage sites, historic structures, and artifacts, eroding tangible, and intangible cultural elements. Sustainable recovery efforts must embrace an integrated approach, recognizing the interconnected vulnerability of natural, historical, and cultural landscapes to the formidable forces of tornadoes and windstorms.

All of the critical infrastructure and community lifeline facilities are vulnerable to tornado events. Some of the critical infrastructure can be considered at a higher risk due to the life safety missions that they serve. Facilities that are within 500 feet of previous tornado tracks can be considered at high risk of tornadoes.

<b>McKean County Critical Facilities and NIMS Construction Type</b>	
<b>Critical Facility Name</b>	<b>NIMS Construction Type</b>
Beacon Light	Type V
Bradford Fire Dept	Type IV
Bradford Manor	Type III
Bradford City PD	Type III

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<b>McKean County Critical Facilities and NIMS Construction Type</b>	
Critical Facility Name	NIMS Construction Type
Bradford Ecumenical Home	Type III
Bradford High School	Type III
Bradford Regional Airport	Type III
Bradford Regional Medical Center	Type II
Bradford Twp FD	Type III
Bradford Water Authority	Type III
Chapel Ridge	Type III
Clermont FD	Type III
Corydon Twp FD	Type III
County Jail	Type II
Derrick City FD	Type III
Eldred Borough FD	Type II
Eldred Twp FD	Type II
Emergycare	Type V
FCI McKean	Type II
Floyd C Fretz School	Type III
Foster Twp PD	Type II
GGB School	Type II
Hamilton Twp Sewer	Type II
Hamlin Twp FD	Type II
Hamlin Twp Sewer	Type II
Hilltop FD	Type II
IU #9	Type III
Kane Area HS	Type II
Kane Area MS-ES	Type II
Kane Borough PD	Type IV
Kane Fire Dept	Type II
Lafayette Twp FD	Type II
Lakeview Senior Care	Type III
Learning Center	Type IV
Lewis Run RD	Type III
Ludow FD	Type III
Lutheran Home at Kane	Type III
McKean County Court House	Type III
McKean DES	Type III
Mennonite School	Type V
Mt Jewett Amb	Type V
Mt Jewett FD	Type III

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<b>McKean County Critical Facilities and NIMS Construction Type</b>	
Critical Facility Name	NIMS Construction Type
Mt Jewett Sewer	Type III
Mt Jewett Water	Type III
NG Readiness Center	Type II
Norwich Twp FD	Type II
Norwich Twp Sewer	Type II
Otto Eldred ES	Type II
Otto Eldred HS	Type III
Otto Twp FD	Type III
Otto Twp PD	Type II
Otto Twp Sewer	Type III
PA American Water	Type II
PA State Police	Type III
Port Allegany Amb	Type II
Port Allegany FD	Type III
Port Allegany ES	Type II
Port Allegany HS	Type II
Port Allegany PD	Type III
School St School	Type IV
Sena Kean Manor	Type III
Smethport Boro PD	Type IV
Smethport FD	Type II
Smethport Schools	Type II
Smethport Water	Type II
UPB	Type II
UPMC Kane	Type III

**Critical infrastructure and community lifeline facilities at high risk (within 500 ft of previous tracks):**

- None

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**Municipalities with an increased risk of tornadoes (previously impacted):**

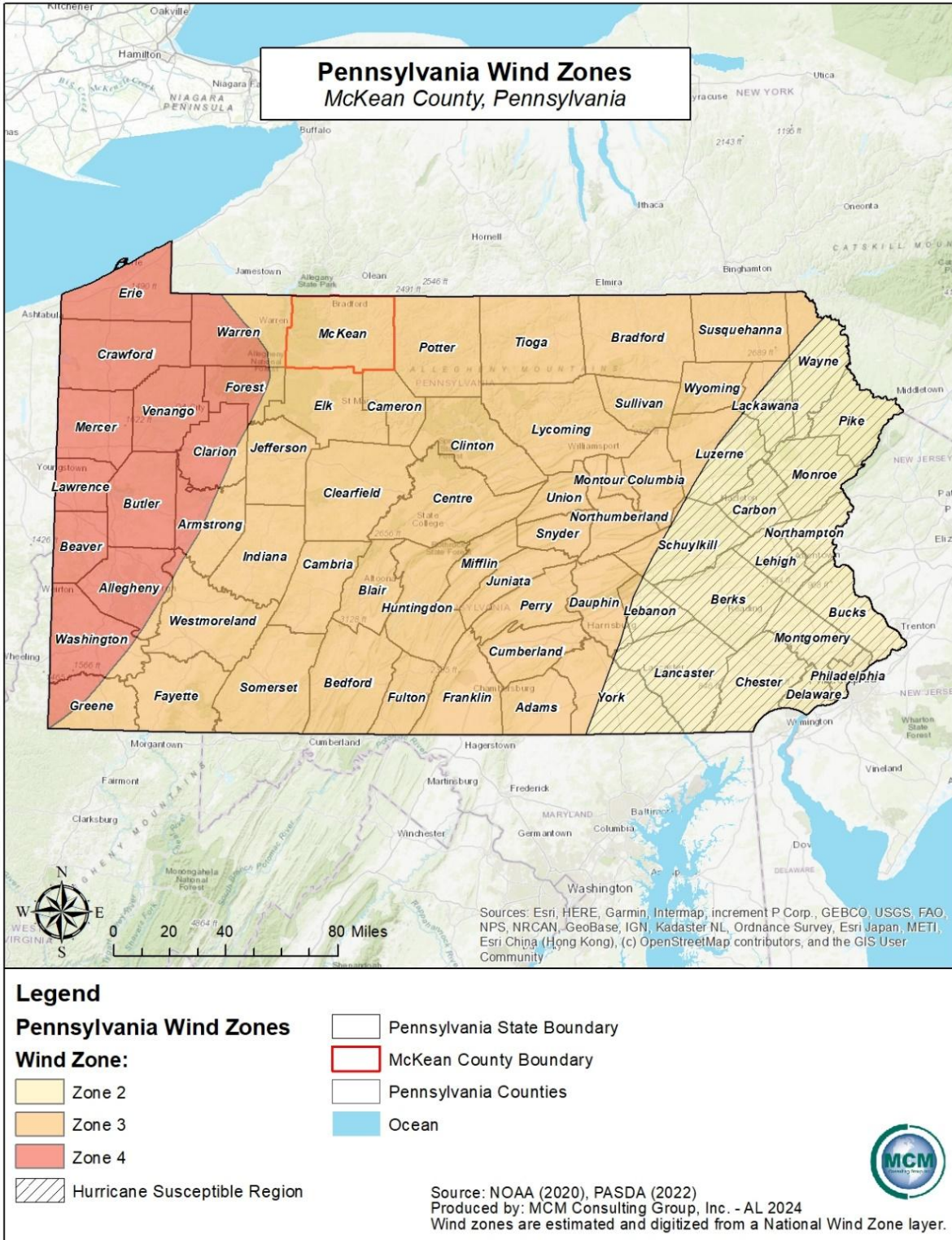
- Bradford Township
- Lafayette Township
- Sergeant Township
- Wetmore Township

**Municipalities without an increased risk of tornadoes (not previously impacted):**

- Annin Township
- Bradford, City of
- Ceres Township
- Corydon Township
- Eldred Borough
- Eldred Township
- Foster Township
- Hamilton Township
- Hamlin Township
- Kane Borough
- Keating Township
- Lewis Run Borough
- Liberty Township
- Mount Jewett Borough
- Norwich Township
- Otto Township
- Port Allegany Borough
- Smethport Borough

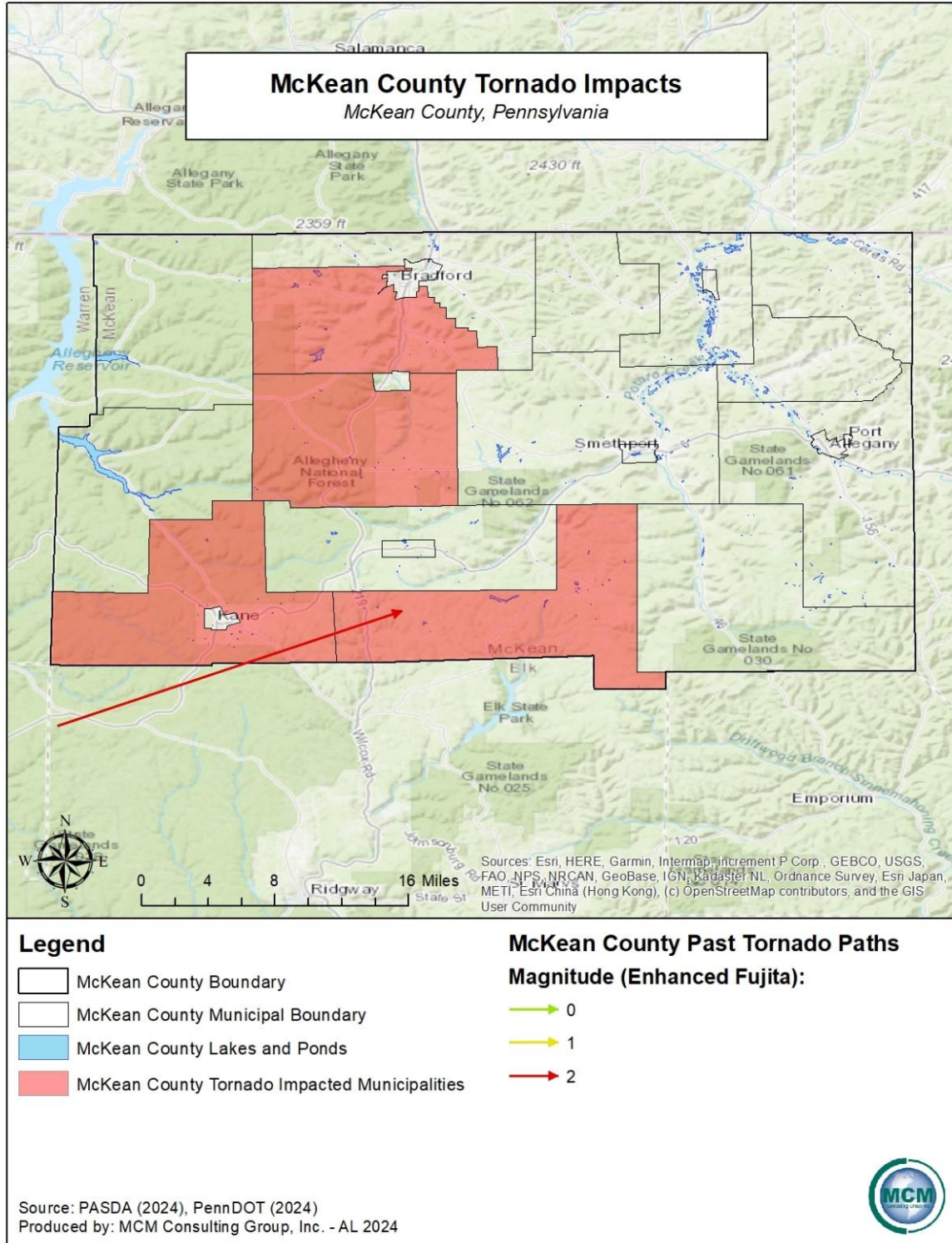
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 32 - Pennsylvania Wind Zones



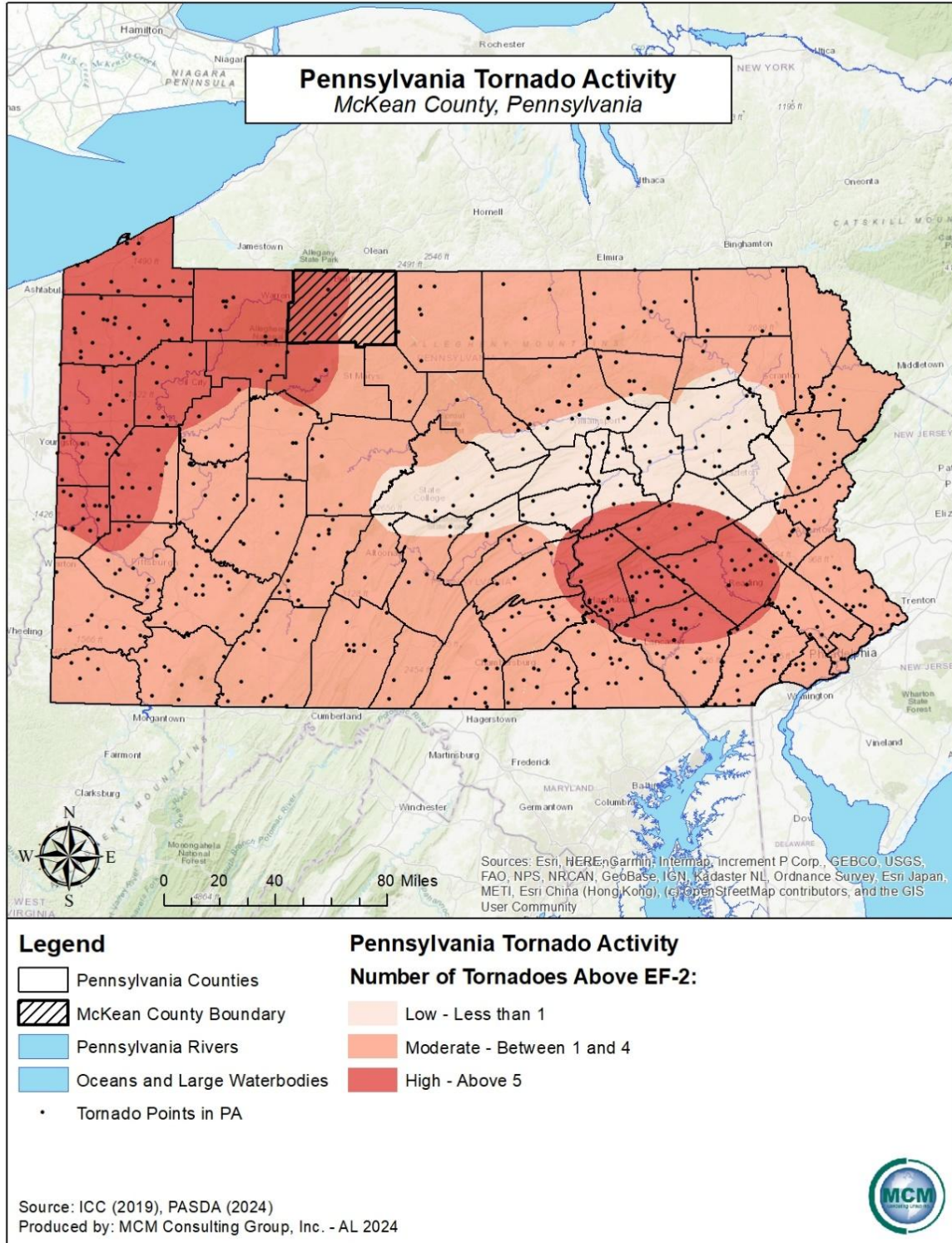
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Figure 33 - Tornado Activity in McKean County



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Figure 34 - Tornado Activity in Pennsylvania



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### **4.3.11. Wildfire**

#### **4.3.11.1 Location and Extent**

The most prevalent causes of devastating wildfires are droughts, lightning 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 McKean 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 McKean 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 McKean 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 44 – Wildland Fire Assessment System* identifies each threat classification and provides a description of the level.

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Table 44 - Wildland Fire Assessment System

<b>Wildland Fire Assessment System (U.S. Forest Service)</b>	
<b>Rank</b>	<b>Description</b>
<b>Low (L)</b>	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.
<b>Moderate (M)</b>	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.
<b>High (H)</b>	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.
<b>Very High (VH)</b>	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.
<b>Extreme (E)</b>	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, McKean County experiences a minimal amount 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. McKean

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County lies mostly in District 15 (Susquehannock State Forest District) with a small part of the county that contains Elk State Forest lying in District 13 (Elk State Forest District) of the DCNR’s Bureau of Forestry. District 15 encompasses two counties and District 13 encompasses two counties as well. In 2023, there were a total of forty fires in District 15 that were responsible for destroying 83.9 acres, while there were thirty-one fires in District 13 in 2023 that destroyed 53.4 acres.

District 15 and District 13 report the following twenty-three-year wildfire summary based on observed and reported wildfires. *Table 45 – Annual Summary of Wildfire Events* illustrates the number of acres burned in a certain number of fires for District 15 and District 13 from the year 2000 to the year 2023.

*Table 45 - Annual Summary of Wildfire Events*

<b>Annual Summary of Wildfire Events District 15</b>				
Year	Number of Fires	Frequency Increase or Decrease	Acres	Severity Increase or Decrease
2000	23	-	124.3	-
2001	20	↓	40.7	↓
2002	2	↓	68.2	↑
2003	17	↑	72.3	↑
2004	3	↓	4.0	↓
2005	15	↑	99.6	↑
2006	19	↑	96.1	↓
2007	3	↓	2.2	↓
2008	8	↑	92.2	↑
2009	11	↑	147.0	↑
2010	5	↓	85.2	↓
2011	2	↓	20.7	↓
2012	10	↑	70.8	↑
2013	4	↓	2.8	↓
2014	4	=	36.4	↑
2015	13	↑	90.8	↑
2016	10	↓	95.0	↑
2017	9	↓	25.5	↓
2018	22	↑	38.7	↑
2019	7	↓	9.4	↓
2020	36	↑	65.2	↑
2021	38	↑	117.1	↑
2022	31	↓	60.6	↓
2023	40	↑	83.9	↑

Source: PA DCNR, 2024

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Annual Summary of Wildfire Events District 13				
Year	Number of Fires	Frequency Increase or Decrease	Acres	Severity Increase or Decrease
2000	18	-	95.6	-
2001	26	↑	112.2	↑
2002	11	↓	26.6	↓
2003	7	↓	43.1	↑
2004	0	↓	0.0	↓
2005	3	↑	50.5	↑
2006	2	↓	11.4	↓
2007	15	↑	19.5	↑
2008	5	↓	15.0	↓
2009	10	↑	281.3	↑
2010	7	↓	18.9	↓
2011	0	↓	0.0	↓
2012	8	↑	252.0	↑
2013	7	↓	380.9	↑
2014	5	↓	123.7	↓
2015	3	↓	45.6	↓
2016	4	↑	101.6	↑
2017	3	↓	0.5	↓
2018	4	↑	5.6	↑
2019	5	↑	4.4	↓
2020	22	↑	19.0	↑
2021	9	↓	19.1	↑
2022	8	↓	59.6	↑
2023	31	↑	53.4	↓

Source: PA DCNR, 2024

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. In 2022 there were sixty-three prescribed burns that were carried out by the Pennsylvania Department of Conservation and Natural Resources (DCNR). This number is up by seventeen prescribed burns from the total number of reported prescribed burns in 2021 by the DCNR only, with a total of forty-six. At the time of writing this plan, data on 2023 prescribed burns by DCNR were unavailable.

McKean County utilizes a database system called WebEOC to track incidents that have occurred within the county. Data from 2020 to 2023 has been recorded for different incident types within the county. *Table 46 – Wildfire Events in McKean County* illustrates the different fire type incidents that have occurred between 2020 and 2023.

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Table 46 - Wildfire Events in McKean County

<b>Wildfire Events in McKean County</b>		
<b>Location</b>	<b>Date</b>	<b>Fire Type</b>
Port Allegany Borough	03/15/2020	Brush Fire
Liberty Township	03/15/2020	Wildfire
Annin Township	03/16/2020	Wildfire
Corydon Township	03/16/2020	Wildfire
Hamlin Township	11/10/2020	Wildfire
Eldred Borough	11/10/2022	Wildfire
Sergeant Township	04/10/2023	Wildfire
Annin Township	04/13/2023	Multiple Wildland Fire
Corydon Township	11/06/2023	Wildfire – Sugar Bay Area
Corydon Township	11/13/2023	Wildfire
Source: McKean County WebEOC™ Closed Incident Data, 2024		

#### **4.3.11.4 Future Occurrence**

Annual occurrence of urban fires and wildfires in McKean 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 and continues to experience these events in a yearly fashion. 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).

Climate change significantly influences wildfires by altering environmental conditions. Rising temperatures, prolonged droughts, and changes in precipitation patterns create drier landscapes, fostering the ignition and rapid spread of wildfires. Elevated temperatures contribute to increased evaporation, drying out vegetation and creating more fuel for fires. Altered precipitation patterns

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can lead to extended periods of drought, further desiccating ecosystems. Climate change also affects the timing and intensity of seasons, extending the fire-prone period. Additionally, warming temperatures facilitate the expansion of pests and diseases that weaken trees, making forests more susceptible to ignition.

### **4.3.11.5 Vulnerability Assessment**

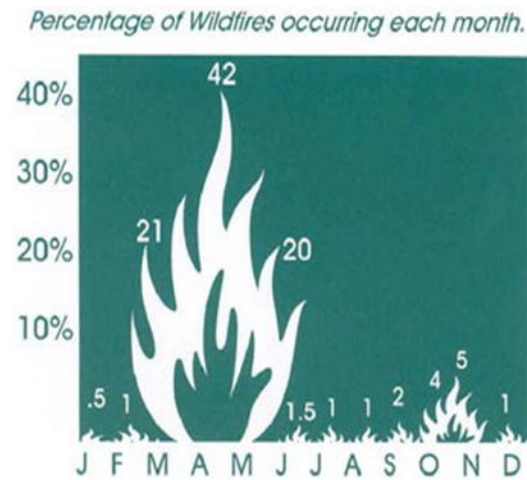
The size and impact of a wildfire depends on its location, climate conditions, and the response of firefighters. If the right conditions exist, these factors may often mitigate the effects of wildfires; however, during a drought, wildfires can be devastating. The highest risk for wildfires in Pennsylvania 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 35 – 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.

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Figure 35 - 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 36 – Wildland Urban Interface* shows the extent of McKean 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 nineteen fire departments that serve McKean County, a list of which can be seen in *Table 63* 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 McKean County. *Figure 37 – Fire Stations Locations* illustrates the position of fire stations and the location of state game lands, state forests, and natural areas within McKean 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.

As seen above in Section 4.3.11.4 climate change may increase the frequency of wildfires. With this potential increase in wildfires comes disruption of systems that humans rely upon for daily activities. The systems wildfires most heavily impact include, but are not limited to transportation, water supply, power, and communications. Wildfires can block off transportation routes directly or can impact visibility of transportation routes due to the intense smoke that can be produced and settle over roadways.

As seen in *Table 3 – Population Change in McKean County*, Ceres Township, Hamlin Township, Lewis Run Borough, Mount Jewett Borough, Port Allegany Borough, and Wetmore Township have seen a net population increase from the 2010 decennial census to the 2020 decennial census. Based on this information, it can be speculated that these municipalities may have an increased vulnerability to wildfires since 2010, due to the increase in population.

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Unserved, underserved, and socially vulnerable populations within McKean County may be at an increased vulnerability to wildfires. This is because these populations may not have access to or the ability to relocate during wildfire events. Those that are unsheltered within McKean County have an increased vulnerability to wildfire events due to being openly exposed to the elements, such as bad air quality from the smoke that wildfires produce.

McKean County promotes fishing, hunting, camping, hiking, canoeing, and other outdoor activities. These land use events can increase the risk of wildfires starting. Approximately 77% of McKean County is undeveloped forest areas, including deciduous, evergreen, mixed deciduous and evergreen, forested wetlands, and emergent wetlands. Natural areas can be extremely vulnerable to wildfires within McKean County. Ecologically, these alter landscapes, compromising soil stability and disrupting ecosystems. Conditions of drought or invasive species that could damage forested areas can lead to wildfires. Wildfires can lead to devastation which can foster landslides and flash flood events. These events can destroy the forested terrain within the county and consume acres of traditional agricultural practices in a short amount of time. In addition to the widespread burning that wildfires cause, these events also pollute the air within the county and surrounding areas, as well as waterways due to run off and the settling of the air pollution to ground level.

Some of the historic and cultural properties that are located in McKean County are at an increased vulnerability to wildfire events. The historic properties in McKean County are the Rufus Barrett Stone House, the Bradford Armory, the Bradford Old City Hall, the Kane Armory, the Thomas L. Kane Memorial Church, the Lynn Hall, and the New Thompson House. Each property is of a construction type that would be vulnerable to wildfires. The majority of the historic properties in the county are constructed out of brick and stone, with wooden interiors that would be destroyed by fires. Also, five historic places are within two miles of a fire station in McKean County. These locations are the Rufus Barrett Stone House, the Bradford Armory, the Bradford Old City Hall, the Kane Armory, the Thomas L. Kane Memorial Church, and the New Thomson House. The Lynn Hall property is farther than two miles from a fire station.

### **Municipalities with high risk due to wildfires (with areas of high-density interface or intermix):**

- Bradford City
- Bradford Township
- Eldred Borough
- Foster Township
- Kane Borough
- Keating Township

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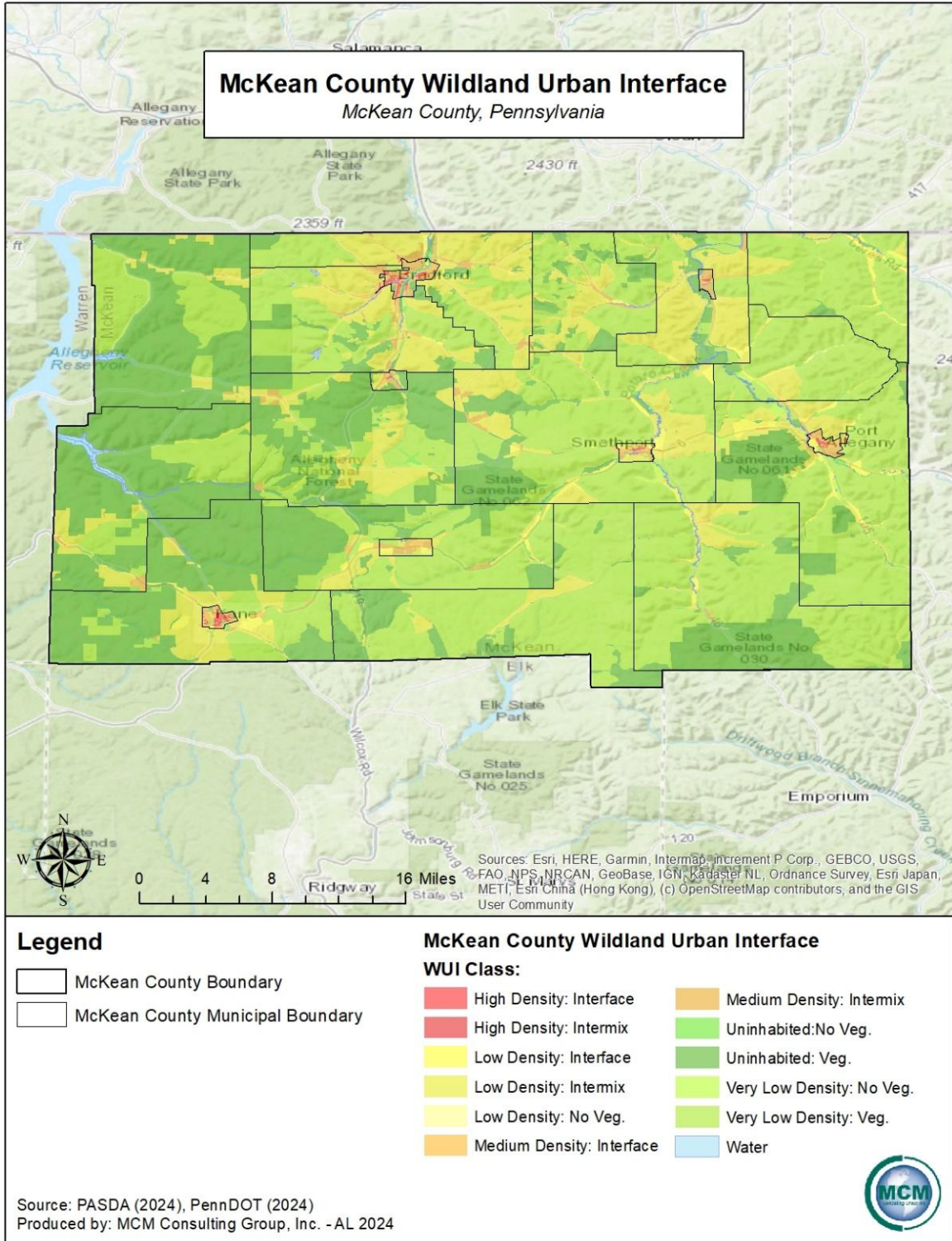
- Lafayette Township
- Lewis Run Borough
- Liberty Township
- Norwich Township
- Otto Township
- Port Allegany Borough
- Smethport Borough
- Wetmore Township

**Municipalities with lower risk due to wildfires (no areas of high-density interface or intermix):**

- Annin Township
- Ceres Township
- Corydon Township
- Eldred Township
- Hamilton Township
- Hamlin Township
- Mount Jewett Borough
- Sergeant Township

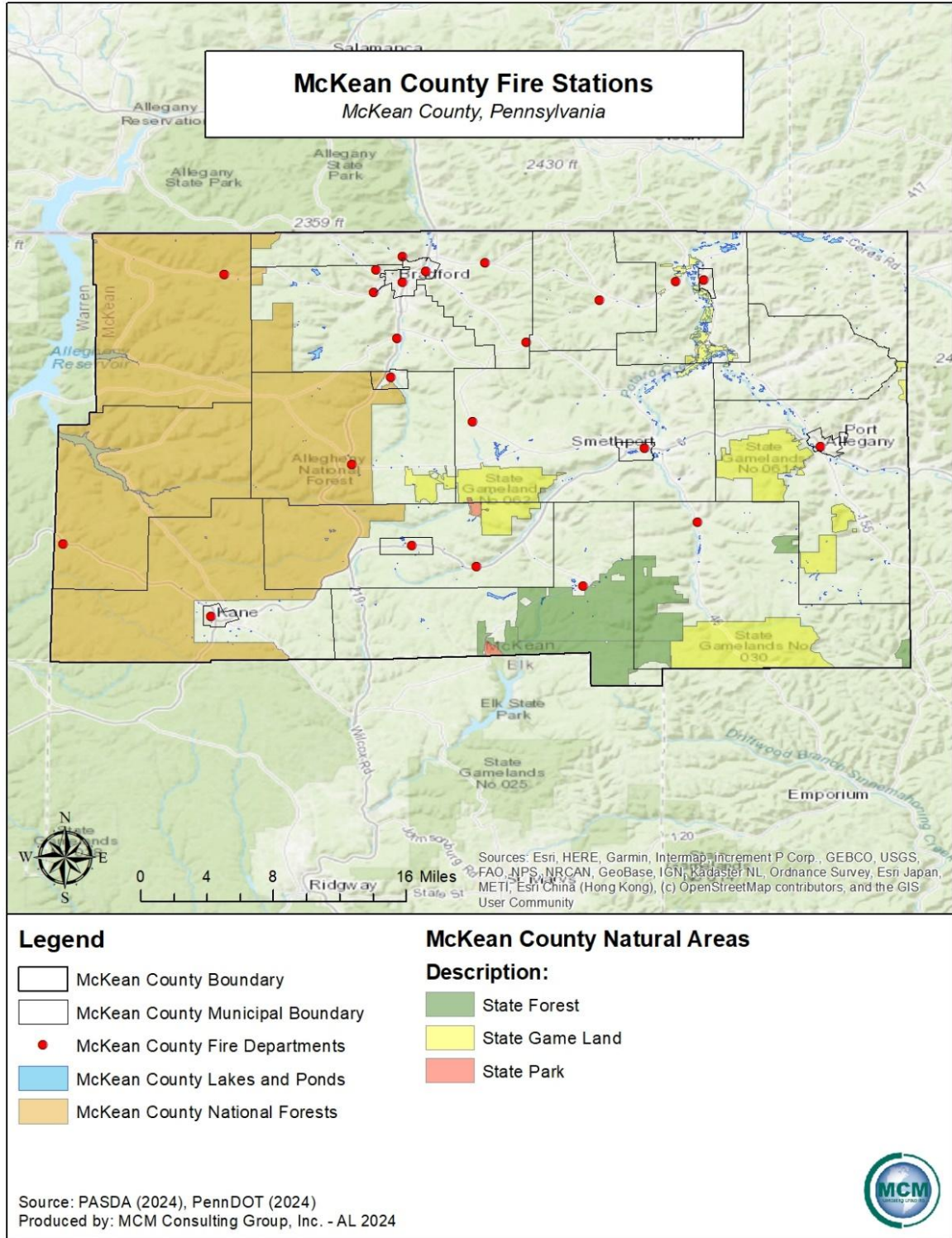
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 36 - Wildland Urban Interface



# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 37 - Fire Stations Locations



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#### **4.3.12. Winter Storms**

##### **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

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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 and 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 rankings can be seen in *Table 47 – 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 47 - NESIS Winter Storm Rankings*

<b>NESIS Winter Storm Rankings</b>			
<b>Category</b>	<b>Description</b>	<b>NESIS Range</b>	<b>Definition</b>
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 snowfalls 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).

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<b>NESIS Winter Storm Rankings</b>			
<b>Category</b>	<b>Description</b>	<b>NESIS Range</b>	<b>Definition</b>
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 <sup>2</sup> – 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 <sup>2</sup> 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. McKean County receives an average of about 55.1 inches of snowfall a year. Most areas of McKean County experience the effect 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 38 - Pennsylvania Annual Snowfall 1981 – 2010* illustrates the long-term trends for snowfall accumulation in Pennsylvania over three decades.

**4.3.12.3 Past Occurrence**

*Figure 39 – Winter Storm Events by County in Pennsylvania* shows the number of winter storm events from 1950 – 2013 for the Commonwealth of Pennsylvania. McKean County had thirty-three winter storm events, zero blizzards, four winter weather events, eleven ice storms, thirty-five heavy snow events, and six lake-effect snow events between 1950 and 2023. *Table 48 – Recent Annual Snowfall Estimates* shows recent annual snowfall measurements as stated by NOAA. Overall, McKean County has experienced a decrease in the annual estimated average

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snowfall. On average, the annual snowfall totals have decreased in the time periods from 2020 to present. A list of additional McKean County winter storms, and other related events is outlined in *Table 49 – McKean County Winter Weather History*.

*Table 48 - Recent Annual Snowfall Estimates*

<b>Recent Annual Snowfall Estimates</b>	
<b>Time Span</b>	<b>Snowfall Estimates (inches)</b>
1999-2000	28.8
2000-2001	54.7
2001-2002	25.9
2002-2003	60.8
2003-2004	62.3
2004-2005	64.5
2005-2006	46.6
2006-2007	55.3
2007-2008	58.2
2008-2009	60.9
2009-2010	39.4
2010-2011	87.6
2011-2012	23.8
2012-2013	59.5
2013-2014	48.2
2014-2015	48.6
2015-2016	19.5
2016-2017	53.2
2017-2018	54.8
2018-2019	53.0
2019-2020	46.0
2020-2021	49.3
2021-2022	47.3
2022-2023	38.4
Source: NOAA, 2023	

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Table 49 - McKean County Winter Weather History

<b>McKean County Winter Weather History</b>		
<b>Location</b>	<b>Date</b>	<b>Event Type</b>
McKean County	01/02/1996	Heavy Snow
McKean County	03/07/1996	Heavy Snow
McKean County	11/10/1996	Heavy Snow
McKean County	11/28/1996	Heavy Snow
McKean County	01/26/1997	Heavy Snow
McKean County	03/06/1997	Heavy Snow
McKean County	03/14/1997	Ice Storm
McKean County	11/14/1997	Heavy Snow
McKean County	12/07/1997	Heavy Snow
McKean County	12/10/1997	Heavy Snow
McKean County	01/15/1998	Ice Storm
McKean County	01/02/1999	Winter Storm
McKean County	01/08/1999	Winter Storm
McKean County	01/14/1999	Winter Storm
McKean County	03/14/1998	Heavy Snow
McKean County	03/04/1999	Heavy Snow
McKean County	03/06/1999	Heavy Snow
McKean County	02/13/2000	Ice Storm
McKean County	02/18/2000	Winter Storm
McKean County	11/21/2000	Heavy Snow
McKean County	12/05/2000	Heavy Snow
McKean County	12/13/2000	Winter Storm
McKean County	03/04/2001	Heavy Snow
McKean County	01/06/2002	Heavy Snow
McKean County	01/19/2002	Heavy Snow
McKean County	01/31/2002	Ice Storm
McKean County	03/24/2002	Winter Storm
McKean County	11/30/2002	Heavy Snow
McKean County	12/05/2002	Heavy Snow
McKean County	12/10/2002	Ice Storm
McKean County	12/13/2002	Heavy Snow
McKean County	12/25/2002	Heavy Snow
McKean County	01/01/2003	Ice Storm
McKean County	11/14/2003	Heavy Snow
McKean County	12/14/2003	Heavy Snow
McKean County	01/04/2004	Ice Storm
McKean County	02/03/2004	Heavy Snow
McKean County	02/06/2004	Ice Storm

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<b>McKean County Winter Weather History</b>		
<b>Location</b>	<b>Date</b>	<b>Event Type</b>
McKean County	03/16/2004	Heavy Snow
McKean County	12/14/2004	Heavy Snow
McKean County	01/05/2005	Winter Storm
McKean County	01/19/2005	Heavy Snow
McKean County	01/22/2005	Winter Storm
McKean County	02/21/2005	Winter Storm
McKean County	10/25/2005	Heavy Snow
McKean County	12/02/2005	Heavy Snow
McKean County	12/16/2005	Winter Storm
McKean County	02/05/2006	Winter Storm
McKean County	02/13/2007	Heavy Snow
McKean County	03/16/2007	Heavy Snow
McKean County	12/02/2007	Ice Storm
McKean County	12/03/2007	Lake-Effect Snow
McKean County	12/09/2007	Ice Storm
McKean County	12/13/2007	Winter Storm
McKean County	12/15/2007	Winter Storm
McKean County	02/01/2008	Winter Storm
McKean County	02/26/2008	Winter Storm
McKean County	03/04/2008	Ice Storm
McKean County	11/20/2008	Lake-Effect Snow
McKean County	12/19/2008	Winter Storm
McKean County	01/07/2009	Lake-Effect Snow
McKean County	01/10/2009	Winter Storm
McKean County	01/27/2009	Winter Storm
McKean County	10/15/2009	Winter Storm
McKean County	02/25/2010	Winter Storm
McKean County	12/05/2010	Lake-Effect Snow
McKean County	12/13/2010	Lake-Effect Snow
McKean County	02/01/2011	Winter Storm
McKean County	02/20/2011	Heavy Snow
McKean County	04/22/2012	Heavy Snow
McKean County	12/26/2012	Winter Storm
McKean County	11/26/2013	Winter Storm
McKean County	12/14/2013	Heavy Snow
McKean County	01/02/2014	Heavy Snow
McKean County	02/01/2015	Winter Storm
McKean County	12/29/2016	Lake-Effect Snow
McKean County	01/12/2018	Winter Storm

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McKean County Winter Weather History		
Location	Date	Event Type
McKean County	03/01/2018	Winter Storm
McKean County	11/15/2018	Winter Storm
McKean County	01/19/2019	Winter Storm
McKean County	12/16/2020	Winter Storm
McKean County	02/15/2021	Winter Storm
McKean County	01/09/2022	Winter Weather
McKean County	01/16/2022	Winter Storm
McKean County	02/03/2022	Winter Storm
McKean County	11/17/2022	Winter Weather
McKean County	11/17/2022	Winter Weather
McKean County	12/15/2022	Winter Weather
McKean County	03/06/2023	Winter Storm
Source: NOAA NCEI, 2023		

#### **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.

Climate change could increase the intensity of winter storms in the northeastern United States and McKean County, Pennsylvania. With warmer air temperatures, more moisture will be held in the air, and if the temperatures on the ground are below freezing, this could result in more snow falling during a weather event like a winter storm. These events may become less frequent as the climate warms, but they could be more intense.

#### **4.3.12.5 Vulnerability Assessment**

Severe winter storms are of significant concern to McKean 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

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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-drive 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. Bridges and overpasses are particularly dangerous because they freeze before other transportation surfaces. For the purposes of this Hazard Mitigation Plan, the entire population of McKean County (40,459 as of the ACS 2022 estimate) 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 51 – Utility Outages in McKean 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 McKean 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.

The table below illustrates the number of citizens per municipality under the age of five or over the age of sixty-five years of age who are at an increased vulnerability to winter storms, and cascading hazards from winter storms:

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Table 50 - Population per Municipality under 5 Years or 65 Years or Older

<b>Population per Municipality under 5 Years or 65 Years or Older</b>				
<b>Municipality</b>	<b>Number of People under 5 years of age</b>	<b>Percent of Population</b>	<b>Number of People 65 years or older</b>	<b>Percent of Population</b>
Annin Township	30	4.0%	144	19.40%
Bradford City	448	5.70%	1,227	15.60%
Bradford Township	143	3.00%	1,018	21.40%
Ceres Township	73	6.80%	213	19.80%
Corydon Township	5	1.80%	103	36.50%
Eldred Borough	14	3.40%	148	35.70%
Eldred Township	56	3.80%	365	24.50%
Foster Township	175	4.30%	705	17.50%
Hamilton Township	21	5.60%	115	30.70%
Hamlin Township	18	2.40%	279	36.80%
Kane Borough	213	5.90%	801	22.20%
Keating Township	101	3.70%	653	23.90%
Lafayette Township	9	0.50%	157	9.10%
Lewis Run Borough	43	6.20%	109	15.80%
Liberty Township	90	6.40%	305	21.60%
Mount Jewett Borough	56	8.30%	121	17.90%
Norwich Township	23	4.20%	92	16.60%
Otto Township	37	2.60%	390	27.70%
Port Allegany Borough	179	7.90%	342	15.20%
Sergeant Township	4	4.30%	34	36.20%
Smethport Borough	85	5.50%	347	22.30%
Wetmore Township	64	3.20%	431	21.90%
Source: United States Census Bureau (USCB), American Community Survey (ACS), 2024				

Approximately 4.7% of the total population of McKean County is under the age of five years old and approximately 20.0% of the total population is sixty-years old or older. In total, 24.7% of the population is at an increased risk from exposure to winter storm events and cascading hazards.

Table 51 - Utility Outages in McKean County in Winter

<b>Utility Outages in McKean County in Winter</b>		
<b>Location</b>	<b>Date</b>	<b>Event</b>
12/21/2018	Power Outage	Smethport Borough
12/23/2018	Water Main Break	McKean County
01/08/2019	Power Outage Transformer Fires	Bradford Township
01/14/2019	Water Break	Bradford City

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<b>Utility Outages in McKean County in Winter</b>		
<b>Location</b>	<b>Date</b>	<b>Event</b>
02/04/2019	PSAP Outages	McKean County
02/24/2019	Power Outages – High Winds	McKean County
12/05/2019	Boil Water Advisory	Bradford City
01/05/2020	Bradford City Water Leak	Bradford City
01/18/2020	MVA/Lines Down	McKean County
02/28/2020	CAD Outage	McKean County
12/01/2020	Power Outage	Hamlin Township
02/05/2021	Low Hanging Wire	Eldred Township
02/18/2022	Radio Outage	McKean County
12/10/2023	Emergency Center Power Outage	Smethport Borough
12/28/2023	Power Outage	Bradford City
Source: McKean County WebEOC™, 2024		

The entire general building stock inventory in McKean County is exposed and vulnerable to the severe winter storm hazard. In general, structural impacts include damage to roof and building frames, rather than building content. There was no historical information available that identified property damage within McKean County due to a single severe winter storm event. Current modeling tools are not available to estimate specific losses for this hazard. All of the historic and cultural properties in McKean County are at similar vulnerability to severe winter storms. The properties include, but are not limited to, the Rufus Barrett Stone House, the Bradford Armory, the Bradford Old City Hall, the Kane Armory, the Thomas L. Kane Memorial Church, the Lynn Hall, and the New Thompson House. The cultural aspects of McKean County, including all seven museums, are also at an increased vulnerability to winter storms. These museums are the McKean County Historical Society, the Eldred World War II Museum, the Zippo/Case Museum & Flagship Store, the Marilyn Horne Museum and Exhibit Center, the Penn-Brad Oil Museum, the Kane Historic Preservation Society and Museum, and the Old Jail Museum. These museums are located in Smethport, Eldred, Bradford, Custer City, and Kane.

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 present in the flood profile due to snow and ice melt. Generally, losses from flooding associated with severe winter storms should be less than those 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

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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, McKean County is generally well-prepared for snow and ice removal each season.

Winter storm vulnerability is going to increase in McKean County when climate change is considered. As mentioned above in Section 4.3.12.4, climate change is expected to increase the intensity of winter storms. With warmer air temperatures, more moisture will be held in the air, and if temperatures on the ground rapidly decrease, or fall below freezing, this could result in more snow falling during a weather event like a winter storm. These events may become less frequent as the global temperatures increase, but they could become more intense.

As seen in *Table 3 – Population Change in McKean County*, Ceres Township, Hamlin Township, Lewis Run Borough, Mount Jewett Borough, Port Allegany Borough, and Wetmore Township have seen a net population increase from the 2010 decennial census to the 2020 decennial census. The impact that a winter storm can have on these municipalities will vary. Municipalities with an increase in population could have more resources available as well as personnel to mitigate the impacts that a winter storm can bring to one's community. A municipality that experienced a population decrease may not have these resources or personnel available to prepare for and mitigate against an impending winter storm. Adversely, municipalities with an increase in population could experience a more significant impact simply because they have more individuals being impacted compared to a smaller municipality. All municipalities within McKean County are at the same level of risk to winter storms, but the direct and indirect impacts and vulnerability will vary by municipality.

Vulnerable, or underserved, populations within McKean 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 the highest vulnerability to winter storm events. Individuals who are also in poverty, based on information provided in the United States Census are more likely to have issues meeting economic requirements for utility bills in the winter as well. All of these populations can be considered socially vulnerable or communities that have unmet needs.

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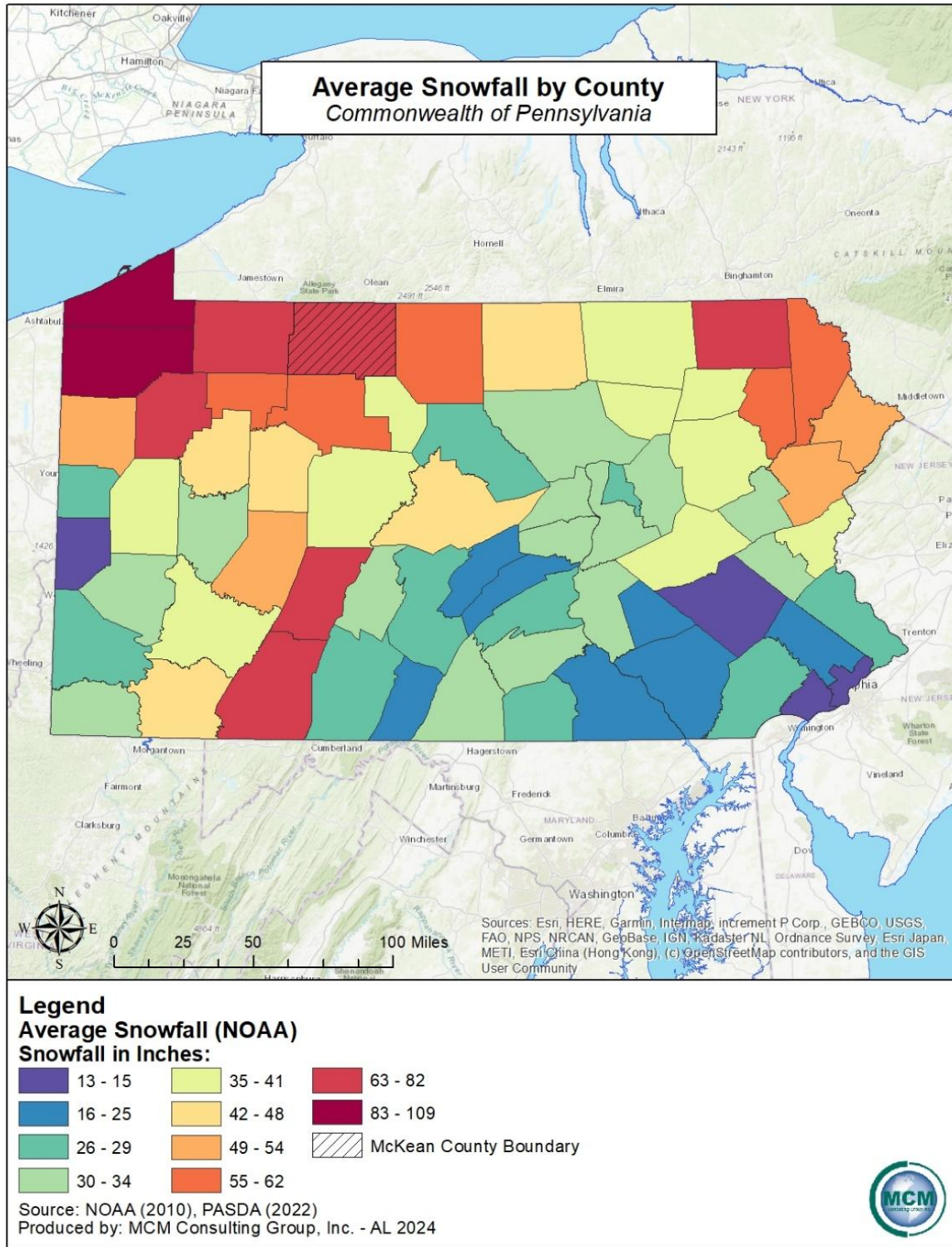
Land use and major developments will have negligible impacts on the vulnerability of McKean County to winter storm events. Land use may impact the response capabilities of McKean County in a winter storm event, but changes in that land use will not increase the vulnerability. McKean County has significant capabilities to respond to winter storm events. Major development in the county will need to be planned to allow for winter storm response, including size and makeup of transportation routes, and location of snow removal areas.

Winter storms may also negatively impact the natural resources in McKean County. According to the Pennsylvania Department of Transportation, 446,991 tons of salt were used in the commonwealth, including McKean County, during the 2022 through 2023 winter storm weather season. Although the use of salt and other anti-skid materials protect life safety by improving roadway conditions, there can also be unintended consequences. When salt used on roadways permeates the surrounding soil, it can infiltrate groundwater and contaminate wells. Hence, any groundwater sources near roadways, in McKean County, may be vulnerable to degradation.

Roadway salt can also pose a risk to freshwater aquatic life near to the routes of transportation treated with the minerals. Salt that makes its way into soil or freshwater becomes a persistent hazard, damaging plants and wildlife that are not adapted to coexist with high salinity. Its persistent nature is due to a lack of any known biological system that can remove it from the environment in which it exists. Although it may be diluted with water, such a treatment would not be sufficient in isolation, and some intervention would likely be necessary to extract the salt from the environment which it pollutes.

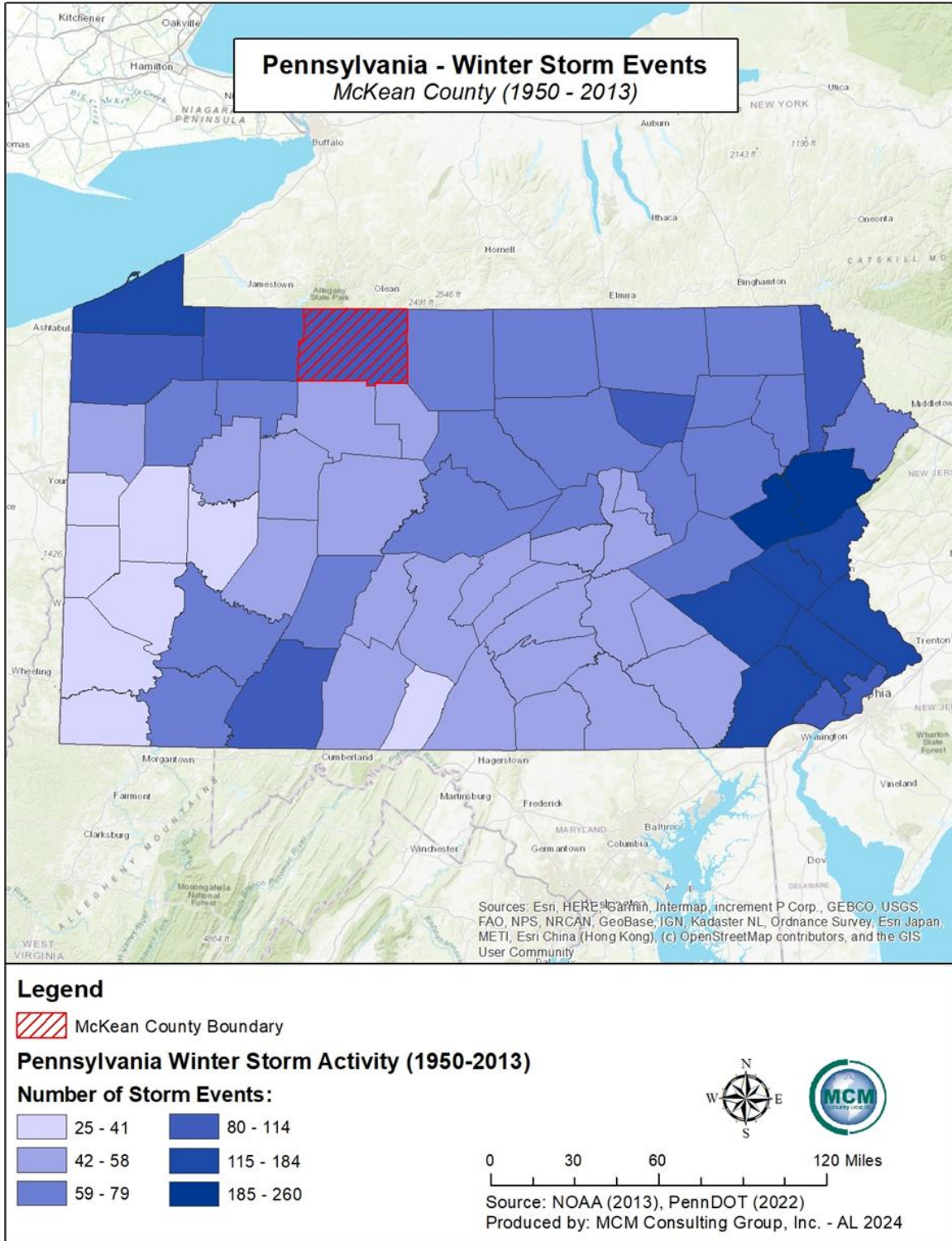
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Figure 38 - Pennsylvania Annual Snowfall 1981 – 2010



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Figure 39 - Winter Storm Events by County in Pennsylvania



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#### **4.3.13. Building/Structural Collapse/Blighted Properties**

##### **4.3.13.1 Location and Extent**

The presence of blighted properties in McKean County is a nuisance for both residents and visitors to the county on a year-round basis. Blighted properties include areas of the county where the infrastructure is damaged and aging beyond occupation, habitation, and/or commercial use.

Blighted properties are described by the Pennsylvania State Statute 1945 Act 385 as:

1. Any premises which because of physical condition or use is regarded as a public nuisance at common law or has been declared a public in accordance with the local housing, building, plumbing, fire, and related codes.
2. Any premises which because of physical condition, use, or occupancy is considered an attractive nuisance to children, including but not limited to abandoned wells, shafts, basements, excavations, and unsafe fences or structures.
3. Any dwelling which because it is dilapidated, unsanitary, unsafe, vermin-infested, or lacking in the facilities and equipment required by the housing code of the municipality, has been designated by the department responsible for enforcement of the code as unfit for human habitation.
4. Any structure which is a fire hazard or is otherwise dangerous to the safety of persons or property.
5. Any structure from which the utilities, plumbing, heating, sewage, or other facilities have been disconnected, destroyed, removed, or rendered ineffective so that the property is unfit for its intended use.
6. Any vacant or unimproved lot or parcel of ground in a predominantly built-up neighborhood, which by reason neglect or lack of maintenance has become a place for the accumulation of trash or debris, or a haven for rodents or other vermin.
7. Any unoccupied property which has been tax delinquent for a period of two years prior to the effective date of Pennsylvania State Statute 1945 Act 385 or local municipality regulations and those in the future having a two-year tax delinquency.
8. Any property which is vacant but not tax delinquent, which has not been rehabilitated within one year of the receipt of notice to rehabilitate from the appropriate code enforcement agency.
9. Any abandoned property

##### **4.3.13.2 Range of Magnitude**

McKean County has a large number of blighted properties that are located in urban environments, including Bradford City and Bradford Township. Most of the blighted properties

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in McKean County are unsecured and highly unsafe due to one or more of the following issues: structure rot, infestation from vermin including but not limited to rats, mice, and insects, and occupation by squatters. These properties can create a risk for the county because they are unsafe for occupation and future construction.

### **4.3.13.3 Past Occurrence**

The number of blighted properties in McKean County has increased in recent years. Although some properties that are considered to be blighted in McKean County have been demolished by the county itself. With recent market trends in real estate, a large number of vacant buildings in McKean County are sold prior to them being blighted.

### **4.3.13.4 Future Occurrence**

Blighted properties in McKean County will continue to increase unless blighted property procedures are put into practice at the county and local levels. With the requisite policies put into place the number of blighted properties in McKean County is liable to decrease.

### **4.3.13.5 Vulnerability Assessment**

Blighted properties are a significant concern when the health and safety of the citizens of McKean County are impacted. Blighted properties, while being an eye sore, are also a threat to the health and safety of individuals. Buildings that are blighted often can be unsafe due to building materials exposed to the environment or to unintentional consumption by humans. Buildings that have utilized asbestos in construction can become a major health hazard if the building is not maintained, the asbestos exposed, and people breath in those particles because the property has become abandoned and blighted. Another large health issue is mold in blighted properties and buildings. After a property becomes blighted, the functional systems that prevent mold from growing and spreading are often rendered useless, thus facilitating the growth of harmful mold and fungi that pose a threat to human health.

Just as blighted properties can adversely affect the health and safety of humans, it can also hurt the environment of an area. The leaching of building materials from an open or fallen property into water features, such as streams and creeks, can damage the wildlife in a water feature and hurt the public supply of drinking water. As mentioned above, asbestos is a large concern if the blighted property is of older construction. Also, potential chemicals from a blighted property, like paints and oils, can make their way into water tables, streams, and creeks, thus polluting the water features.

Blighted properties also offer shelter for animals and vermin that may not be able to find a home, and an area for breeding in the wild. This can result in the spread of rats and other pests in an area with a large concentration of blighted properties. Along with the accumulation of pests like

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rats, there is also a high chance of that area also attracting vermin like cockroaches. The increase in vermin can also pose a threat to human health, as vermin and pests can carry diseases which can be contracted due to close contact.

Blight can also adversely affect the infrastructure and its ability to function if the blighted properties in McKean County are adjacent to or near critical facilities and functional needs facilities. If a blighted property abuts a critical facility, it may be best for that structure to be torn down so that potential negative effects from the blighted property do not cause damage or limit the function of the critical facility.

Finally, blighted properties can be a problem for tourism and attracting new residents to McKean County. If blighted properties flourish in the county, people who travel to McKean County for pleasure, whether that be for summer vacations or seasonal hunting, might reconsider that travel due to the presence of blighted properties.

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#### **4.3.14. Civil Disturbance**

##### **4.3.14.1 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.

##### **4.3.14.2 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 be aroused 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

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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.

McKean County's greatest likelihood for civil disturbance is in Smethport Borough, the county seat. 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. McKean County is home to two university and post-secondary education centers: University of Pittsburgh at Bradford and Northern PA Regional College.

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### 4.3.14.3 Past Occurrences

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. A Proclamation of Disaster Emergency was established by the Governor’s Office for the entire Commonwealth of Pennsylvania on April 15, 2021. This gave the Pennsylvania Emergency Management Agency Director command and control of statewide emergency operations and directed all agencies and departments to utilize all resources and personnel to cope with the magnitude and severity of the event.

### 4.3.14.4 Future Occurrence

While unlikely, civil disturbances may occur in McKean County, and it is difficult to accurately predict the probability of future occurrence for civil disturbance events over the long-term. However, *Table 52 - Civil Disturbance Events Reported to PEMA 2018-2023*, depicts the range of potential civil disturbances in Pennsylvania and gives the county some background for consideration of future occurrences.

*Table 52 - Civil Disturbance Events Reported to PEMA 2018-2023*

<b>Table 4.3.18-4 Civil Disturbance Events Reported to PEMA-KC, 2018- 2023 (PEMA, 2023).</b>						
EVENT TYPE	2018	2019	2020	2021	2022	2023*
Demonstration	4	2	35	14	10	1
Juvenile Detention Center	7	0	0	0	0	0
Prison Disturbance	0	1	5	3	2	0
Detainee Escape	0	0	0	0	0	0
Protest	8	17	172	42	16	7
Large gathering	8	4	16	3	7	1
Riot	0	0	4	0	1	0
School Threat	0	0	0	0	0	0
Assault	0	0	0	0	0	0
Gun/Bomb Incident	0	0	0	0	0	0
Work Stoppage	0	0	0	0	2	0
Other	1	13	28	29	13	1
<b>Civil Disorder - totals</b>	<b>28</b>	<b>37</b>	<b>260</b>	<b>101</b>	<b>51</b>	<b>10</b>

*\*Events totaled through April 2023*

According to the Pennsylvania State Hazard Mitigation Plan, from 2018 to 2023, the commonwealth experienced an average of eighty-one civil disturbance events each year. While

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that number is relatively low and the occurrences in McKean County are rare, the local planning team (LPT) decided civil disturbance should be regarded as a low-risk hazard due to the current political trends and frictions across the country.

### **4.3.14.5 Vulnerability Assessment**

Climate change has the potential to increase McKean County's vulnerability to civil disturbances, and disturbance events. Intense weather events and weather patterns can lead to riots and civil disturbance in areas that are directly impacted. For example, an extreme heat or drought event, that could become more common from climate change, could cause residents to seek water and resources, and create a conflict from increased competition for resources.

All municipalities in McKean 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.

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#### **4.3.15. Dam Failure**

##### **4.3.15.1 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 six high-hazard and low-hazard dams in McKean County that are both publicly and privately owned and are registered with the USACE in the NID. There is also one dam with a hazard classification as significant. There are four dams within the county that are high-hazard and require an emergency action plan. *Table 54 – McKean County Dam Inventory*

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illustrates the dams located in McKean County. *Table 53 – High-Hazard Dams Municipal Summary* summarizes the high-hazard dams in McKean County by municipality. The municipalities not listed do not have high-hazard dams.

*Table 53 - High-Hazard Dams Municipality Summary*

<b>High-Hazard Dams – Municipal Summary</b>	
<b>Municipality</b>	<b>Number of High-Hazard Dams</b>
Bradford Township	3
Smethport Borough	1
<b>Total:</b>	<b>4</b>
Source: NID, 2024	

*Table 54 - McKean County Dam Inventory*

<b>McKean County Dams</b>							
<b>Dam Name</b>	<b>River</b>	<b>Owner Name</b>	<b>Year Completed</b>	<b>Dam Height (feet)</b>	<b>Drainage Area (acres)</b>	<b>Hazard</b>	<b>EAP</b>
Bradford City No. 2	Gilbert Run	Bradford City Water Authority	1886	44	4.49	H	Y
Bradford City No. 3	Marilla Brook	Bradford City Water Authority	1898	47	4.8	H	Y
Bradford City No. 5	West Branch Tunungwant Creek	Bradford City Water Authority	1957	68	6.6	H	Y
Clark	Warner Brook	Albert Clark	1966	16	0.388	L	NR
Elk Lick Scout Reservation	TR South Branch Cole Creek	Allegheny Highlands Council, BSA	N/A	12.5	1.42	S	Y
Hamlin State Park	Marvin Creek	Borough of Smethport	1915	10	56.7	H	Y
Resting Waters GSC	Rocky Run	Resting Waters Girl Scout	1977	14	0.08	L	NR
Source: NID, 2024							

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

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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. McKean County is home to four levee sections, which are detailed in *Table 55 – McKean County Levee Inventory*.

*Table 55 - McKean County Levee Inventory*

<b>McKean County Levee Inventory</b>				
<b>Levee Name</b>	<b>Flood Source</b>	<b>Levee Type</b>	<b>Levee Bank Side</b>	<b>Levee Length (miles)</b>
Bradford Channel	Bolivar Run, West Branch, Tunungwant Creek	N/A	N/A	6.92265
Eldred	Allegheny River, Barden Brook	Earthen	Right	1.583748
Lillibridge	Allegheny River, Lillibridge Creek	Earthen	Right	0.361632
Oswayo Creek	Oswayo Creek	N/A	Left	1.18966
Source: National Levee Database, 2024				

### **4.3.15.2 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 40 – McKean County Dams* shows the location of dams within McKean County as well as their hazard designation.

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### **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 41 – McKean County Levee Locations* illustrates areas protected by the McKean County levee systems. The figures following *Figure 41 – McKean County Levee Locations* illustrate areas around the City of Bradford, Eldred Borough, Port Allegany Borough, and Ceres Township that are heavily protected by levees. They are *Figure 42 – McKean County Levee Locations – City of Bradford*, *Figure 43 – McKean County Levee Locations – Eldred Borough*, *Figure 44 – McKean County Levee Locations – Port Allegany Borough*, and *Figure 45 – McKean County Levee Locations – Ceres Township*.

A Levee failure or 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.

#### **4.3.15.3 Past Occurrence**

##### **Dams**

There have been no past occurrences of dam failure or major incidence occurring at the locations of dams within McKean County. Smaller incidents 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.

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#### **Levees**

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

#### **4.3.15.4 Future Occurrence**

##### **Dams**

Although dam failures can occur at any time, given the right circumstances, the likelihood of a dam failure in McKean 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 McKean 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.

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### 4.3.15.5 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 56 – 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 56 - Dam Classification*

<b>Dam Classification (PA Code 1980)</b>		
<b>Dam Size Classification</b>		
<b>Class</b>	<b>Impoundment Storage (Acre-Feet)</b>	<b>Dam Height (Feet)</b>
<b>A</b>	Equal to or greater than 50,000	Equal to or greater than 100
<b>B</b>	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
<b>C</b>	Equal to or less than 1,000	Equal to or less than 40
<b>Dam Damage Classification</b>		
<b>Category</b>	<b>Loss of Life</b>	<b>Economic Loss</b>
<b>1</b>	Substantial	Excessive
<b>2</b>	Few	Appreciable
<b>3</b>	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

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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 four high-hazard dams in McKean County vary greatly. The Hamlin State Park Dam, located in the borough of Smethport, has the largest drainage area with a total of 56.7 acres. The dams that were constructed most recently are the Bradford City No. 5 Dam, which was constructed in 1957, and the Hamlin State Park Dam, which was constructed in 1915. The dam that is the oldest in the county is Bradford City No. 2 Dam, which was constructed in 1886. The Bradford City No. 5 Dam is the tallest in the county with a height of 68 feet. The Bradford City Water Authority owns the most dams in McKean County with a total of three dams. These dams are Bradford City No. 2 Dam, Bradford City No. 3 Dam, and the Bradford City No. 5 Dam. The dams in McKean County are owned by a mix of public and private owners and vary in almost every aspect. The county dams are distributed relatively evenly throughout the county and municipalities, with an even mix of high and low hazard dams in the municipalities.

The failure or partial failure of a High-Hazard Potential Dam can have impacts that affect many different jurisdictions across McKean County and counties adjacent to McKean County. A failure at any of the dams in McKean 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 McKean 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 facility locations like medical facilities, power and energy facilities, and schools, nursing homes, and senior care and long-term care facilities.

McKean 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 in *Table 57 – High-Hazard Potential Dams Risk Type*:

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Table 57 - 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.
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 McKean 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).

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The risk of high-hazard potential dams in McKean 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.

Specifically, vector GIS boundary data for dam inundation areas would allow for more comprehensive damage overlays and damage analysis. Vector GIS information would allow for inundation areas to be mapped along with community lifeline facilities and critical facilities to see what specific facilities could be impacted by a failure at a high-hazard potential dam, including type and use of those facilities impacted. This inundation data could also lead to greater analysis on the construction type of the buildings impacted, including what materials are used for building and what the physical characteristics of the buildings are made of that may be impacted. While useful for vulnerability assessment, these datasets would have to be carefully regulated in regard to access to ensure that no unauthorized individuals or organizations have the ability to see or use the data. Dam inundation maps could also be used if GIS boundary data is not available or able to be released.

Once these datasets have been published and inundation data is easier to acquire, this information will be used to develop more detailed risk assessments and vulnerability assessments for dam failure at the high-hazard potential dams. Continued collaboration with state and federal partners will occur to ensure that any data created or made available is utilized for vulnerability assessment for high-hazard potential dams.

Although there are data limitations to take into account in regard to high-hazard potential dams in McKean County, some open source, nationally available data can be integrated into this vulnerability assessment. One of those tools is the Resilience Analysis and Planning Tool (RAPT), administered by FEMA. This tool can overlay areas of interest around certain features to determine what types of populations are within certain distances of those features. In the table below, a 2-mile distance was calculated around each high-hazard dam in McKean County. Those locations were then used to determine how many people or households are vulnerable to a dam failure based strictly on distance. Some of the indicators used for this analysis were total population, households with vehicles, households with limited English and housing units that are mobile homes. However, it is important to note that certain data in this set was corrected, as local level knowledge indicated that certain locations indicated as vulnerable are not, given their current location.

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Table 58 - High-Hazard Dam Vulnerability Data

<b>High-Hazard Dam Vulnerability Data</b>				
<b>Dam</b>	<b>Total Population</b>	<b>Households without a vehicle</b>	<b>Households with limited English</b>	<b>Housing units that are mobile homes</b>
Bradford City No. 2	920	43	1	37
Bradford City No. 3	751	32	2	30
Bradford City No. 5	490	18	3	19
Hamlin Lake Park	308	19	0	53
<b>Total</b>	<b>2,469</b>	<b>112</b>	<b>6</b>	<b>139</b>

Source: RAPT, ACS, 2017-2021, Table B08201, Table S1602, and Table DP04

An analysis was also conducted for high priority infrastructure within 2-miles of high-hazard dams in McKean County. There were no law enforcement locations within 2 miles of the dams. The information in the table below illustrates which infrastructure was located in that vulnerability zone.

Table 59 - High-Hazard Dam Vulnerability Data - Infrastructure

<b>High-Hazard Dam Vulnerability Data – Infrastructure</b>				
<b>Dam</b>	<b>Hospitals</b>	<b>Nursing Homes</b>	<b>Fire Stations</b>	<b>Public Schools</b>
Bradford City No. 2	0	0	0	0
Bradford City No. 3	0	0	0	0
Bradford City No. 5	0	0	0	0
Hamlin Lake Park	0	2	1	2

Source: RAPT, Homeland Infrastructure Foundation-Level Data, 2024

The table below provides more information on infrastructure within 2 miles of high-hazard dams.

Table 60 - High-Hazard Dam Vulnerability Data - Infrastructure Names

<b>High-Hazard Dam Vulnerability Data – Infrastructure Names</b>	
<b>Dam</b>	<b>Infrastructure Details</b>
Bradford City No. 2	N/A
Bradford City No. 3	N/A
Bradford City No. 5	N/A
Hamlin Lake Park	Fire Stations: 1. Smethport Fire Department Public Schools: 1. Smethport Area Elementary School

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

High-Hazard Dam Vulnerability Data – Infrastructure Names	
Dam	Infrastructure Details
	2. Smethport Area Junior/Senior High School
Source: RAPT, Homeland Infrastructure Foundation-Level Data, 2024	

### Levees

Each levee that is located in McKean County is of different length and each protects areas from a different section of waterway and flood way. The Bradford Channel levee is the largest in McKean County with a length of 6.92 miles. The Lillibridge levee is the smallest in length in McKean County with a length of 0.362 miles each.

The entire leveed areas for McKean County protect a total of 1,211 structures within the county. Also protected are eleven facility points with McKean County that includes community lifeline facilities (municipal buildings, hospitals, police/fire/EMS, schools, childcare centers, and nursing/care homes) facilities. Each levee in McKean County is a mainline levee and protects along a variety land features. A failure of levee in the urban areas in McKean County would be catastrophic to life and property.

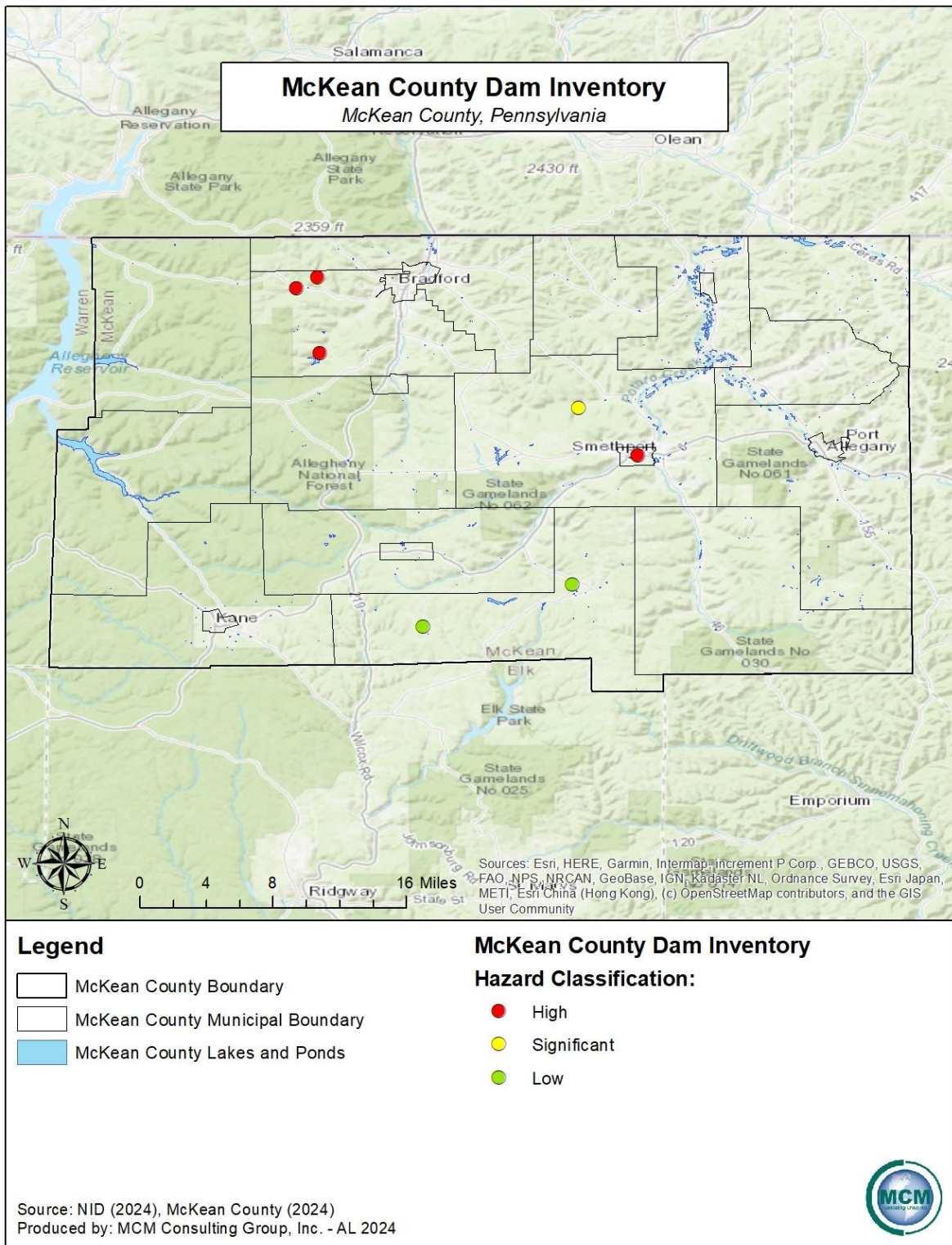
There are a high number of community lifeline facilities within the levee protection areas for the levees around McKean County. *Table 61 – Number of Vulnerable Structures within Leveed Areas* shows the number of addressable structures and facility type points in the largest levee protection areas within McKean County based on NLD information from 2024. 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 61 - Number of Vulnerable Structure within Leveed Areas*

Number of Vulnerable Structures within Leveed Areas		
Leveed Area Name	Addressable Structures in Leveed Area	Facility Type Points in Leveed Area
Bradford Channel	978	8
Eldred	186	3
Lillibridge	13	0
Oswayo Creek	34	0
<b>Totals:</b>	<b>1,211</b>	<b>11</b>

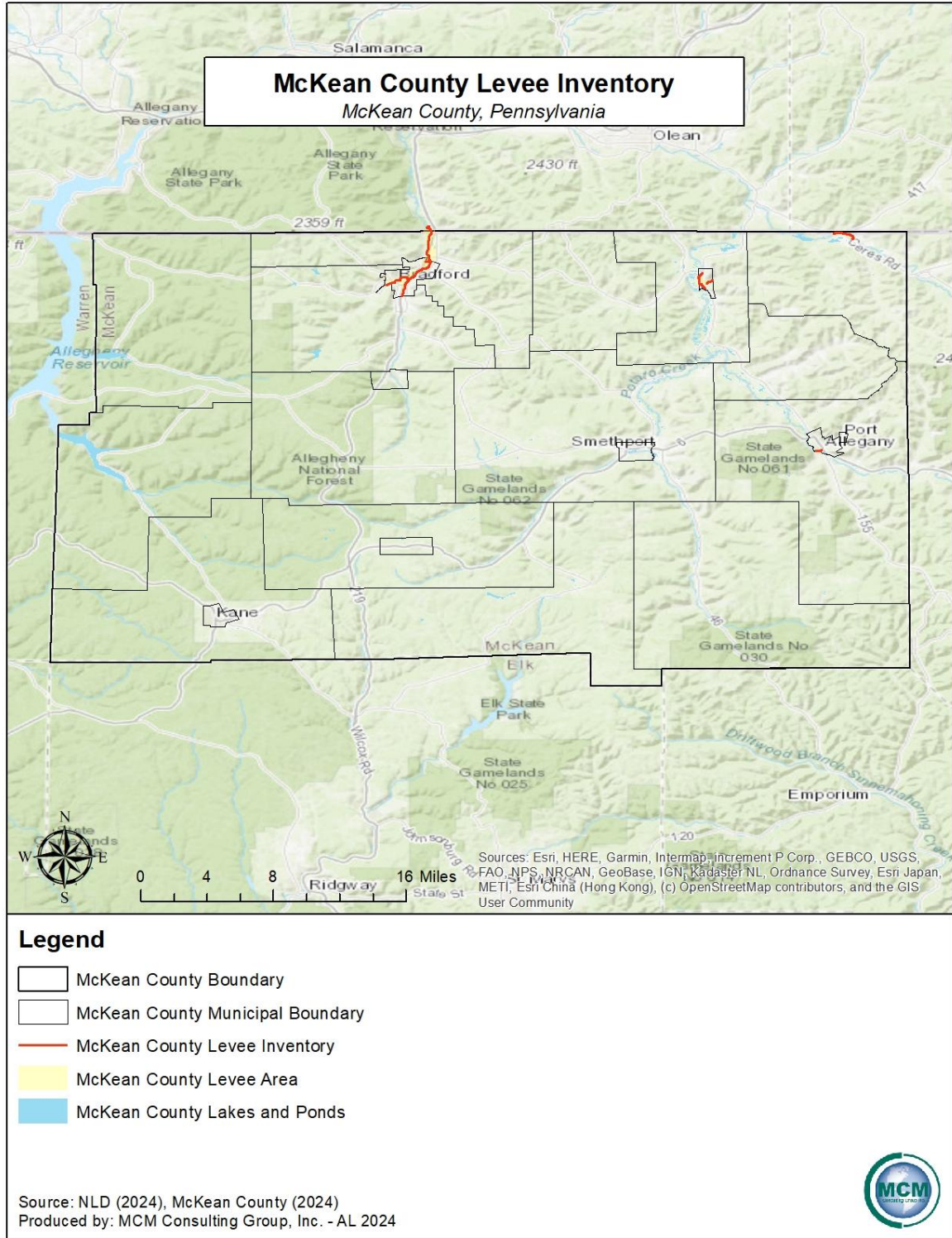
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 40 - McKean County Dams



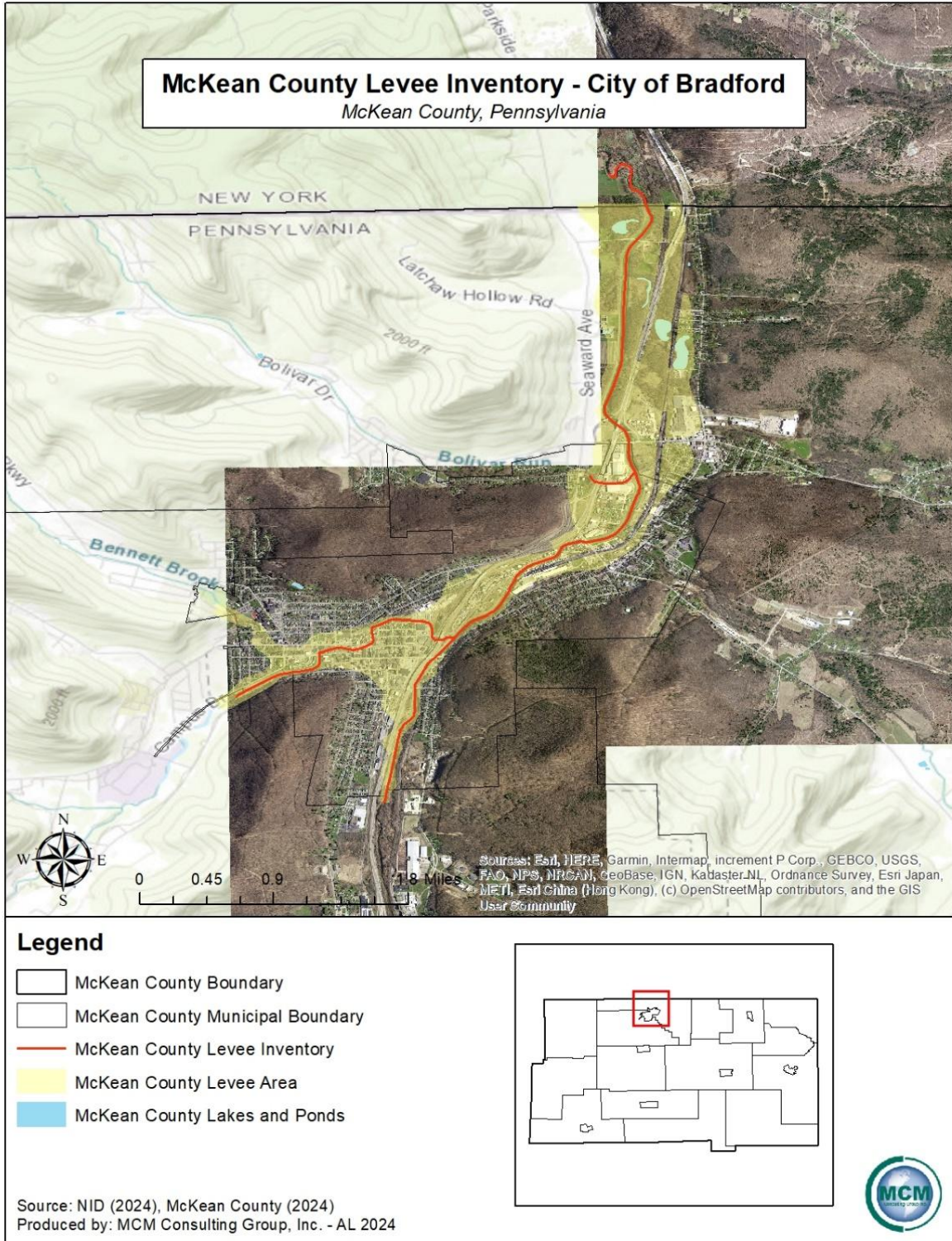
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 41 - McKean County Levee Locations



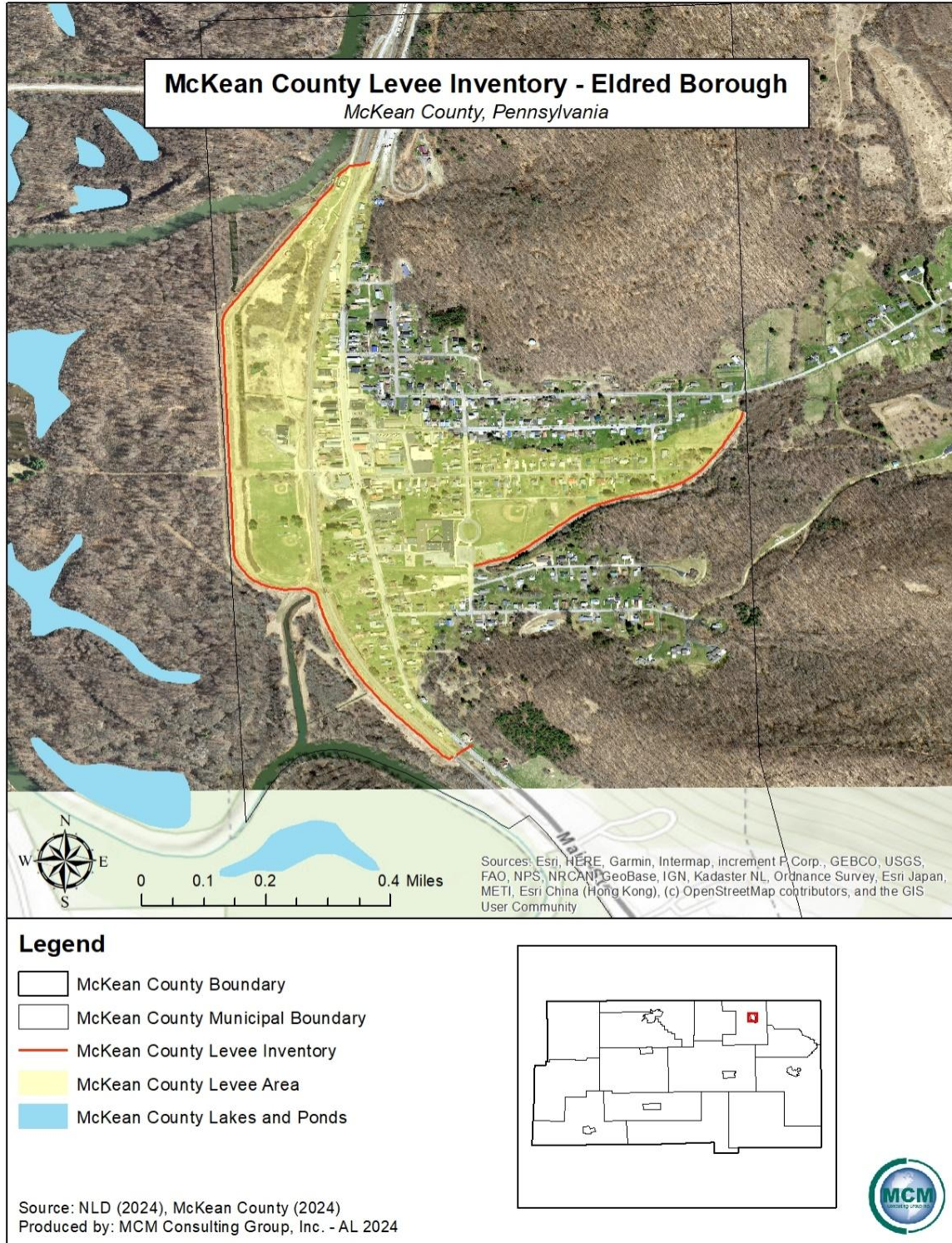
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 42 - McKean County Levee Locations – City of Bradford



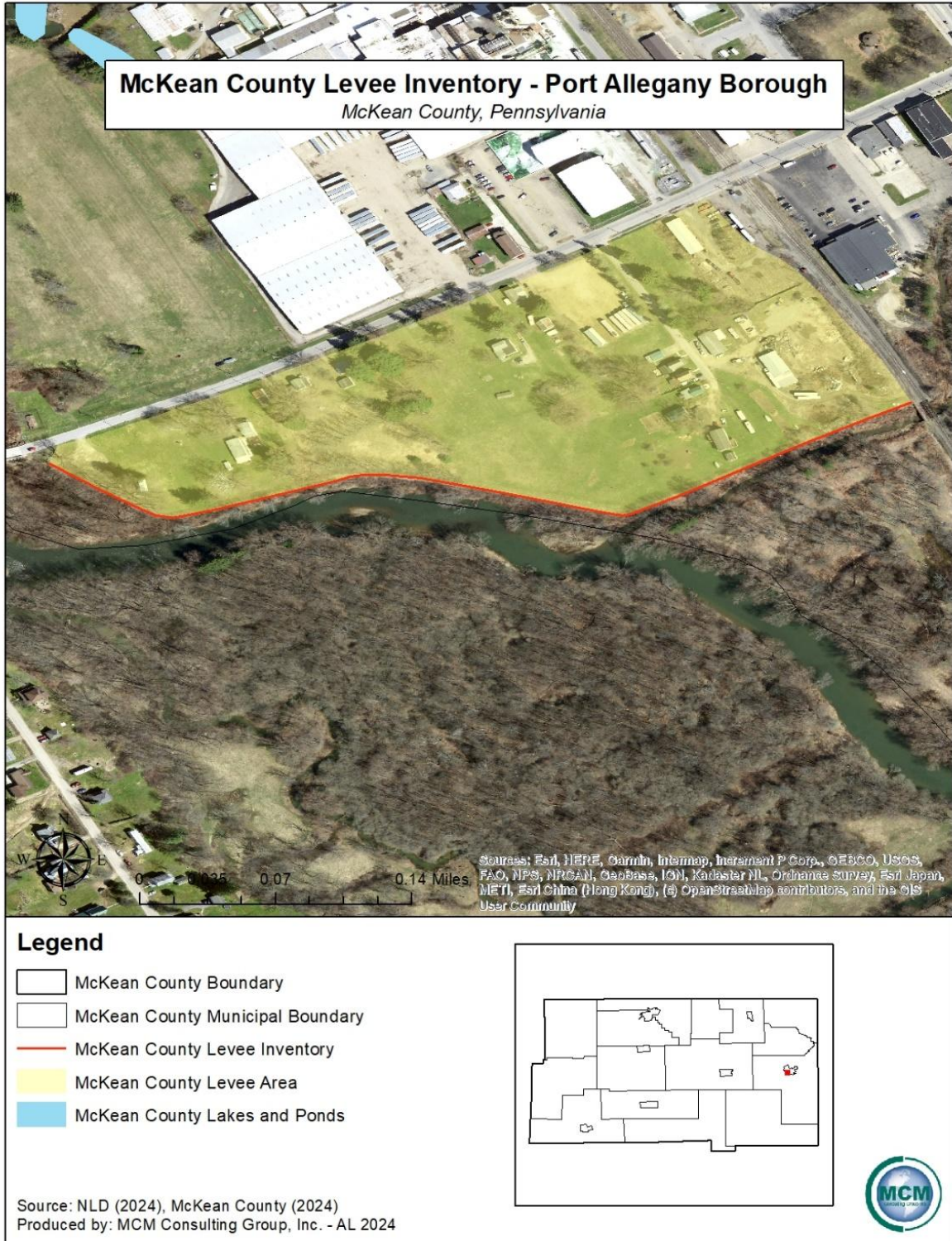
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 43 - McKean County Levee Locations – Eldred Borough



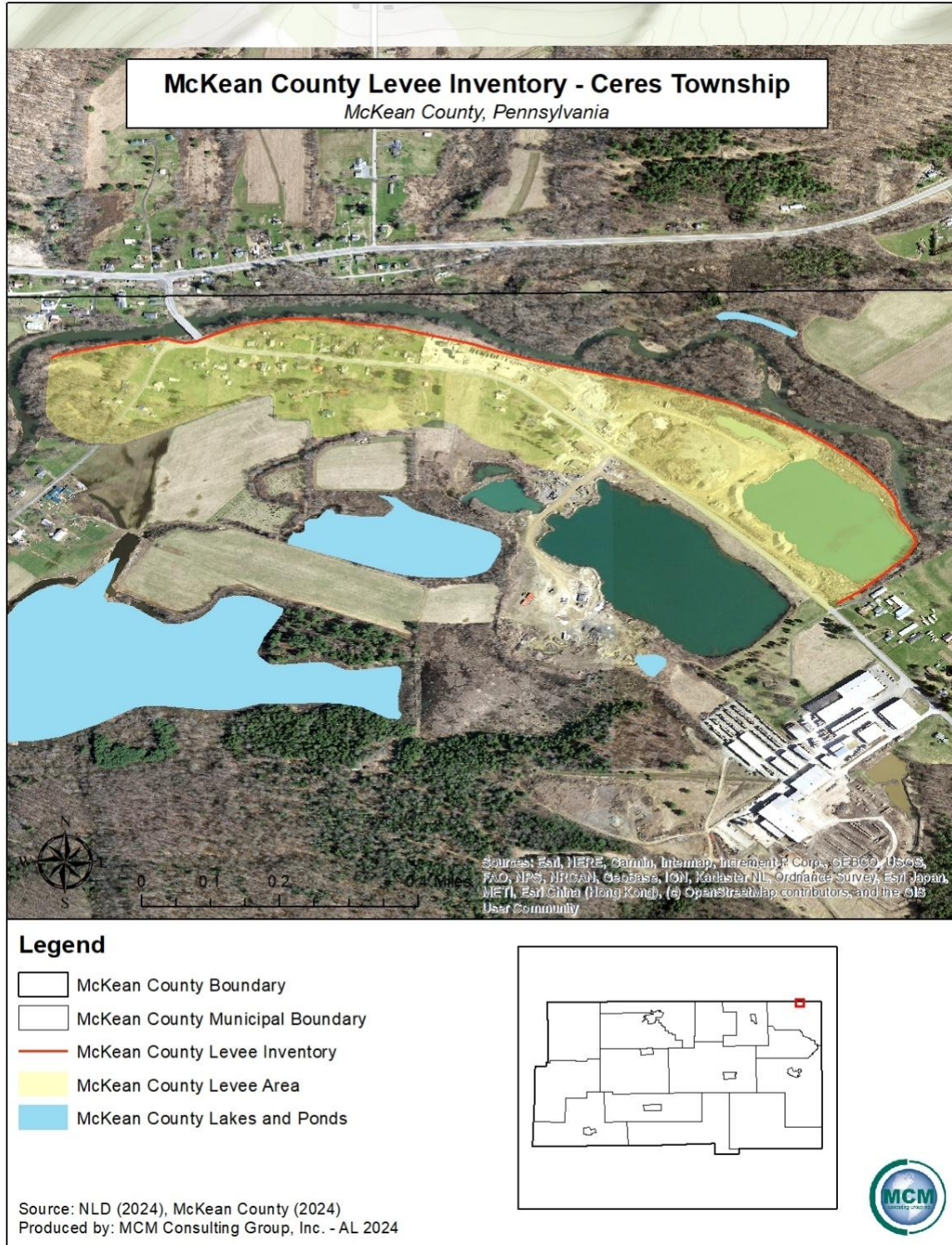
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 44 - McKean County Levee Locations – Port Allegany Borough



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Figure 45 - McKean County Levee Locations – Ceres Township



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### **4.3.16. Disorientation**

#### **4.3.16.1 Location and Extent**

Many people are attracted to Pennsylvania's rural areas for recreational purposes such as hiking, camping, hunting, and fishing. People can become lost or trapped in remote and rugged wilderness areas, as a result. McKean County has several parks and large forested areas that may attract locals and tourists due to the natural appeal of the landscape and the expanses of land, both state-owned and otherwise. McKean County is home to two state parks. Kinzua Bridge State Park lies entirely in McKean County while Elk State Park – East Branch Dam lies mostly in Elk County but carries over into McKean County. McKean County also has several state game lands, and the Allegheny National Forest also extends into the county. In the event of disorientation, search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are often focused in and around state forest and state park lands as they contain numerous miles of hiking and biking trails.

#### **4.3.16.2 Range of Magnitude**

Approximately 77% of McKean County is undeveloped forest land (Comprehensive Plan, 2007). A wide variety of factors can contribute to the outcome of a search and rescue mission, but the most common dangers associated with disorientation are lack of food, water, and shelter. McKean County generally has a limited amount of water (0.5% of total land area is surface water), and during the warmer summer months shelter is less of a necessity than during winter months when extreme cold poses a threat. Age, physical fitness, and familiarity with the area can also have a bearing on the outcome.

Initial search and rescue efforts are often made with teams of dogs, people on horseback, and or volunteers from fire departments, and for longer term incidents drones may be employed.

#### **4.3.16.3 Past Occurrence**

Wilderness search and rescue often requires considerable resources, sometimes resulting in the expenditure of hundreds of man-hours, both paid and volunteer. McKean County utilizes a database system called WebEOC to track various incidents within the county. This system tracks many incidents that have occurred throughout the county. Specifically, search and rescue incidents that occurred in McKean County have been recorded. All search and rescue operations that have been recorded in WebEOC can be seen in *Table 62 – Search and Rescue Operations in McKean County 2018 to 2024*. These incidents reflect a disoriented individual that needed assistance to return to safety and a place of familiarity.

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Table 62 - Search and Rescue Operations in McKean County 2018 to 2024

Search and Rescue Operations in McKean County 2018 to 2024		
Date	Event	Municipality
11/20/2018	Missing Person – Search and Rescue	Corydon Township
02/04/2019	Confined Space – Search and Rescue	Bradford City
07/05/2019	Missing Person – Search and Rescue	Corydon Township
07/09/2019	Land Rescue – Search and Rescue	Bradford Township
07/28/2019	Wilderness Rescue – Search and Rescue	Hamilton Township
07/31/2019	Confined Space – Search and Rescue	McKean County
08/16/2019	Wilderness Rescue – Search and Rescue	McKean County
10/10/2019	Missing Person – Search and Rescue	Foster Township
10/12/2019	Missing Person – Search and Rescue	Hamilton Township
10/03/2020	Lost Hiker – Search and Rescue	Corydon Township
06/26/2020	Missing Person – Search and Rescue	Bradford Township
12/08/2020	Lost Hiker – Search and Rescue	Corydon Township
12/13/2020	Missing Person – Search and Rescue	McKean County
01/13/2021	Land Rescue Medical Emergency – Search and Rescue	Ceres Township
07/22/2021	Confined Space Search and Rescue	Liberty Township
08/09/2021	Stranded Boater – Water Rescue	Corydon Township
01/12/2022	Industrial Entrapment - Search and Rescue	Bradford City
03/18/2022	Missing Endangered Person Advisory – Search and Rescue	Foster Township
08/01/2022	Water Rescue	Corydon Township
09/16/2022	Watercraft in Distress – Water Rescue	Corydon Township
11/19/2022	Missing Person – Search and Rescue	Foster Township
09/01/2023	Missing Person – Search and Rescue ROV	McKean County
11/12/2023	Lost Person – Search and Rescue	Norwich Township
11/14/2023	Missing Endangered Person Advisory	Wetmore Borough
03/17/2024	Lost Person – Search and Rescue	Liberty Township
Source: McKean County WebEOC, Closed Incident Data (2024)		

### 4.3.16.4 Future Occurrence

During the warm summer months, as activities such as hiking, biking, and camping increase, so does the likelihood of individuals becoming disoriented. Many search and rescue events also occur in November due to individuals getting lost during hunting season. Disorientation occurs most often in state parks and state forests where outdoor recreation is most abundant, and the woods are most dense. Additionally, medical emergencies occur regularly in the county, especially among the elderly, which could result in disorientation events.

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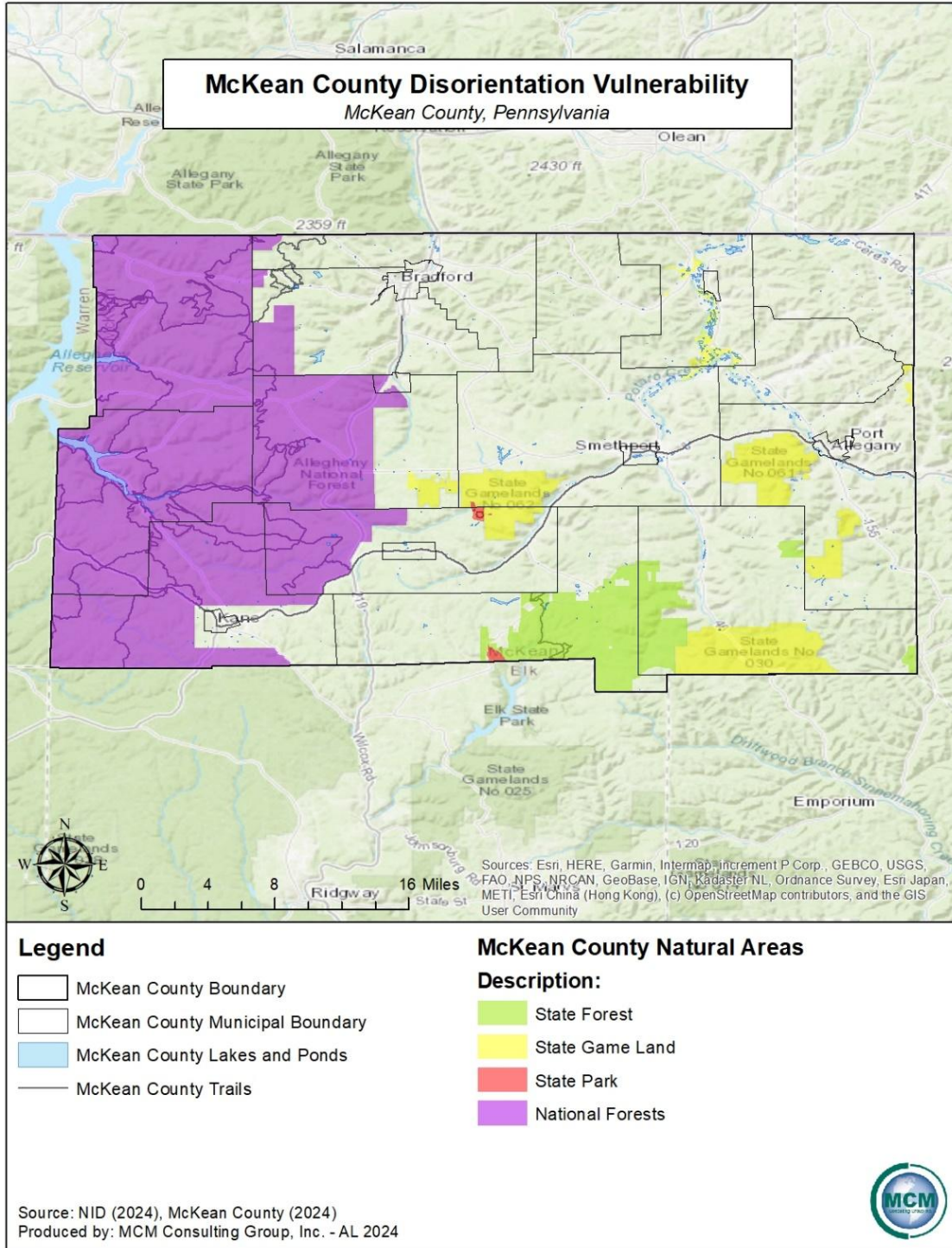
### **4.3.16.5 Vulnerability Assessment**

Individuals are most likely to become disorientated in areas of vast, open wilderness. Children and the elderly are most vulnerable to exposure to the elements. The elderly tend to be more vulnerable to disorientation due to medical/mental related issues that may occur outside of rugged terrain. Often, an individual with dementia or Alzheimer's may become disoriented in residential or wilderness locations.

The most dangerous period to become lost outdoors is during the winter months when heat and shelter are vital. McKean County regularly experiences winter storms and temperatures below freezing, so persons participating in outdoor recreational activities in the winter are at a higher risk in the event of disorientation. *Figure 46 – McKean County Disorientation Vulnerability* identifies areas within the county that are most vulnerable to disorientation.

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Figure 46 - McKean County Disorientation Vulnerability



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#### **4.3.17. Emergency Services Shortage**

##### **4.3.17.1 Location and Extent**

Fire, emergency medical services (EMS), local emergency management coordinators (LEMC), and law enforcement service agencies are defined per municipality in McKean County. Regional and state-wide services are also available.

With the exception of law enforcement and the majority of in-county EMS, most areas are served by volunteers instead of career personnel, which increases response time due to volunteer availability. Volunteers provide emergency services 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 the number of responders. The initial training time for fire, EMS, and law enforcement can take several months to complete. Emergency medical services require 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. These time obligations away from family, especially when uncompensated, may be limiting engagement.

##### **4.3.17.2 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. McKean County has

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

#### **4.3.17.3 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 (municipal) 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 keys to success.

McKean County has had multiple events that were caused by emergency service shortages, most significantly from 2020 to 2022, exacerbated by the COVID-19 pandemic. McKean County has had a significant decrease in volunteers in both EMS and the fire service over the course of the past five years. The McKean County local planning team stated that this decrease in volunteer resources has detrimentally impacted emergencies services that are provided to the public. However, this shortage has not been caused exclusively by the COVID-19 pandemic and was occurring before the pandemic across McKean County and the Commonwealth of Pennsylvania.

#### **4.3.17.4 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

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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 McKean 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 McKean County, but that type of change is slow and often long-term.

### **4.3.17.5 Vulnerability Assessment**

The possibility that EMS agencies and fire services could fail creates a vulnerability to all McKean 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 enforcement 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 McKean 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

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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 have 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 McKean County are identified in the following tables, *Table 63 – McKean County Fire Departments* identifies the municipalities served. Almost all fire departments in McKean County are volunteer based. *Table 64 – McKean County EMS Agencies* identifies each emergency medical service agency, and the municipalities served. *Table 65 – McKean 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 McKean County Emergency Services.

*Table 63 - McKean County Fire Departments*

<b>McKean County Fire Departments</b>	
<b>Station Name</b>	<b>Municipalities Covered</b>
Bradford Fire Department	Bradford City
Smethport Fire Department	Smethport, Keating Township
Port Allegany Fire Department	Port Allegany, Annin Township, Liberty Township
Eldred Brough Fire Department	Eldred Borough, Ceres Township
Kane Volunteer Fire Department	Kane Borough, Wetmore Township
Lewis Run Volunteer Fire Department	Lewis Run Borough
Hilltop Volunteer Fire Department	Keating Township
Rew Volunteer Fire Department	Foster Township, Keating Township
Otto Township Volunteer Fire Department	Otto Township
Mt. Jewett Volunteer Fire Department	Mt. Jewett Borough, Hamlin Township, Sergeant Township.
Derrick City Volunteer Fire Department	Foster Township
Norwich Township Volunteer Fire Department	Norwich Township
Clermont Volunteer Fire Department	Sergeant Township
Bradford Township Volunteer Fire Department	Bradford Township, Foster Township
Eldred Township Volunteer Fire Department	Eldred Township
Corydon Township Volunteer Fire Department	Corydon Township

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<b>McKean County Fire Departments</b>	
<b>Station Name</b>	<b>Municipalities Covered</b>
Hamlin Township Volunteer Fire Department	Hamlin Township
Lafayette Township Volunteer Fire Department	Lafayette Township
Ludlow Volunteer Fire Department	Hamilton Township

*Table 64 - McKean County EMS Agencies*

<b>McKean County EMS Agencies</b>		
<b>Station Name</b>	<b>Service provided</b>	<b>Municipalities Covered</b>
Bradford City Fire Department	ALS/BLS	Bradford City, Bradford Township, Foster Township, Corydon Township, Keating Township, Lafayette Township
Port Area Ambulance Service	ALS/BLS	Port Allegany Borough, Annin Township, Liberty Township, Keating Township, Norwich Township
EmergyCare-Kane	ALS/BLS	Kane Borough, Wetmore Township, Hamilton Township, Areas of Warren County, Areas of Elk County, Areas of
Mt. Jewett Area Ambulance Association	BLS	Mt, Jewett Borough, Hamlin Township, Sergeant Township
TLC EMS, LLC	ALS/BLS	Eldred Township, Eldred Borough, Otto Township
Emporium Ambulance (Cameron County)	ALS/BLS	Norwich Township
Shinglehouse Ambulance (Potter County)	ALS/BLS	Ceres Township

*Table 65 - McKean County Law Enforcement Agencies*

<b>McKean County Police Departments</b>	
<b>Station Name</b>	<b>Municipalities Covered</b>
110 Bradford City	City of Bradford
210 Smethport Borough	Smethport Borough
310 Port Allegany Borough	Port Allegany Borough
510 Kane Borough	Kane Borough
810 Foster Township	Foster Township
910 Otto Township	Otto Township
1510 Bradford Township	Bradford Township

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<b>McKean County Police Departments</b>	
<b>Station Name</b>	<b>Municipalities Covered</b>
1710 University of Pittsburgh-Bradford Campus	City of Bradford, Pitt Campus
2310 Allegheny National Forest Rangers	Allegheny National Forest
Kinzua Bridge State Park Rangers	Kinzua State Park
PA State Police, Troop C- Lewis Run Station	Entire County

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### **4.3.18. Environmental Hazards**

#### **4.3.18.1 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 49 – Environmental Hazard Transportation Vulnerability* shows major transportation routes through McKean County, including United States Route 6, Pennsylvania State Route 219, Pennsylvania Route 44, and Pennsylvania Route 46.

##### 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 237 SARA Title III facilities in McKean 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 48 – Hazardous Waste Locations* identifies SARA Title III facilities as well as several other locations that consume, store, or release potentially hazardous materials and wastes. Over the past five-to-ten-year period, multiple Superfund sites have been remedied.

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

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TRI information to the EPA. The EPA is the federal enforcement agency responsible for SARA Title III and PEMA classifications. As of 2024, there are eleven TRI facilities in McKean County, all located around the major population centers and boroughs in McKean County.

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 47 – Oil & Gas Well Locations* shows the location of all oil and gas wells in the county along with their proximity to surface waters.

### **4.3.18.2 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:

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- Micrometeorological effects of buildings and terrain which alter 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.

### **4.3.18.3 Past Occurrence**

#### **Transportation**

In the past, deaths have resulted from a fuel oil truck fire. More recent events are recorded in the WebEOC and county reporting software and are summarized in *Table 66 – Hazardous Material Incidents*. Transportation accidents that involved hazardous materials were included in the table below.

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Table 66 - Hazardous Material Incidents

Hazardous Material Incidents		
Municipality	Date	Event
Hamlin Township	08/28/2020	Oil Spill
Foster Township	05/29/2020	Hazardous Material Release
McKean County	05/20/2020	Hazardous Material Release – Crude Oil
Smethport Borough	11/29/2020	Oil Leak
Otto Township	04/17/2021	Dumping
Eldred Township	04/19/2021	Hazardous Material Release
Lafayette Township	06/03/2021	Hazardous Material Release - Hydrocarbons
Otto Township	06/28/2021	Dumping
Smethport Borough	07/17/2021	Oil Leak
Otto Township	08/15/2021	Drilling Brine Dumping
City of Bradford	10/25/2021	Diesel Smell
City of Bradford	03/15/2022	Oil Sheen
Sergeant Township	07/12/2022	Large Explosion
Mt. Jewett Borough	05/31/2023	Hazardous Material Release
Bradford Township	07/03/2023	Hazardous Material Release
Kane Borough	03/07/2024	Oil Well Burn Off
Source: WebEOC, County Reporting System, 2020-2024		

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

### Fixed Facility

There have been a number of hazardous material incidents in McKean County in the past but few of those events have been related to fixed facilities in the county. There have been no significant release events from fixed facilities in McKean County. More recent events are recorded in WebEOC and county reporting software and are summarized in *Table 66 – Hazardous Material Incidents*.

The EPA tracks the management of hazardous materials in facilities that handle significant amounts of hazardous materials. The eleven toxic release inventory (TRI) facilities in McKean County as of 2024 are summarized in *Table 67 – 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.

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Table 67 - TRI Facilities

<b>Toxic Release Inventory Facilities</b>				
<b>Name</b>	<b>Municipality</b>	<b>Industry Sector</b>	<b>Chemical</b>	<b>Production-related Waste Managed (lbs)</b>
Allegheny Bradford Corporation	Lewis Run Borough	Fabricated Metals	Chromium, Nickel, Nitric acid	265
Allegheny Surface Technology	Lewis Run Borough	Fabricated Metals	Nitric acid	840
American Refining Group, Inc.	City of Bradford	Petroleum	1,2,4-Trimethylbenzene, Benzene, Cyclohexane, Ethylbenzene, Hydrogen sulfide, lead compounds, mercury compounds, n-Hexane, n-Methyl-2-pyrrolidone, Polycrylic aromatic compounds, Toulene, Xylene, Zinc compounds	170,307.13
Ardagh Glass, Inc.	Port Allegany Borough	Nonmetallic Mineral Product	Chromium, Chromium compounds, Lead and lead compounds, Sulfuric acid	34,514.1
Collins Pine Company – Kane Hardwood Sawmill	Wetmore Township	Wood Products	Lead and lead compounds	3.47
Dresser Pipeline Solutions	City of Bradford	Fabricated Metals	Manganese	17

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<b>Toxic Release Inventory Facilities</b>				
<b>Name</b>	<b>Municipality</b>	<b>Industry Sector</b>	<b>Chemical</b>	<b>Production-related Waste Managed (lbs)</b>
Georgia Pacific Panel Products, LLC.	Sergeant Township	Wood Products	Diisocyanates, Formaldehyde, Methanol	11,914.4
International Waxes, Inc.	Keating Township	Petroleum	Ammonia, Cyclohexane, Toulene, Xylene	317,661
Keystone Powdered Metal Company	Lewis Run Borough	Fabricated Metals	Copper, Manganese compounds	11.122
WR Case and Sons Cutlery Company	Bradford Township	Fabricated Metals	Chromium, Copper	4
Zippo Manufacturing Company	Bradford Township	Fabricated Metals	Chromium, Copper, Nickel	1,292
Source: EPA, 2024				

As of 2024, McKean County is home to 11,271 active natural gas wells.

#### **4.3.18.4 Future Occurrence**

##### Transportation

While many incidents involving hazardous material releases have occurred in McKean 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 McKean 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.

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#### **4.3.18.5 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 McKean County is vulnerable to a hazardous materials incident caused along a transportation route. These incidents can occur along highways, railways, and pipelines. *Figure 49 – Environmental Hazard Transportation Vulnerability Map* identified the 2,000-foot hazard corridor for all major highways in McKean County. *Figure 50 – Annual Truck Traffic Percentages* identifies the annual truck traffic percentages for all of the roadways in McKean 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. Hamilton Township contains the most oil and gas wells, and Foster Township has the most domestic water wells, meaning that Hamilton Township is most vulnerable to an event at an oil and gas well site and Foster Township is most vulnerable to water contamination. *Table 68 – Oil and Gas Wells & Drinking Water Wells* illustrates the type of well and the local domestic drinking water wells for each municipality.

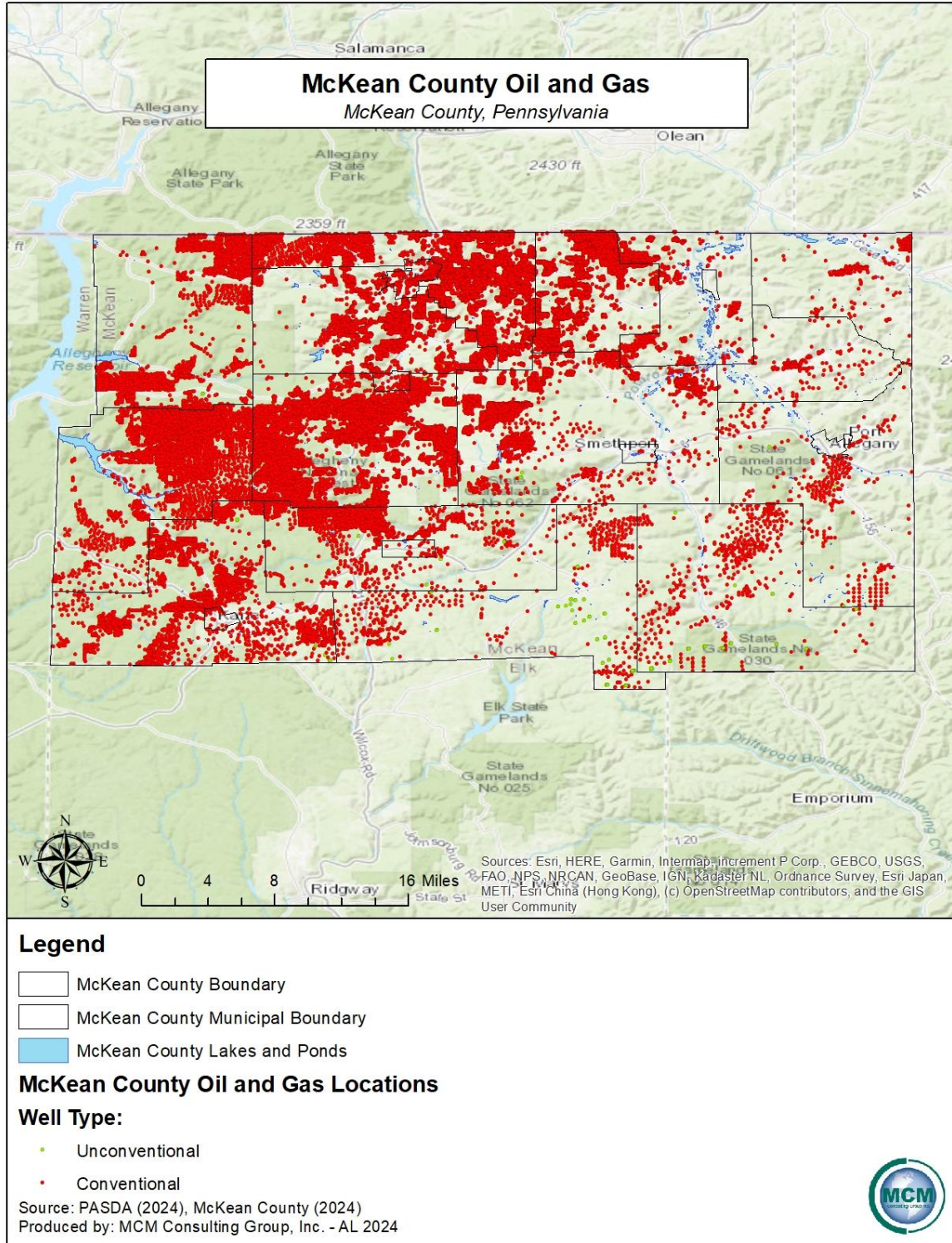
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Table 68 - Oil and Gas Wells & Drinking Water Wells

<b>Oil &amp; Gas Wells in McKean County</b>					
<b>Municipality</b>	<b>Type of Well</b>				<b>Domestic Drinking Water Wells</b>
	<b>Active</b>	<b>Abandoned</b>	<b>Inactive</b>	<b>Proposed</b>	
Annin Township	78	5	0	0	39
Bradford City	105	3	0	1	0
Bradford Township	585	105	0	15	77
Ceres Township	84	0	0	0	32
Corydon Township	909	32	1	73	35
Eldred Borough	0	0	0	0	0
Eldred Township	265	14	0	17	66
Foster Township	1,006	49	0	118	117
Hamilton Township	2,407	33	0	96	16
Hamlin Township	237	1	0	25	33
Kane Borough	12	1	0	0	5
Keating Township	355	10	3	22	53
Lafayette Township	2,935	70	0	129	42
Lewis Run Borough	40	0	0	0	1
Liberty Township	89	1	0	5	107
Mount Jewett Borough	7	3	0	0	2
Norwich Township	232	0	2	12	21
Otto Township	309	25	0	41	32
Port Allegany Borough	0	0	0	0	3
Sergeant Township	300	3	0	47	11
Smethport Borough	1	0	0	0	9
Wetmore Township	1,315	41	0	110	32
<b>Total:</b>	<b>11,271</b>	<b>396</b>	<b>6</b>	<b>711</b>	<b>733</b>
Source: PA DEP, 2024					

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Figure 47 - Oil and Gas Well Locations



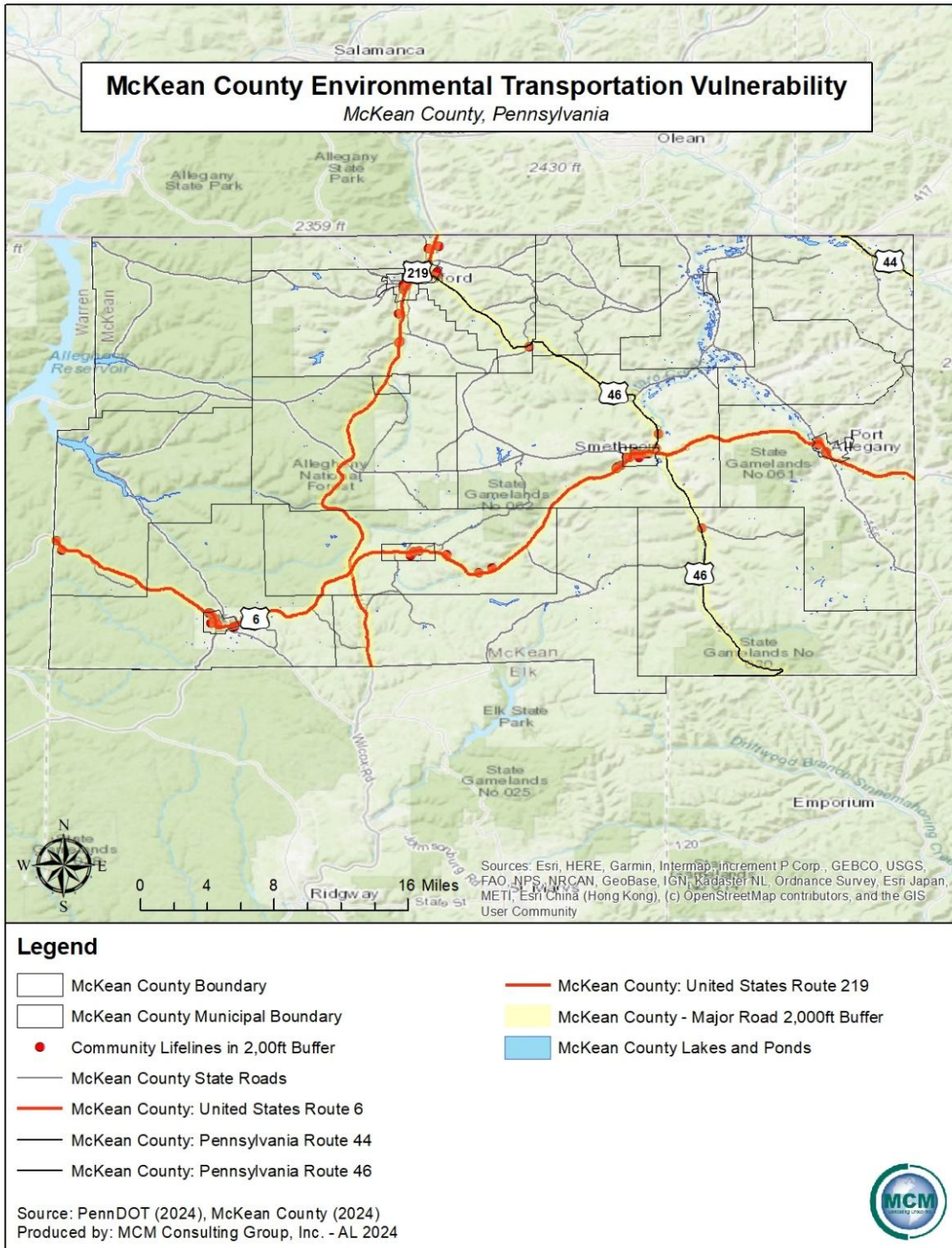
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Figure 48 - Hazardous Waste Locations



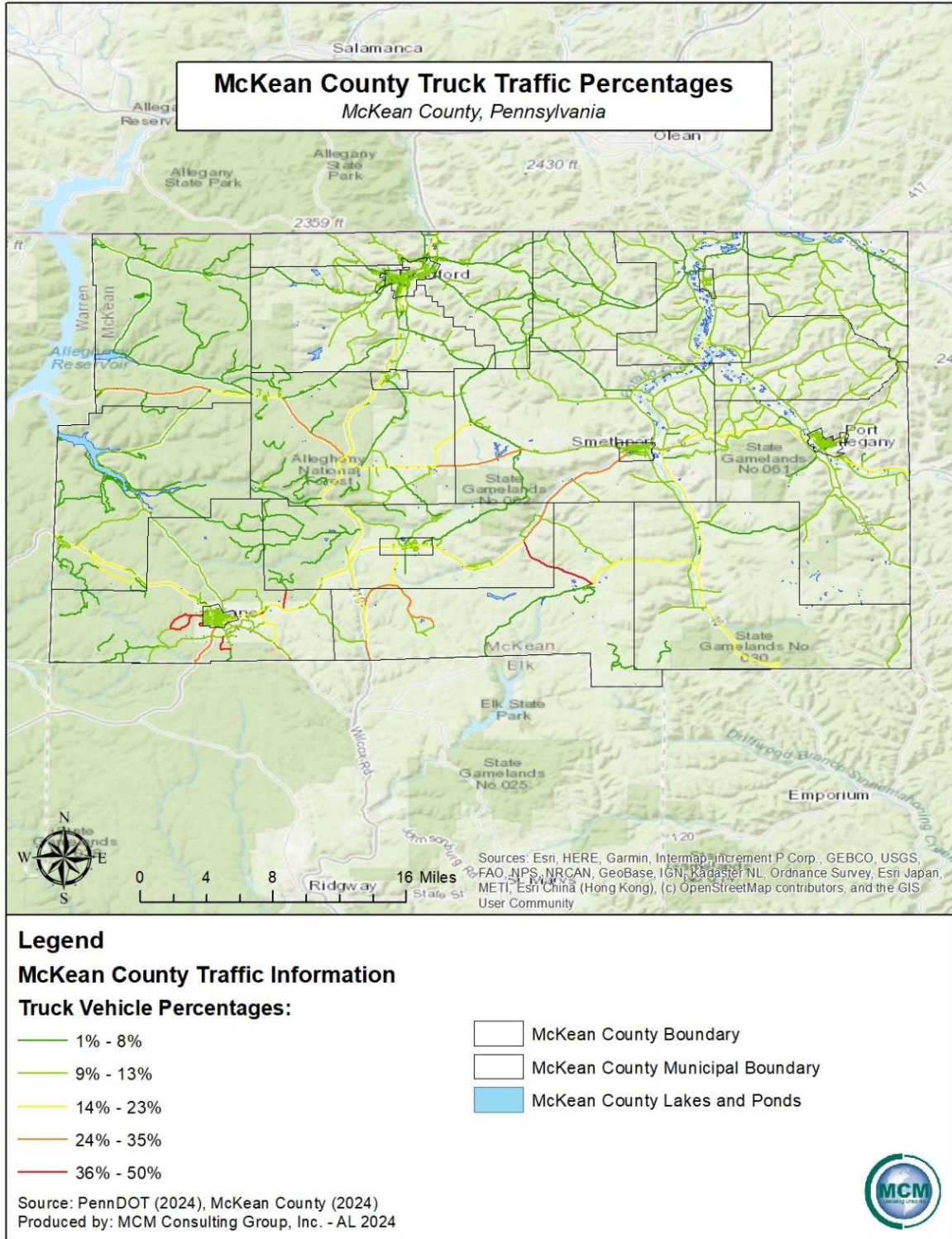
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Figure 49 - Environmental Hazard Transportation Vulnerability



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Figure 50 - Annual Truck Traffic Percentages



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#### **4.3.19. Substance Use Disorder**

##### **4.3.19.1 Location and Extent**

Substance Use Disorder (SUD) is a chronic condition characterized by compulsive drug or alcohol use despite the harmful consequences. According to the American Addiction Centers substance use disorder affects brain function and behavior, leading to an inability to control substance intake. (Fuller 2023). Symptoms include intense cravings, tolerance, withdrawal symptoms, and continued use despite negative effects on health, relationships, and responsibilities. Substance use disorder can impact anyone regardless of age, gender, or background, and often requires comprehensive treatment involving therapy, medication, and support to achieve recovery.

Substance use disorder can escalate into opioid addiction through a progression that often starts with the legitimate medical use of prescription opioids for pain relief. Over time, individuals may develop a tolerance, requiring larger doses for the same effect. This can evolve into physical dependence, where the body experiences withdrawal symptoms without the drug. Psychological factors, such as seeking relief from stress, trauma, or co-occurring mental health disorders, may compel individuals to continue using opioids despite negative consequences. Eventually, the compulsive need to use opioids takes over, characterized by addiction, where obtaining and using the drug becomes a central focus of life.

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), ten classes of substance use disorder exist. These substances use related mental illnesses include alcohol use disorder, cannabis use disorder, phencyclidine use disorder, other hallucinogen use disorder that differ from phencyclidine use, inhalant use disorder, opioid use disorder, sedative, hypnotic or anxiolytic use disorder, and stimulant use disorder which accompanies cocaine or methamphetamine.

Pennsylvania and the United States at large have been experiencing a substance use disorder epidemic which can lead to 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. Substance use disorder and opioid addiction has increased drastically over the past several years during, and following, the hardships faced from the COVID-19 pandemic. Opioid use has increased since the beginning of the COVID-19 pandemic which has been attributed to the uncertainty people may experience as a result of 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

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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 anti-anxiety 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 McKean County, this profile focuses on opioid drugs and the substance use disorder epidemic. The opioid crisis along with substance use disorder 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.

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### **4.3.19.2 Range of Magnitude**

Substance use disorder may lead to a narcotic addiction which could lead to an overdose and can sometimes be fatal. The most dangerous side effect of an overdose can include depressed breathing. 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. Substance use dependency 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 annual estimate of 20,000 babies born in the United States with this condition.

### **4.3.19.3 Past Occurrence**

In 2023, there was an estimated total of 109,000 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 data from the CDC. *Table 69 – Drug Overdose Mortality in McKean County* shows death rates and deaths per month in McKean County from 2014 to 2024. From the year 2014 to 2024, McKean County experienced an increase in death rates from drug overdoses. The most common age group for opioid abuse in McKean County is the eighteen to forty-five years of age demographic. In McKean County the overdose rate of males is greater than the overdose rate of females. Whites have the highest total rate of overdose deaths in McKean County, while Blacks have the highest per capita rate of overdose deaths when adjusted for population size. The most used narcotic substances in McKean County are fentanyl, heroin, cocaine, benzodiazepines, and Rx opioids.

*Table 69 - Drug Overdose Mortality in McKean County*

<b>Drug Overdose Mortality in McKean County</b>	
<b>Year</b>	<b>Deaths Per Year</b>
2014	10
2015	12
2016	16
2017	19
2018	20
2019	21
2020	21
2021	16
2022	17
2023	17
2024	19

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Table 70 - Drugs Present in 2020 Pennsylvania Overdose Deaths

<b>Drugs Present in 2020 PA Overdose Deaths</b>	
<b>Drug Category</b>	<b>Percent Reported Among 2020 Decedents</b>
Cannabis	25%
Cocaine	20%
Heroin	15%
Fentanyl	14%
Methamphetamine	10%
Prescription Opioids	5.5%
Cathinones	5.5%
Benzodiazepines	5%
Source: DEA, 2020	

#### **4.3.19.4 Future Occurrence**

Both McKean County, and Pennsylvania as a whole, have seen a steady rise in substance use disorder and the use of opioids over the last several years, with drug-related death rates increasing at a high percentage. Substance use disorder is a pressing issue in Pennsylvania, with far-reaching implications for public health, safety, and the well-being of individuals. Future occurrences of substance use, and opioid addiction 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 Pennsylvania government 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 DMP) 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 DMP 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 McKean County, there are five drug take-back boxes located throughout the county. The drug take-back box locations include Bradford City Police Station, Bradford Township Police Department, Kane Borough Police Station, Sheriff’s Department, and the State Police Barracks- Lewis Run.

In the event of an opioid overdose, death can sometimes be prevented with the use of the drug naloxone. The former Pennsylvania Secretary of Health, Dr. Rachel Levine, in 2020, signed updated standing order prescriptions of naloxone. Naloxone is a medication that can reverse an

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overdose that is caused by an opioid drug (i.e., prescription pain medication or heroin). Naloxone is used to block the effects of opioids 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 forty years and its only function is to reverse the effects of opioids on the brain and respiratory system in order to prevent death. Also, with the January 10, 2018, disaster declaration, emergency medical technicians (EMTs) are now allowed to leave naloxone behind at a scene of a recent overdose 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 McKean County. According to the National Library of Medicines, supervised injection sites can provide disordered substance users with a secure location to reduce the risk of overdose, while also weaning them off of addictive substances.

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 McKean 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.

### **4.3.19.5 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. Substance use disorder 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 McKean County, have seen an increase of time and resources devoted to the opioid epidemic as overdose and response increase.

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While Substance use disorder and opioid addiction are often viewed as criminal problems, it can also be viewed as a chronic disease. This paradigm shift moves away from faulting the abuser and incentivizing quick cures, to viewing the abuser as a patient and working towards long-term management of the disease. In general, it is important to consider alternative approaches to pain treatment.

According to the National Institute of Mental Health, substance use disorder often stems from underlying mental health issues such as depression, anxiety, trauma, or unresolved psychological struggles. Individuals may turn to substances as a coping mechanism to alleviate emotional pain or distress. However, prolonged substance abuse can exacerbate mental health symptoms and lead to a cycle of dependency. Additionally, genetic predispositions and environmental factors can also contribute to the development of both substances use disorders and mental health disorders (National Institute of Mental Health, 2023).

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 McKean 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, fueled the opioid epidemic. The COVID-19 pandemic challenged vulnerable populations, including those with opioid use disorders. The opioid epidemic and COVID-19 pandemic intersected and presented 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 included disruption of treatment and recovery services, limited access to mental health services and peer support, disrupted routines, loss of work, and increased stress which led to increased opioid use and risk of relapse for those in recovery. Additionally, the pandemic took away

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media, legislator, and public health agency attention that had been focused on the opioid crisis. Since the end of the pandemic, the opioid epidemic in Pennsylvania increased 30%.

Risk factors may arise from indirect factors including housing instability and incarceration. Those with substance use disorder and opioid use disorders are potentially at a higher risk for housing insecurity, homelessness, and incarceration. Congregate living facilities such as homeless shelters, jails, and prisons are high-risk environments for virus transmission, and there are challenges in implementing recommendations from the CDC such as social distancing and quarantine.

Additionally, first responders and medical personnel are also a vulnerable population when dealing with substance use disorder and opioid epidemic. First responders face exposure risk due to an increase in emergency calls due to an increase in the crisis, particularly to synthetic fentanyl. Fentanyl and related substances are hazardous materials, which cause the environment and the people around the substance to be vulnerable. Unintentional fentanyl contact can impact first responders and others that are in close proximity to the opioid user. Depending on the potency of the drug, it can take as little as a few milligrams of fentanyl to cause fatal health complications, the equivalent of a few grains of sand. 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 remain wary 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 excreted human urine and feces, or improper disposal of medications. 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. A worst-case scenario with substance use in McKean County would be a high number of overdoses among residents and insufficient first responder personnel and material resources.

*Figure 51 – Opioid Overdose Deaths in Pennsylvania 2021 and Figure 52 – Opioid Overdose Deaths in Pennsylvania 2022* illustrate the number of deaths per county in the Commonwealth of Pennsylvania.





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#### **4.3.20. Terrorism/Cyberterrorism Incidents**

##### **4.3.20.1 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 11<sup>th</sup> 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.

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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

### **4.3.20.2 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

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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. McKean County has five school districts (public schools K through 12<sup>th</sup> grade) that include thirteen primary, secondary, and high schools. McKean County is home to two university and post-secondary education centers: University of Pittsburgh at Bradford and Northern PA Regional College.

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 Smethport, 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.

### **4.3.20.3 Past Occurrence**

No major terrorism or cyber terrorism events have occurred in McKean County, Pennsylvania. Cyber terrorism events are becoming more common in areas of local government, and these include counties near McKean County, PA.

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 11<sup>th</sup>, 2001, attacks on the World Trade Center and the Pentagon. One of the aircrafts

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hijacked in the September 11<sup>th</sup> 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 2023, there were a total of at least 656 mass shooting incidents in the United States according to the Gun Violence Archive. 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

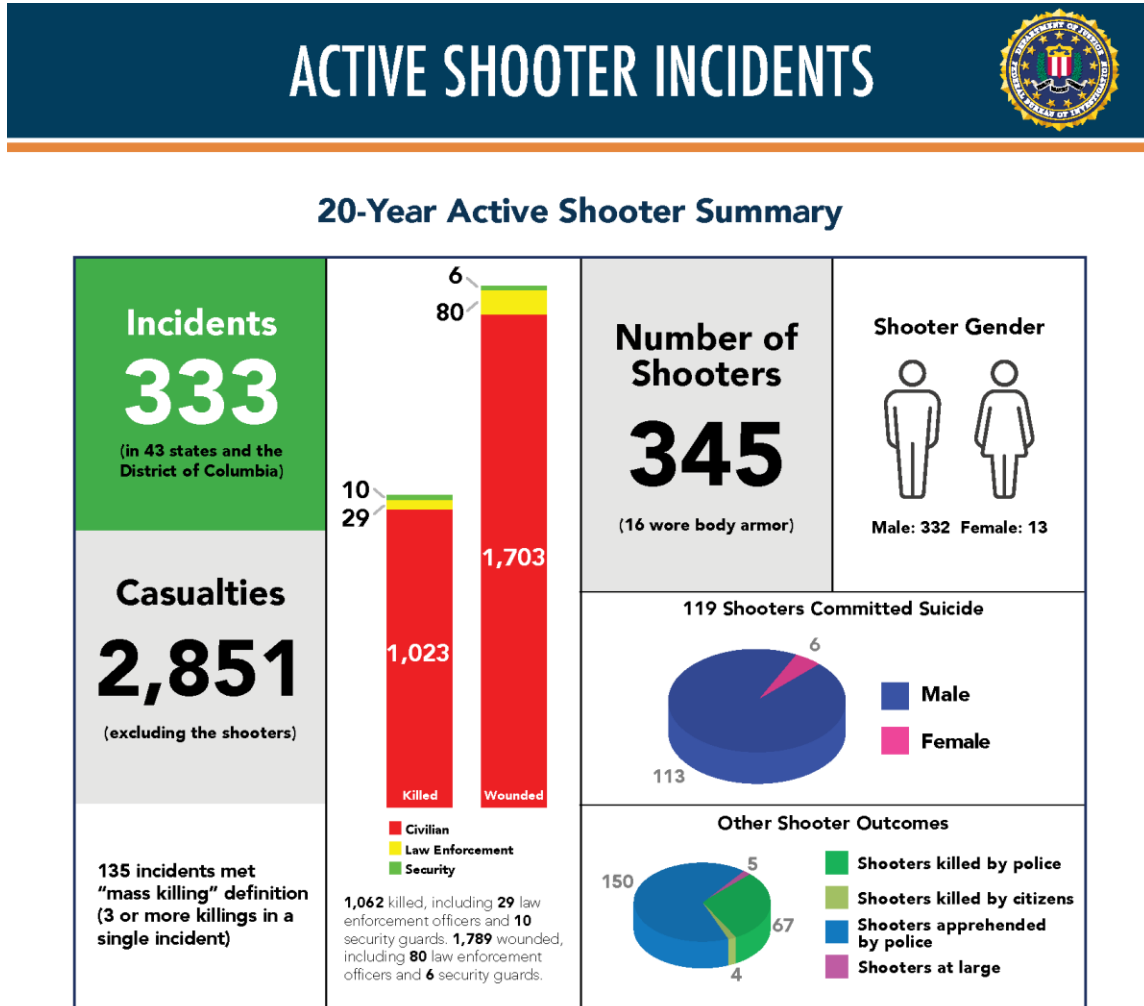
## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

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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 53 – 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 54 – Education Environments* shows two more summary pages from the report that detail active shooter statistics in educational environments.

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Figure 53 - 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.

# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 54 - Education Environments

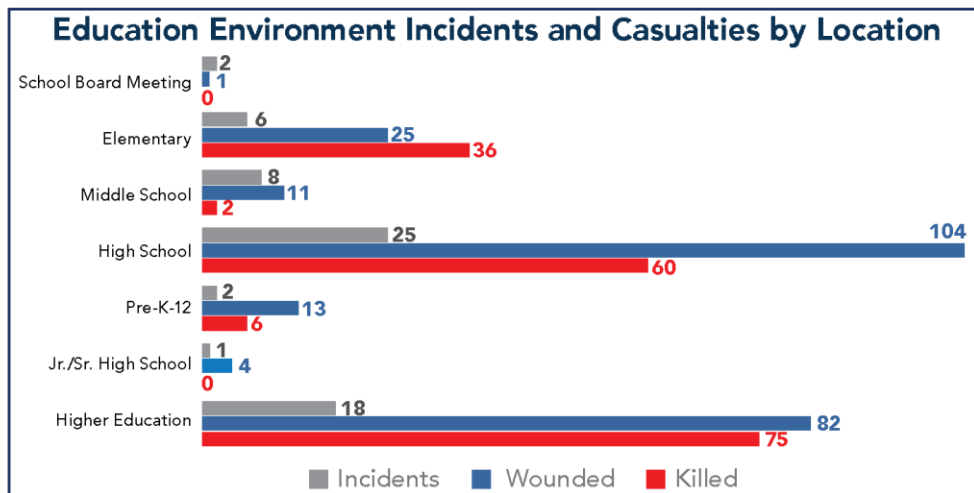
## ACTIVE SHOOTER INCIDENTS



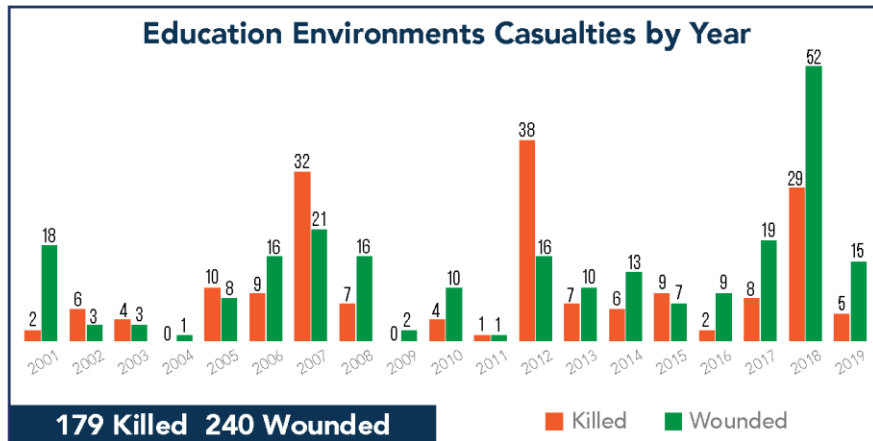
### Education Environments

#### 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)



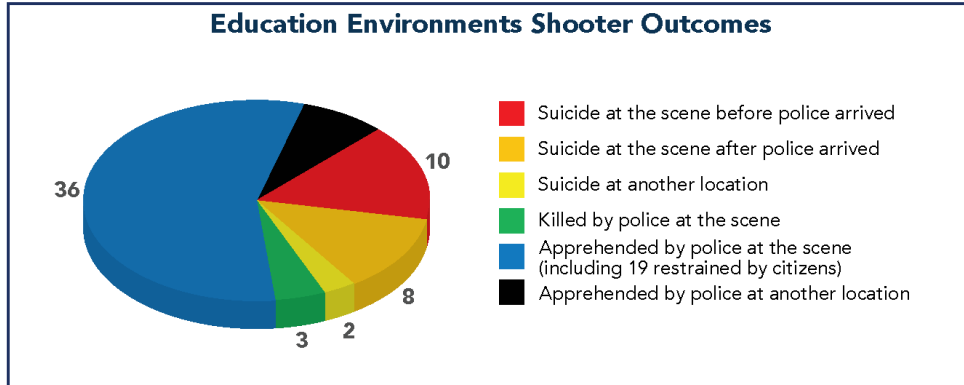
Education Environments Casualties by Year: 2001 (2 killed, 18 wounded); 2002 (6 killed, 3 wounded); 2003 (4 killed, 3 wounded); 2004 (0 killed, 1 wounded); 2005 (10 killed, 8 wounded); 2006 (9 killed, 16 wounded); 2007 (32 killed, 21 wounded); 2008 (7 killed, 16 wounded); 2009 (0 killed, 2 wounded); 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)

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## ACTIVE SHOOTER INCIDENTS

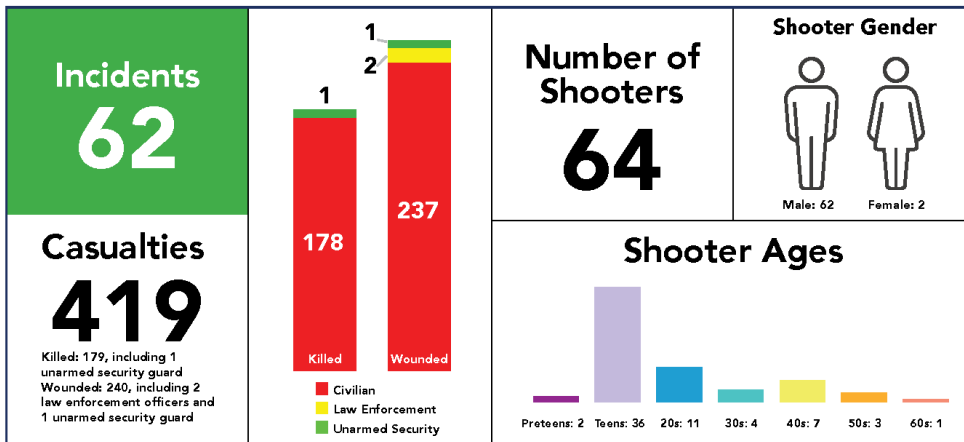


### Education Environments



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).

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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 McKean 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.

One hack 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.

Then, 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.

#### **4.3.20.4 Future Occurrence**

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

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### **4.3.20.5 Vulnerability Assessment**

McKean 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 damage. 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.

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

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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 McKean 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.

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### **4.3.21. Transportation Accidents**

#### **4.3.21.1 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 number of roadways, coupled with the high volume of traffic, creates the potential for serious accidents along the roads and bridges. In McKean County there are 245 state-maintained and eighty-one locally maintained bridges, according to PennDOT. Major transportation routes in McKean County include U.S. Route 6 and U.S. Route 219. Other state routes are also present in the county including PA Routes 46, 59, 146, 246, 321, 346, 446, 546, 646, and 770. *Figure 55 – Major Transportation Routes* shows the major transportation systems in McKean County.

McKean County has one public airport, which is the Bradford Regional Airport. 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 five-mile radius around each airport can be considered a high-risk area since most aviation incidents occur near take-off and landing sites as shown in *Figure 56 – Airports and Vulnerability Zones*.

There are several freight and passenger rail lines in McKean County. The railroad companies that operate within McKean County include Genesee & Wyoming Inc., Buffalo & Pittsburgh Railroad Inc., and Western New York & PA Railroad Inc. With the ability of these railroads for interchanging with other companies, goods can be transported virtually anywhere via rail from McKean 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 McKean County.

There are 8,429 active oil and gas wells located in McKean County. Pipeline infrastructure is seen throughout the county. There are nine major pipeline companies that transport hazardous materials in and through McKean County. Of these nine major pipeline companies, seven supply natural gas only; one supplies natural gas and propane; and one supplies natural gas and

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hydrogen sulfide. *Figure 58 – Utility Pipelines Vulnerability* shows the various pipelines that run through McKean County.

### **4.3.21.2 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. Most 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 because of a car crash. Most fatal crashes occur in May and June, but the highest number of crashes overall occurs in October, November, and December. Inclement weather, high traffic volumes, and high 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.

A worst-case scenario for a transportation accident impacting the county would occur if a road or rail accident resulted in a hazardous material spill in Bradford City, which is the most populous municipality in McKean County with 8,284 residents during the 2020 U.S. Census. Bradford City is also the home to the University of Pittsburgh at Bradford which has approximately 1,100 students and 436 employees (University of Pittsburgh – Bradford, 2024). Such an event would constitute an immediate health hazard to the population and require evacuation.

### **4.3.21.3 Past Occurrence**

*Table 71 – PennDOT Crash Report for McKean County* shows crash statistics recorded by the Pennsylvania Department of Transportation between 2010 and 2022. Reports for 2023 were not available at the time of this report. The year 2014 had the most total crashes in McKean County while 2020 had the fewest total crashes. The number of total crashes has remained similar between 2020 and 2022 in the county. The only crashes involving both trains and vehicles occurred in 2015 and 2017 with a total of two crashes happening in the county.

The majority of municipalities noted on the municipality hazard identification and risk evaluation worksheet that there has been no change in transportation accident frequency and impact in McKean County.

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Table 71 - PennDOT Crash Report for McKean County

<b>PennDOT Crash Report for McKean County</b>								
<b>Year</b>	<b>Vehicle accidents for McKean County</b>				<b>Vehicle Accident Deaths for McKean County</b>			<b>Train/Trolley with Motor Vehicle Crashes</b>
	<b>Total</b>	<b>Fatal Accidents</b>	<b>Injury Crashes</b>	<b>Property Damage Only</b>	<b>Total Vehicle Accident Fatalities</b>	<b>Alcohol-Related Fatalities</b>	<b>Pedestrian Fatalities</b>	
2010	318	5	136	177	6	4	1	0
2011	360	10	162	188	12	4	0	0
2012	351	7	174	170	8	2	1	0
2013	383	9	176	198	15	5	0	0
2014	398	8	169	221	8	4	0	0
2015	371	7	148	216	7	2	0	1
2016	389	7	182	200	7	2	0	0
2017	347	3	139	205	3	1	0	1
2018	316	4	132	180	4	0	0	0
2019	326	8	137	181	13	7	0	0
2020	263	3	114	146	3	1	1	0
2021	270	5	107	158	5	1	0	0
2022	265	5	104	156	5	1	0	0

### **4.3.21.4 Future Occurrence**

McKean County’s population has decreased over the last decade, it is possible, although not guaranteed, 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 enacted measures 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 driving 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.

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#### **4.3.21.5 Vulnerability Assessment**

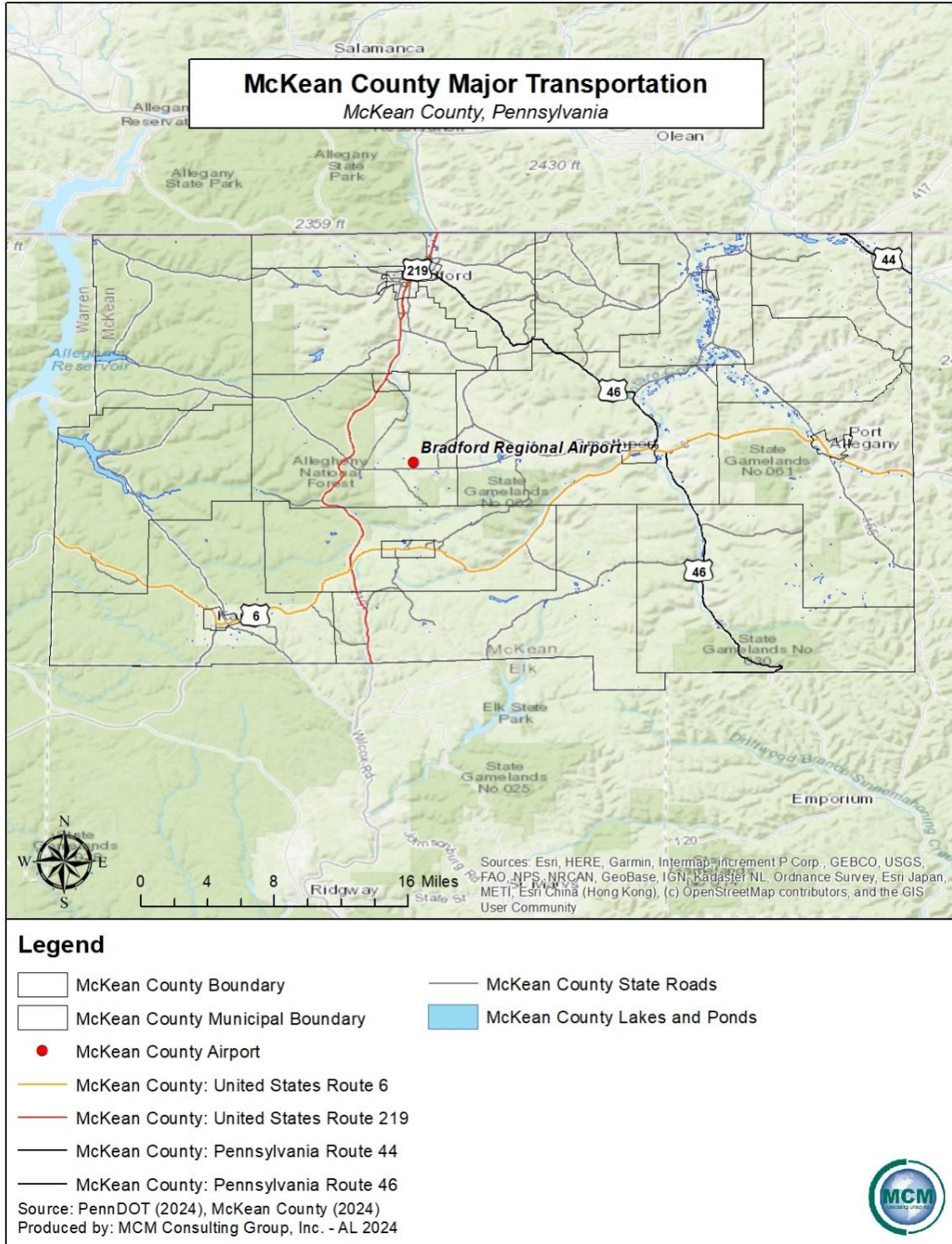
A transportation accident can occur anywhere in McKean County. However, severe accidents are more likely to occur on the county's major highways due to the heavier traffic volumes which make highways extremely vulnerable. The vulnerability for accidents on either highway, railway, or aviation, are directly 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. 17.5% of bridges in McKean County are in poor condition, indicating vulnerability to transportation accidents, while 40.8% remain in fair condition, and 41.7% are in good 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 57 – Average Daily Traffic on Major Highway Vulnerability* identifies all major highways and railroads within McKean County.

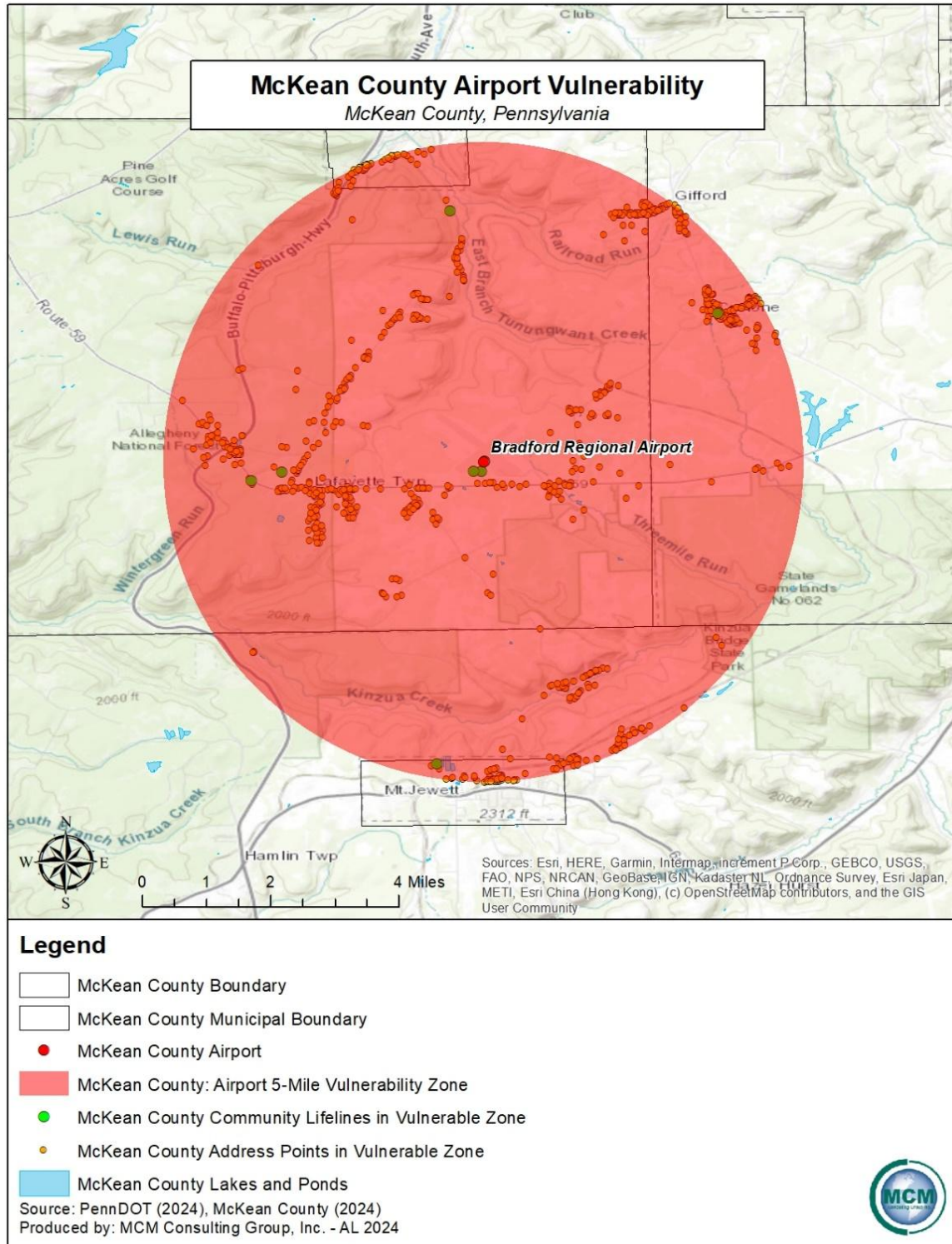
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 55 - Major Transportation Routes



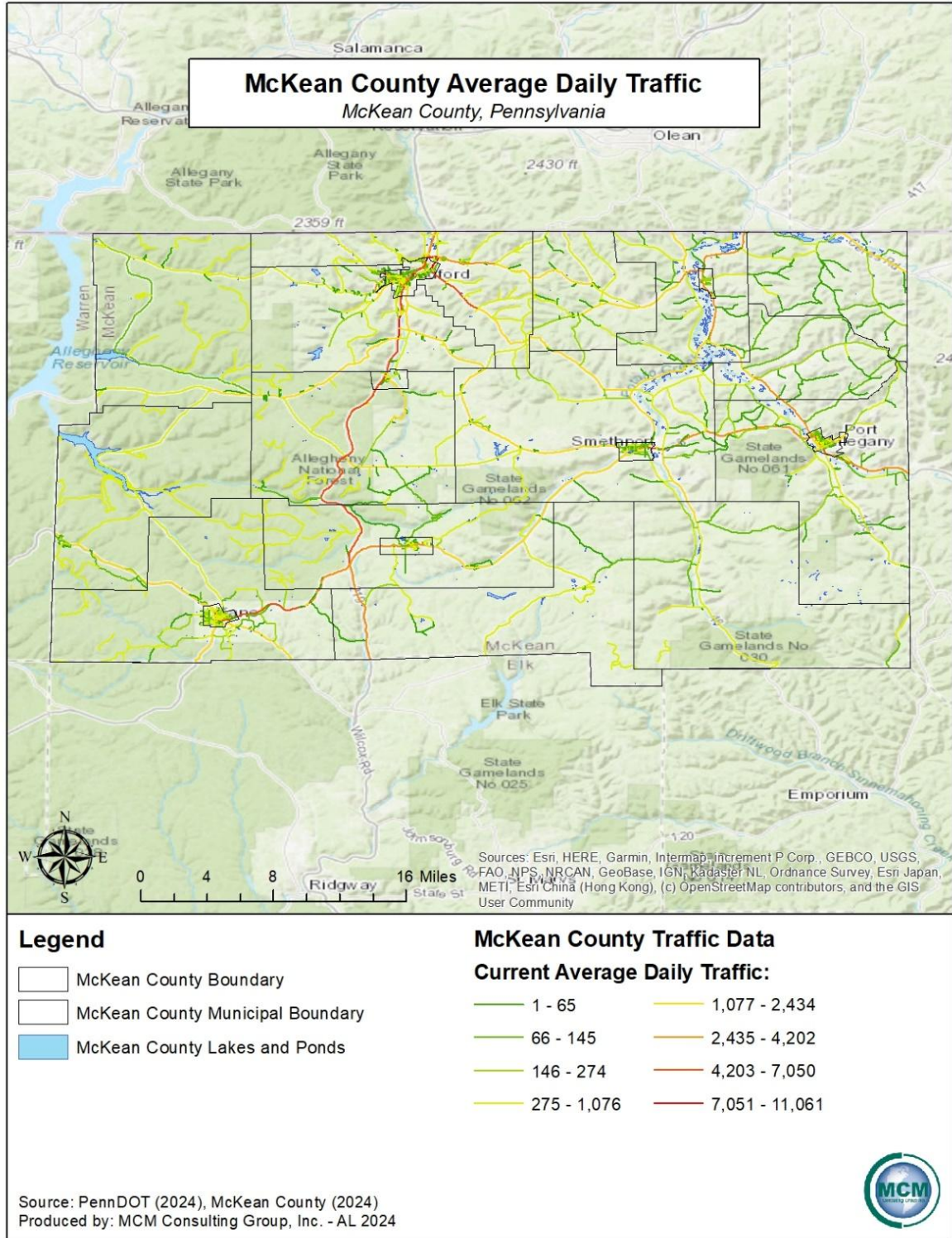
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 56 - Airports and Vulnerability Zones



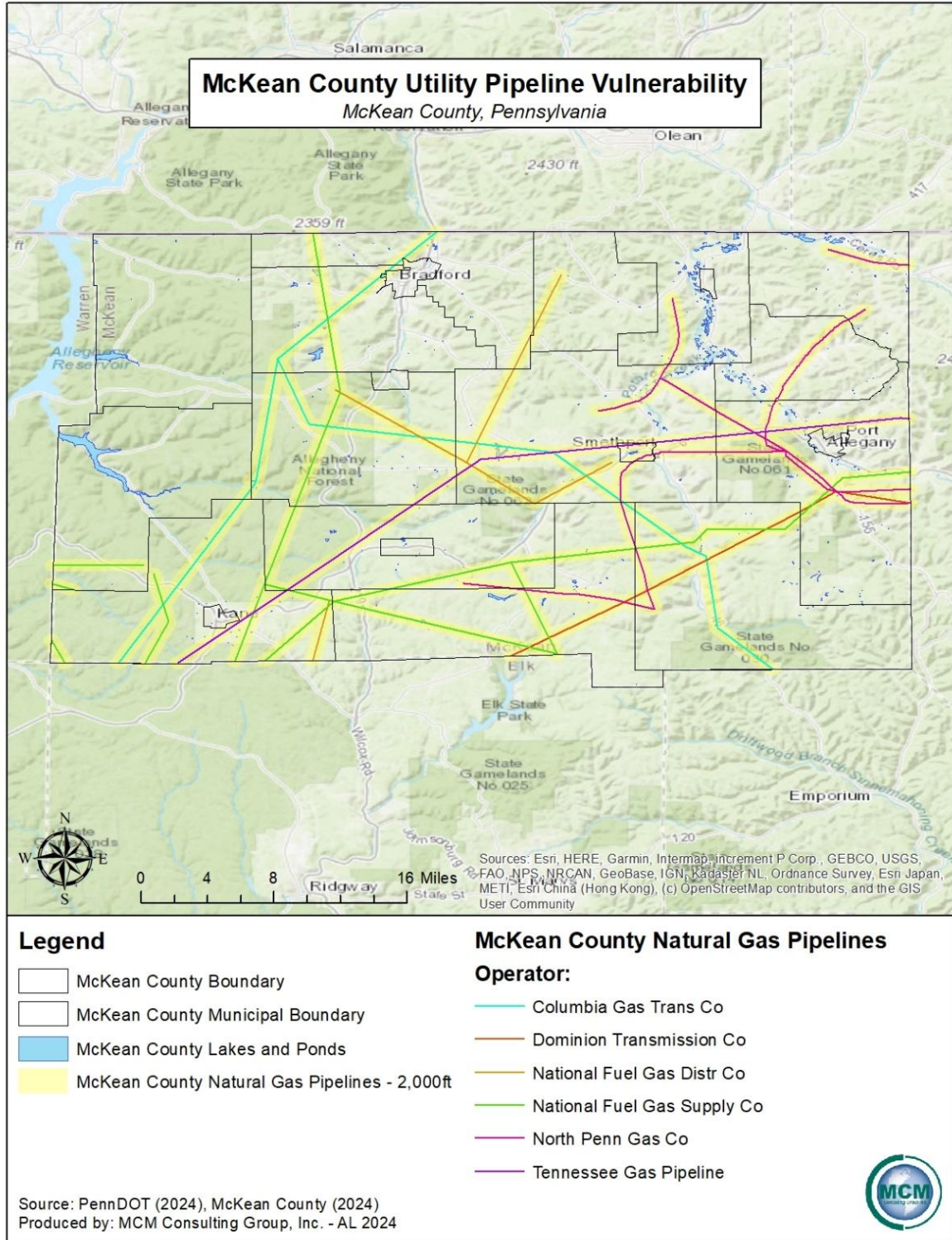
# McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Figure 57 - Average Daily Traffic on Major Highway Vulnerability



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Figure 58 - Utility Pipelines Vulnerability



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#### **4.3.22. Urban Fire and Explosion**

##### **4.3.22.1 Location and Extent**

Urban fire and explosion hazards incorporate vehicle and building/ structure fires, as well as overpressure ruptures, overheat explosions, or other explosions that do not ignite. Statewide, this hazard is most problematic in the denser, and more urbanized areas, occurring most often in residential structures (US Fire Administration, 2009). Urban fires can more easily spread from building to building in denser urban areas.

According to the U.S. Census Bureau, 2020 U.S. Census, McKean County has approximately 19,530 housing units. Buildings that were constructed fifty or more years ago are at a higher risk of urban fires due to improvement in fire safety engineering practices. Nearly 36.6% of all structures in McKean County were built before 1939, with a majority of housing units built before 1953.

Fires can start from numerous causes including human errors or electrical malfunctions. Most fires are small and have little impact on the greater community other than possibly increasing insurance rates. Oftentimes large urban fires are the result of other hazards such as storms, droughts, transportation accidents, hazardous material spills, arson, or terrorism.

Natural gas exploration and extraction sites can be associated with fires and explosion events. Well flares regularly burn off excess gas, and if improperly managed, such activities can be dangerous for the surrounding areas.

##### **4.3.22.2 Range of Magnitude**

Urban fires can occur in any populated area, and fires affecting one structure happen quite often. Urban fires are most threatening when the fire can rapidly spread from one structure to another. McKean County is largely rural/semi-rural and does not have significant expanses of dense population.

Damage from fire and explosions ranges from minor smoke inhalation and/or water damage to the destruction of buildings. A worst-case scenario for any fire and or explosion would be in injuries and/or death of the occupants of the structures and the potential of injury or death of firefighters.

There are economic consequences related to a fire and explosion hazard, including:

- Loss in wages due to temporarily or permanently closed businesses
- Destruction and damage to business and personal assets
- Loss of tax base
- Recovery costs

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- Loss related to the ability of public, private, and non-profit entities to provide post-incident relief.

The secondary effects of urban fire and explosion events relate to the ability of public, private, and non-profit entities to provide post-incident relief. Human services agencies (community support programs, health and medical services, public assistance programs and social services) can be affected by urban fire and explosion events. Effects include causing physical damage to facilities and equipment, disruption of emergency communications, loss of health and medical facilities and supplies, and an overwhelming load of victims who are suffering from the effects of the urban fire, including loss of their home or place of business.

### **4.3.22.3 Past Occurrence**

From 1910 to 1990, the Commonwealth of Pennsylvania experienced 13 major fires in suburban and urban settings, and 10 of them occurred after 1980. Between 1978 and 1982, the average number of deaths per fire was 2.7. After October 1990, the average number of deaths per fire decreased.

As of March 2024, there were 668 active natural gas wells in McKean County (PA DEP, 2024). These locations should be closely monitored, and safety protocols should be strictly adhered to in order to avoid explosions and starting fires. McKean County utilizes a database system called WebEOC to track incidents within the county. However, no such data was available to reference for urban fires or explosions during the development of this report, and as such no detailed report of past events can be displayed at this time.

### **4.3.22.4 Future Occurrence**

Small urban fires occur regularly and usually cause little damage. Areas with greater population and an increased rate of population density are at greater risk for future urban fires and explosions. The more urban areas of McKean County include Bradford and Smethport. Any new construction must comply with PA Department of Labor's statewide uniform construction codes. One requirement in the construction codes is automatic sprinkler requirements for buildings other than one- and two-family dwellings. In most cases, this requirement will contain fires to the point of origin.

### **4.3.22.5 Vulnerability Assessment**

Fire and explosion vulnerability greatly depends on the vulnerability of other hazards. Most fires result from the secondary effect of another hazard. The probability of a fire or explosion occurring increases with population and economic growth. The natural gas industry and exploration is active and growing in McKean County, and with it comes greater risk for fire and explosion. Urban fire risk also proliferates as the use of wood burning and other alternative

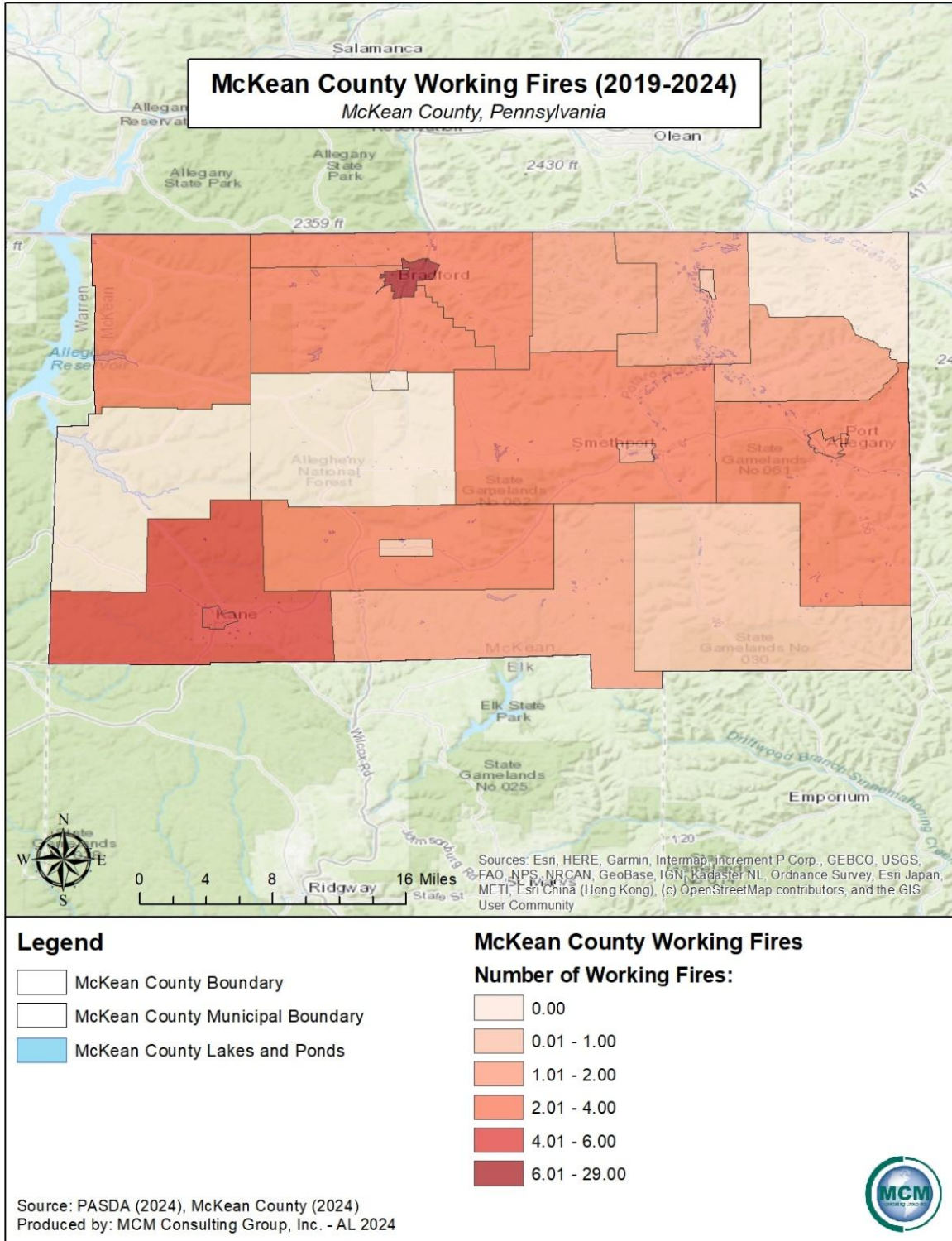
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heating sources increases. The elderly (those 65 years and older) tend to be more vulnerable to structure fires than other age groups, and often experience the highest number of deaths per fire. Older structures are more vulnerable to urban fire, and fires can spread faster to each other in areas with higher concentrations of housing. Potential secondary effects of urban fires include utility interruption and hazardous material spills. The following map *Figure 59 – McKean County Working Fires* identifies previous fires as well as which of those resulted in fatalities.

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Figure 59 - McKean County Working Fires



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### 4.3.23. Utility Interruptions

#### 4.3.23.1 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 services 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 McKean County is shown in *Table 72 – McKean County Utility Providers*.

*Table 72 - McKean County Utility Providers*

<b>McKean County Utility Providers</b>	
<b>Utility Type</b>	<b>Name of Utility Provider</b>
Electricity	Penelec, Tri-County Rural Electric Cooperative
Telephone/9-1-1/Wireless	Breezeline, Hughesnet, Verizon, Armstrong Telephone Company, Frontier Communications, Windstream
Natural Gas	Columbia Gas of Pennsylvania, National Fuel Gas Supply Corporation, Chesapeake Energy, Eastern Gas Transmission and Storage, KC Midstream Solutions, LLC., National Fuel Gas Midstream Company, LLC., Tennessee Gas Pipeline Company, L.L.C., UGI Utilities, Inc., Utility Pipeline
Water	Bradford City Water Authority, Smethport Borough Authority, Eldred Borough Water Authority, Lewis Run Borough Water Company, Rixford Water Association, Port Allegany Water

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McKean County Utility Providers	
Utility Type	Name of Utility Provider
	Department, Mt.Jewett Borough Water Department, Pennsylvania American Water Company
Source: PA Public Utility Commission, 2024	

### **4.3.23.2 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.

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### 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 McKean County workforce.

### **4.3.23.3 Past Occurrence**

Minor utility interruptions occur annually in McKean County and occur most often in conjunction with winter weather and/or windstorms. McKean County utilizes a database system called WebEOC to track incidents within the county. *Table 73 – Utility Interruptions in McKean County* illustrates the number of interruptions to electric, natural gas, telecommunications, and water services between 2018 and 2023 in McKean County.

*Table 73 - Utility Interruptions in McKean County*

Utility Interruptions in McKean County		
Date	Event Type	Municipality
11/19/2018	Boil Water Advisory	Keating Township
11/25/2018	20 Inch Water Line Break	Bradford City
12/21/2018	Power Outage	Smethport Borough
12/23/2018	Water Main Break	McKean County
01/08/2019	Power Outage Transformer Fires	Bradford Township
01/14/2019	Water Break	Bradford City
02/04/2019	PSAP Outages	McKean County
02/24/2019	Power Outages – High Winds	McKean County
06/24/2019	Power Outage	Smethport Borough
06/30/2019	Power Outage	Smethport Borough
07/20/2019	Water Main Break	McKean County
07/22/2019	Water Main Break	Bradford City
08/16/2019	Natural Gas Line Rupture	Smethport Borough

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<b>Utility Interruptions in McKean County</b>		
<b>Date</b>	<b>Event Type</b>	<b>Municipality</b>
08/27/2019	Power Outage	Port Allegany Borough
09/27/2019	Water Main Brak McKean County Jail	Smethport Borough
10/09/2019	Power Outage	Keating Township
10/17/2019	Verizon Wireless Issues	McKean County
11/07/2019	Radio System Failure	McKean County
11/22/2019	Boil Water Advisory	Norwich Township
12/05/2019	Boil Water Advisory	Bradford City
01/05/2020	Bradford City Water Leak	Bradford City
01/18/2020	MVA/Lines Down	McKean County
02/28/2020	CAD Outage	McKean County
04/23/2020	Do Not Drink Advisory	Hamlin Township
06/23/2020	Tree/Wires Down	Foster Township
06/24/2020	Boil Water Advisory	Mt. Jewett Borough
10/21/2020	Power Outage	Bradford City
11/02/2020	Gas Oder	Eldred Township
11/23/2020	Water Main Break	Bradford Township
11/25/2020	Water Line Break	Port Allegany Borough
12/01/2020	Power Outage	Hamlin Township
02/05/2021	Low Hanging Wire	Eldred Township
03/02/2021	Electrical Lines Down	Bradford Township
03/03/2021	Water Main Break	Mt. Jewett Borough
03/28/2021	Power Outage – Communications Center	Keating Township
05/14/2021	Electrical Emergency	McKean County
05/18/2021	Power Outage	Foster Township
08/21/2021	Electrical Lines Down	Sergeant Township
09/22/2021	Power Lines Down	Hamlin Township
10/21/2021	Power Outage	Smethport Borough
11/30/2021	Apartment Complex – No Heat	Bradford City
02/18/2022	Radio Outage	McKean County
05/19/2022	Water Shortage	Eldred Borough
06/02/2022	Power Outage	Kane Borough
06/29/2022	Power Outage	Keating Township
08/29/2022	BRMC – Power Failure	Bradford City
10/06/2022	911 Radio Failure	Keating Township
10/15/2022	Electrical Lines Down	Bradford Township
03/06/2023	Generator Power – Phone Failure	Keating Township
03/07/2023	Radio Outage	McKean County
03/17/2023	Boil Water Advisory	Keating Township
03/25/2023	Multiple Trees and Power Lines Down	McKean County

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<b>Utility Interruptions in McKean County</b>		
<b>Date</b>	<b>Event Type</b>	<b>Municipality</b>
03/25/2023	Power Outage – 911 Tower Site on Generator Power	Bradford Township
04/06/2023	Phone Service Failure	Keating Township
05/15/2023	911 Center Power Outage	Keating Township
06/14/2023	Verizon Pole Down	Otto Township
06/27/2023	Electrical Lines Down	Wetmore Borough
07/01/2023	Verizon Wireless Outage	Smethport Borough
07/05/2023	Electrical Lines Down	Keating Township
07/06/2023	Emergency PSAP UPS Restart	McKean County
07/21/2023	Power Outage Nursing Home	Kane Borough
09/05/2023	Power Outage BRMC AC	Bradford City
12/10/2023	Emergency Center Power Outage	Smethport Borough
12/28/2023	Power Outage	Bradford City
03/19/2024	Electrical Lines Down	Hamlin Township

Source: McKean County WebEOC, Closed Incident Data, 2024

The Pennsylvania Public Utility Commission tracks the reliability of electric distribution companies (EDC) and outages. *Table 74 – 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 74 - 2018 Winter Storms Riley and Quinn Power Outages*

<b>2018 Winter Storms Riley and Quinn Power Outages</b>			
<b>Electric Distribution Company</b>	<b>Customers affected by storms Riley and Quinn 2018 (Percentage of total customers)</b>	<b>Customers affected by Nika 2014 (Percentage of total customer)</b>	<b>Customers affected by Sandy 2012 (Percentage of total customers)</b>
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%)
<b>Total:</b>	<b>1,422,195</b>	<b>959,964</b>	<b>1,769,273</b>

Source: Winter Storm Riley and Quinn Report 2019

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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 lifeline facility 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. An attack on an electrical grid and power substations in North Carolina in December of 2022 left almost 45,000 people without power and reliant heat during the cold temperatures of January.

### **4.3.23.4 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 McKean 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.

Utility interruptions could see direct impacts based on climate change in McKean County. Prolonged heat waves caused by climate change could stress a power grid that was not specifically designed for increased heat exposure. Increased intensity of winter storms is of particular concern for the Commonwealth of Pennsylvania, as power outages can occur from lines being brought down by ice and snow.

### **4.3.23.5 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 60 – McKean County Utilities* illustrates the approximate locations of service lines and pipelines throughout McKean County.

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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.

### Electricity:

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 for the health, safety, and well-being of McKean 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 the available amount of ground water for consumption. This will result in greater well shortages and water utility interruptions for citizens that have well water.

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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.

### 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

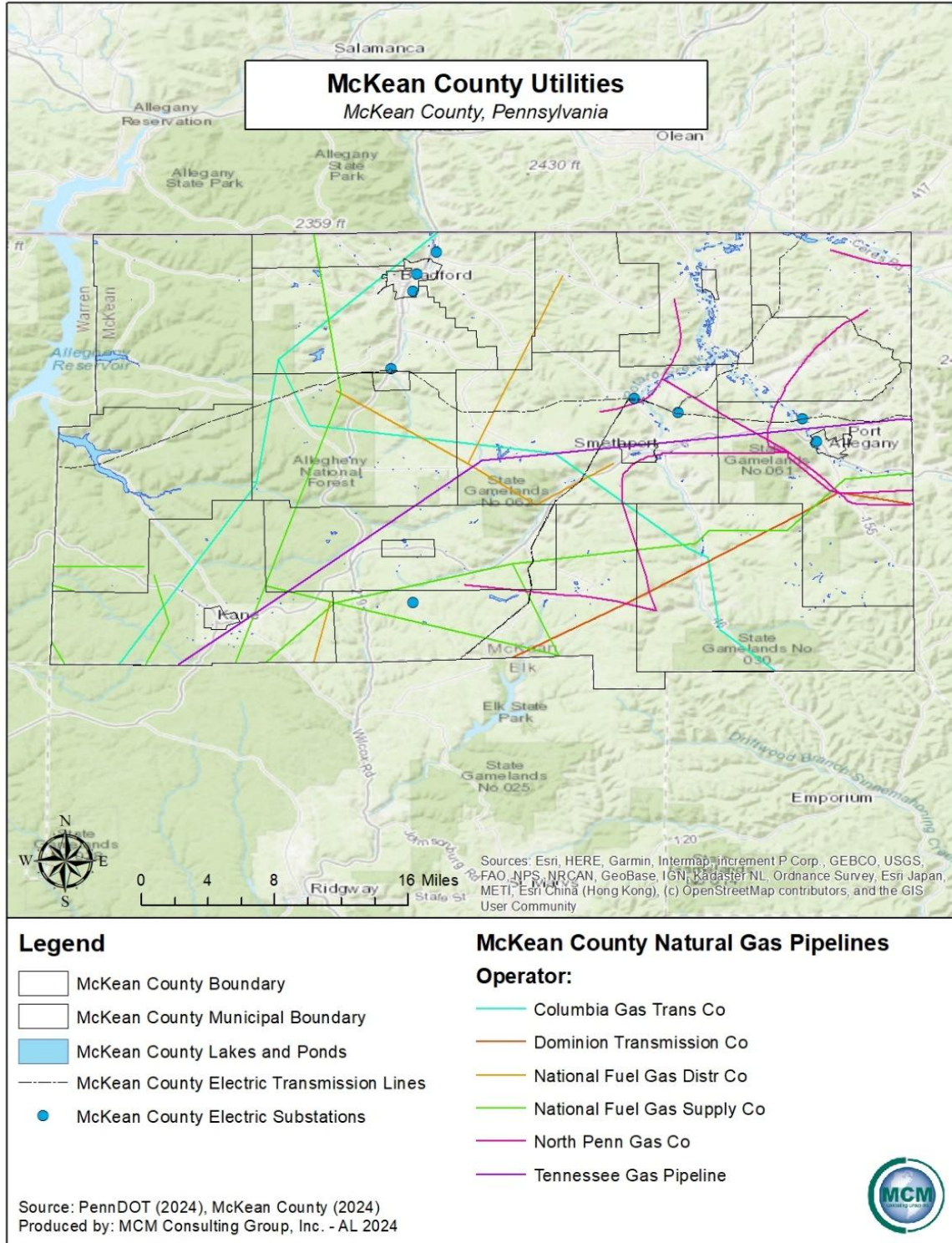
### Communications:

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 McKean 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 McKean County is 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.

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Figure 60 - McKean County Utilities



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### 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 75 – 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 75 - Risk Factor Approach Summary*

Risk Factor Value =

$$[(\text{Probability} \times .30) + (\text{Impact} \times .30) + (\text{Spatial Extent} \times .20) + (\text{Warning Time} \times .10) + (\text{Duration} \times .10)]$$

*Table 76 – 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.

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Table 76 - 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		
<b>PROBABILITY</b> <i>What is the likelihood of a hazard event occurring in a given year?</i>	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%	
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	2		
	LIKELY	BETWEEN 10 & 100% ANNUAL PROBABILITY	3		
	HIGHLY LIKELY	100% ANNUAL PROBABILITY	4		
<b>IMPACT</b> <i>In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?</i>	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%	
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2		
	CRITICAL	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.	3		
	CATASTROPHIC	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.	4		
<b>SPATIAL EXTENT</b> <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%	
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2		
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3		
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4		
<b>WARNING TIME</b> <i>Is there usually some lead time associated with the hazard event? Have warning measures been implemented?</i>	MORE THAN 24 HRS	SELF-DEFINED	<i>(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)</i>	1	10%
	12 TO 24 HRS	SELF-DEFINED		2	
	6 TO 12 HRS	SELF-DEFINED		3	
	LESS THAN 6 HRS	SELF-DEFINED		4	
<b>DURATION</b> <i>How long does the hazard event usually last?</i>	LESS THAN 6 HRS	SELF-DEFINED	<i>(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)</i>	1	10%
	LESS THAN 24 HRS	SELF-DEFINED		2	
	LESS THAN 1 WEEK	SELF-DEFINED		3	
	MORE THAN 1 WEEK	SELF-DEFINED		4	

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### 4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, *Table 77 – Risk Factor Assessment* lists the risk factor calculated for each of twenty-three potential hazards identified in the 2025 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 77 - Risk Factor Assessment

McKean County Hazard Ranking Based on Risk Factor Assessment Methodology							
Hazard Risk	Hazard Natural (N) or Human Caused (H)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		Probability	Impact	Spatial Extent	Warning Time	Duration	
<b>HIGH</b>	Substance Use Disorder	4	4	4	4	4	<b>4</b>
	Cyberterrorism	4	3	4	4	3	<b>3.6</b>
	Utility Interruption	4	3	3	4	4	<b>3.5</b>
	Emergency Services	4	3	4	1	4	<b>3.4</b>
	Invasive Species	4	3	4	1	4	<b>3.4</b>
	Environmental (Transportation)	4	3	2	4	3	<b>3.2</b>
	Tornado and Windstorm	4	3	3	2	2	<b>3.1</b>
	Winter storm	4	2	4	1	3	<b>3</b>
	Blighted Properties	4	2	2	4	4	<b>3</b>
	Extreme Temperature	4	1	4	1	3	<b>2.7</b>
	Radon Exposure	2	3	3	1	4	<b>2.6</b>
	Flood	3	3	2	1	3	<b>2.6</b>
	Subsidence and Sinkholes	4	2	1	4	1	<b>2.5</b>
	Terrorism	1	4	2	4	2	<b>2.5</b>
	Wildfire	4	1	2	4	2	<b>2.5</b>
<b>MODERATE</b>	Drought	3	1	3	1	4	<b>2.3</b>
	Urban Fire and Explosion	4	1	1	4	2	<b>2.3</b>
	Environmental Hazards (Fixed Facility)	2	2	2	4	3	<b>2.3</b>
	Disorientation	4	1	1	4	1	<b>2.2</b>
	Transportation Accidents	4	1	1	4	1	<b>2.2</b>
	Dam Failure	1	3	2	1	4	<b>2.1</b>

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<b>McKean County Hazard Ranking Based on Risk Factor Assessment Methodology</b>							
Hazard Risk	Hazard Natural (N) or Human Caused (H)	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		Probability	Impact	Spatial Extent	Warning Time	Duration	
	Pandemic and Infectious Disease	2	2	2	1	4	<b>2.1</b>
	Flash Flood	3	1	2	3	1	<b>2</b>
<b>LOW</b>	Earthquake	1	1	4	4	1	<b>1.9</b>
	Ice Jam Flood	3	1	1	2	3	<b>1.9</b>
	Civil Disturbance	2	2	1	1	2	<b>1.7</b>
	Landslide	2	1	1	4	1	<b>1.7</b>

Based on these results, there are fifteen high risk hazards, eight moderate risk hazards, and four low risk hazards in McKean 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 78 – Countywide Risk Factor Assessment* shows the different municipalities in McKean 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 the consultant based on the findings in the hazard profiles located in sections 4.3.1 through 4.3.23.

## McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Table 78 - Countywide Risk Factor

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Substance Use Disorder	Cyberterrorism	Utility Interruption	Emergency Services	Invasive Species	Environmental (Transportation)	Tornado and Windstorm	Winter storm	Blighted Properties
	4	3.6	3.5	3.4	3.4	3.2	3.1	3	3
Annin Township	=	=	=	=	=	=	=	=	=
Bradford City	=	=	=	=	=	=	=	=	=
Bradford Township	3.3	1.6	2.7	3.1	2	3.2	3.1	3.3	3.2
Ceres Township	=	=	=	=	=	=	=	=	=
Corydon Township	=	=	=	=	=	=	=	=	=
Eldred Borough	=	=	=	=	=	=	=	=	=
Eldred Township	=	=	=	=	=	=	=	=	=
Foster Township	=	=	=	=	=	=	=	=	=
Hamilton Township	3.5	1.8	3.2	3.7	2.8	2.9	3.2	3	2.2
Hamlin Township	=	=	=	=	=	=	=	=	=
Kane Borough	=	=	=	=	=	=	=	=	=
Keating Township	=	=	=	=	=	=	=	=	=
Lafayette Township	=	=	=	=	=	=	=	=	=
Lewis Run Borough	=	=	=	=	=	=	=	=	=
Liberty Township	=	=	=	=	=	=	=	=	=
Mount Jewett Borough	=	=	=	=	=	=	=	=	=
Norwich Township	=	=	=	=	=	=	=	=	=
Otto Township	=	=	=	=	=	=	=	=	=
Port Allegany Borough	=	=	=	=	=	=	=	=	=

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Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Substance Use Disorder	Cyberterrorism	Utility Interruption	Emergency Services	Invasive Species	Environmental (Transportation)	Tornado and Windstorm	Winter storm	Blighted Properties
		4	3.6	3.5	3.4	3.4	3.2	3.1	3
Sergeant Township	=	=	=	=	=	=	=	=	=
Smethport Borough	=	=	=	=	=	=	=	=	=
Wetmore Township	=	=	=	=	=	=	=	=	=

Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Extreme Temperatures	Radon Exposure	Flood	Subsidence and Sinkhole	Terrorism	Wildfire	Drought	Urban Fire and Explosion	Environmental Hazards (Fixed Facility)
		2.7	2.6	2.6	2.5	2.5	2.5	2.3	2.3
Annin Township	=	=	=	=	=	=	=	=	=
Bradford City	=	=	=	=	=	=	=	=	=
Bradford Township	2.9	1	3.3	2	1.4	3.3	2.6	2.7	2.2

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Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Extreme Temperatures	Radon Exposure	Flood	Subsidence and Sinkhole	Terrorism	Wildfire	Drought	Urban Fire and Explosion	Environmental Hazards (Fixed Facility)
	2.7	2.6	2.6	2.5	2.5	2.5	2.3	2.3	2.3
Ceres Township	=	=	=	=	=	=	=	=	=
Corydon Township	=	=	=	=	=	=	=	=	=
Eldred Borough	=	=	=	=	=	=	=	=	=
Eldred Township	=	=	=	=	=	=	=	=	=
Foster Township	=	=	=	=	=	=	=	=	=
Hamilton Township	2.1	1.6	2.5	1.9	2.4	3.4	3.4	3.2	1
Hamlin Township	=	=	=	=	=	=	=	=	=
Kane Borough	=	=	=	=	=	=	=	=	=
Keating Township	=	=	=	=	=	=	=	=	=
Lafayette Township	=	=	=	=	=	=	=	=	=
Lewis Run Borough	=	=	=	=	=	=	=	=	=
Liberty Township	=	=	=	=	=	=	=	=	=
Mount Jewett Borough	=	=	=	=	=	=	=	=	=
Norwich Township	=	=	=	=	=	=	=	=	=
Otto Township	=	=	=	=	=	=	=	=	=
Port Allegany Borough	=	=	=	=	=	=	=	=	=
Sergeant Township	=	=	=	=	=	=	=	=	=
Smethport Borough	=	=	=	=	=	=	=	=	=
Wetmore Township	=	=	=	=	=	=	=	=	=

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Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Disorientation	Transportation Accidents	Dam Failure	Pandemic and Infectious Disease	Flash Flood	Earthquake	Ice Jam Flood	Civil Disturbance	Landslide
	2.2	2.2	2.1	2.1	2	1.9	1.9	1.7	1.7
Annin Township	=	=	=	=	=	=	=	=	=
Bradford City	=	=	=	=	=	=	=	=	=
Bradford Township	2.2	2.6	2.9	=	3.3	1.7	2.3	1	2.2
Ceres Township	=	=	=	=	=	=	=	=	=
Corydon Township	=	=	=	=	=	=	=	=	=
Eldred Borough	=	=	=	=	=	=	=	=	=
Eldred Township	=	=	=	=	=	=	=	=	=
Foster Township	=	=	=	=	=	=	=	=	=
Hamilton Township	2.5	3.4	1	=	2.3	1.8	2.5	1.7	1.3
Hamlin Township	=	=	=	=	=	=	=	=	=
Kane Borough	=	=	=	=	=	=	=	=	=
Keating Township	=	=	=	=	=	=	=	=	=
Lafayette Township	=	=	=	=	=	=	=	=	=
Lewis Run Borough	=	=	=	=	=	=	=	=	=
Liberty Township	=	=	=	=	=	=	=	=	=
Mount Jewett Borough	=	=	=	=	=	=	=	=	=
Norwich Township	=	=	=	=	=	=	=	=	=
Otto Township	=	=	=	=	=	=	=	=	=
Port Allegany Borough	=	=	=	=	=	=	=	=	=
Sergeant Township	=	=	=	=	=	=	=	=	=

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Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk									
IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR									
JURISDICTION	Disorientation	Transportation Accidents	Dam Failure	Pandemic and Infectious Disease	Flash Flood	Earthquake	Ice Jam Flood	Civil Disturbance	Landslide
	2.2	2.2	2.1	2.1	2	1.9	1.9	1.7	1.7
Smethport Borough	=	=	=	=	=	=	=	=	=
Wetmore 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 McKean County. The estimation of potential loss in this assessment focuses on the monetary damage that could result from flooding. The potential

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property loss was determined for each municipality and for the entire county. The quantity of commercial and residential structures in each McKean County municipality is outlined in section 4.3.4 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 McKean County are estimated to equal \$103.11 million with 26.23% 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 \$237.92 million.

#### **4.4.4. Future Development and Vulnerability**

The 2020 census population for McKean County is 40,421 which is 3,432 fewer than the 2010 census. There was an overall decrease in population based on the data. Six municipalities have seen population increases while the remaining sixteen had decreases in the period between 2010 and the 2020, *Table 79 – 2010 – 2020 Population Change*.

*Table 79 - 2010 – 2020 Population Change*

<b>Population Change in McKean County from 2010-2020</b>			
<b>Municipality</b>	<b>2010 Census</b>	<b>2020 Census</b>	<b>Percent of Change 2010-2020</b>
Annin Township	694	709	2.20%
Bradford City	8,770	7,849	-10.50%
Bradford Township	4,805	4,793	-2.50%
Ceres Township	905	846	-6.50%
Corydon Township	275	283	2.90%
Eldred Borough	825	765	-3.60%
Eldred Township	1,592	1,394	-12.40%
Foster Township	4,316	4,038	-6.40%
Hamilton Township	543	549	1.10%
Hamlin Township	734	681	-7.20%
Kane Borough	3,730	3,630	-2.70%
Keating Township	3,021	2,725	-9.80%
Lafayette Township	2,350	1,768	-24.80%

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<b>Population Change in McKean County from 2010-2020</b>			
<b>Municipality</b>	<b>2010 Census</b>	<b>2020 Census</b>	<b>Percent of Change 2010-2020</b>
Lewis Run Borough	617	583	-5.50%
Liberty Township	1,612	1,607	-0.30%
Mount Jewett Borough	919	858	-6.60%
Norwich Township	583	501	-14.10%
Otto Township	1,556	1,516	-2.60%
Port Allegany Borough	2,157	2,135	-1.00%
Sergeant Township	141	145	2.80%
Smethport Borough	1,655	1,436	-13.20%
Wetmore Township	1,650	1,621	-1.80%

Source: United States Census Bureau (2024), 2020 Census Data

The 2022 census estimates indicates that there are approximately 19,456 housing units in McKean County, Pennsylvania. Of those, 77.4% of the structures are occupied-housing units. The county-wide population changes indicate a potential alteration to overall hazard vulnerability. Municipalities that undergo widespread population reductions may have more difficulty meeting personnel demands than expanding jurisdictions. However, certain municipalities experienced significant resident increases and, thus, may 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 McKean County Hazard Mitigation Local Planning Team will conduct annual reviews 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 or major emergency.

## **5. Capability Assessment**

### **5.1. Update Process Summary**

The capability assessment is an evaluation of McKean 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 McKean 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 twenty-two 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 McKean County, and its municipalities have the capacity to do and provides an understanding of what must be changed to mitigate loss.

McKean 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

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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**

Eighteen of the twenty-two municipalities in McKean County completed and submitted a capability assessment survey. The results of the survey were collected, aggregated, and analyzed.

Each plan participant has some ability to expand and improve upon their administrative and technical capabilities following this plan update and during an update process. The municipalities of McKean County could improve upon these capabilities by first reviewing the capability assessment forms submitted during this update process and identifying areas of growth based off of these forms. A comprehensive review is within the power of each municipality of McKean County to see what departments, commissions, boards, and staff they have available to assist in each aspect of capability assessments. Each municipality, as a plan participant, should assess if they have the ability to improve in these areas during an annual review process or during the next hazard mitigation plan update. The plan participants should also review their ability to improve the financial capabilities by reviewing funding and funding sources and researching other funding sources for hazard mitigation processes. Each plan participant can improve their education and outreach capabilities by increasing public event participation and education events that they attend in the county.

#### **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

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building codes; thereby mitigating the potential impacts of local flooding. This capability assessment details the existing McKean 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 jurisdiction of 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 McKean County adhere to the standards of the Pennsylvania Uniform Code (Act 45). All of the municipalities in McKean County have opted-in on building code enforcement, although all municipalities enforce their own code enforcement.

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### **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, and 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, to assure adequate utilities and other improvements are provided in a manner that will not pollute streams, wells and/or soils, to reduce traffic congestions, and to 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 twenty-two municipalities in McKean County, some have subdivision/land use ordinances, some have zoning regulations – some have both and some have neither (McKean County Planning Commission, June 2024).

<b>Municipality</b>	<b>Comprehensive Plan</b>	<b>Comprehensive Plan Municipalities</b>	<b>Zoning Ordinances</b>	<b>SALDO</b>	<b>County SALDO</b>	<b>SALDO Municipalities</b>
Annin Twp	No		No	No	Yes	
Bradford, City of	Yes	Bradford City, Bradford Twp, Foster Twp, Lafayette Twp, Lewis Run Boro	Yes	Yes		
Bradford Twp	Yes		Yes	Yes		
Ceres Twp	No		No	No	Yes	
Corydon Twp	No		No	No	Yes	
Eldred Boro	Yes		Yes	No	Yes	
Eldred Twp	No		No	No	Yes	
Foster Twp	Yes	Bradford City, Bradford Twp, Foster Twp, Lafayette Twp, Lewis Run Boro	Yes	Yes		

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<b>Municipality</b>	<b>Comprehensive Plan</b>	<b>Comprehensive Plan Municipalities</b>	<b>Zoning Ordinances</b>	<b>SALDO</b>	<b>County SALDO</b>	<b>SALDO Municipalities</b>
Hamilton Twp	No		No	No	Yes	
Hamlin Twp	No		No	No	Yes	
Kane Boro	Yes		Yes	No	Yes	
Keating Twp	No		No	No	Yes	
Lafayette Twp	Yes		Yes	Yes		
Lewis Run Boro	Yes		Yes	No	Yes	
Liberty Twp	No		No	No	Yes	
Mt Jewett Boro	Yes		Yes	No	Yes	
Norwich Twp	No		No	No	Yes	
Otto Twp	No		No	No	Yes	
Port Allegany Boro	No		Yes	No	Yes	
Sergeant Twp	No		No	No	Yes	
Smethport Boro	No		Yes	No	Yes	
Wetmore Twp	No		No	No	Yes	
<b>McKean County</b>	Yes		No	Yes		Annin Twp, Ceres Twp, Corydon Twp, Eldred Boro, Eldred Twp, Foster Twp, Hamilton Twp, Hamlin Twp, Kane Boro, Keating Twp, Lewis Run Boro, Liberty Twp, Mt Jewett Boro, Norwich Twp, Otto Twp, Port Allegany Boro, Sergeant Twp, Smethport Borough, Wetmore Twp

Source: McKean County DES, 2025

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### **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 regulations 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 McKean 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

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uses. The MPC also requires comprehensive plans to include a plan for community facilities and services that recommends considering storm drainage and floodplain management.

McKean County last updated its comprehensive plan in 2020.

Article III of the MPC enables municipalities to prepare a comprehensive plan: however, development of a comprehensive plan is voluntary. All twenty-two municipalities in McKean County have adopted their own comprehensive plans. Bradford City, Bradford Township and Foster Township adopted a multi-municipal comprehensive plan.

### **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.

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### **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 following.

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

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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

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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.

According to the State NFIP Coordinator, all but one of McKean County's twenty-two municipalities have floodplain regulations in place that meet requirements set forth by the NFIP. 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, sixteen municipalities submitted an NFIP survey. These surveys can be found in Appendix C of this plan.

At the time of writing this plan additional National Flood Insurance Program and Floodplain Management information for Foster Township, Keating township and Sergeant Township we not made available. It should be noted that Kane Borough does not participate in the National Flood Insurance Program.

Each community within McKean County should identify their procedures for substantial improvement and substantial damage implementation in their floodplain management ordinance. This is a concern for local municipalities and plan participants if those locations are not aware of where their floodplain management ordinance is located, or what is in the ordinance. Each municipality may have different processes and procedures in place for substantial improvement and substantial damage following an event. Floodplain management ordinance maintenance, access, and implementation can be a challenge for municipalities and local governments, and this also relates to the availability of information on SI/SD.

During this hazard mitigation plan update, a previous National Flood Insurance Program (NFIP) survey was used. This document was utilized and distributed to the municipalities prior to the "Checking In on the NFIP" document being provided to MCM Consulting Group, Inc. The "Checking In on the NFIP" document was not distributed to municipalities, so they did not have

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two separate versions of the NFIP survey. This new document will be used for future hazard mitigation plan development in McKean County.

The following table outlines the McKean County municipality floodplain administrator designees or representative. This information was retrieved from the Pennsylvania Department of Community and Economic Development at the following website: <https://dced.pa.gov/local-government/municipal-statistics/municipalities/> or <https://apps.dced.pa.gov/munstats-public/ReportInformation2.aspx?report=LocalOfficial> [Excel](#)

<b>McKean County Municipal Floodplain Administrator Designees</b>		
<b>Municipality Name</b>	<b>Position Title</b>	<b>Name or Agency</b>
Annin Township	Flood Plain Administrator	Joel Windsor
Bradford City	Flood Plain Administrator	John Peterson
Bradford Township	Flood Plain Administrator	James B. Erwin
Ceres Township	Flood Plain Administrator	Jeffery Moyer
Corydon Township	Flood Plain Administrator	Dennis Faucher
Eldred Borough	Flood Plain Administrator	Andrew Lathrop
Eldred Township	Flood Plain Administrator	Jeffrey H. Rhinehart
Foster Township	Flood Plain Administrator	Mike Cleveland
Hamilton Township	Flood Plain Administrator	Becky Davidson
Hamlin Township	Flood Plain Administrator	Russell Braun
Kane Brough	Flood Plain Administrator	Donald E. Payne
Keating Township	Flood Plain Administrator	Keating Township
Lafayette Township	Flood Plain Administrator	Kimberly Cole
Lewis Run Brough	Flood Plain Administrator	James Coldren
Liberty Township	Flood Plain Administrator	Richard Brown
Mt Jewett Borough	Flood Plain Administrator	Barbara Harp
Norwich Township	Flood Plain Administrator	James Thomas
Otto Township	Flood Plain Administrator	Jeannine E. Drummond
Port Allegany Borough	Flood Plain Administrator	Jeremy Morey
Sergeant Township	Flood Plain Administrator	Russ Braun
Smethport Borough	Flood Plain Administrator	Gregory Roundsville
Wetmore Township	Flood Plain Administrator	Stephen Dyne

This information was retrieved on 02/05/2025.

### **5.2.2. Administrative and Technical Capability**

There are six boroughs, fifteen townships, and one city within McKean County. Each of these municipalities conducts 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

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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 McKean County 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 McKean County have a municipal engineer under contract to perform these duties.

### **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

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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 McKean 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.

### **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 McKean County and its municipalities to have an emergency management coordinator.

The McKean County Department of Emergency Services 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

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- 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. 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

### **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 for 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.

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### **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. 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

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- 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.

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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.

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#### **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.

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#### **5.2.4. Education and Outreach**

The McKean County Department of Emergency Services 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 McKean 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.

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: <https://www.mckeancountypa.gov/index.php>

The McKean 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 McKean County Department of Emergency Services and the McKean County Planning Commission/ Department also post information to educate residents, particularly in disaster preparedness, floodplain management, and zoning requirements. The McKean County Planning Commission/Department currently provides access to planning documents and educational brochures about the benefits of planning and helpful guides. The DES 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 McKean County Local Planning Team will identify actions necessary to complete this.

#### **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

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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, EOPs, 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.

### **McKean County Comprehensive Plan**

#### **Overview**

Comprehensive plans establish the overall vision, goals, and objectives for a community's growth. The 2020 McKean County Comprehensive Plan was adopted by the McKean County Commissioners on February 8, 2020. The plan is a collaborative effort between the three counties in the Northern Pennsylvania Tri-County region and contains both regional priorities and action plans for each county in the region. The plan establishes countywide goals and objectives, describes environmental and demographic characteristics, identifies potential capital improvement projects, and inventories existing planning initiatives and tools in the county.

As part of the update process, the goals and objectives in the 2018 Comprehensive Plan were reviewed, and those that are currently supportive of hazard mitigation goals and principles were identified. The plan also identified opportunities to integrate goals and objectives from the 2019 Hazard Mitigation Plan and 2025 HMP Update into the next update of the comprehensive plan.

#### **Recommendations for Continued and Future Integration**

As discussed, many of the goals and objectives outlined in the McKean County Comprehensive Plan are related to the hazard mitigation risks and goals established in the HMP. Several could be revised to include updated information from this HMP. Additionally, the comprehensive plan can identify the places of higher vulnerability that are identified in this plan for all the high-risk hazards, and include objectives aimed at reducing the risk to these vulnerable areas. For example, an objective of the comprehensive plan could be to encourage elevation and flood proofing of structures in the Special Flood Hazard Area (SFHA) by seeking Flood Mitigation Assistance (FMA) grants and strictly enforcing floodplain management ordinances in certain communities (See Section 4.3.3 for Flooding and Flash Flooding information). Similarly, an objective for communities that are most vulnerable to subsidence and land failure could be to educate property owners about mine subsidence, associated risks, and actions to take in the event of an emergency. These types of objectives could also be created for medium-risk hazards when appropriate.

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Another key opportunity for further integration of hazard mitigation into planning and regulatory tools is to incorporate hazard mitigation goals and objectives into the ongoing/future McKean County Comprehensive Plan update. The McKean County Comprehensive Plan also ties into the McKean County Hazard Mitigation Plan when mitigation strategy is considered. The mitigation principles outlined in this hazard mitigation plan are used and reviewed in long-range planning throughout McKean County.

### **Recommendations for Continued and Future Integration**

There are several opportunities to integrate hazard mitigation into the county's long range transportation plan (LRTP). The plan could discuss hazards that may potentially impact the county's transportation system, such as extreme weather and other natural hazards. The plan could also inventory vulnerable assets, identify evacuation routes, and discuss the need for redundancy in the transportation network in the event of hazard or hazard event. The goals and objectives highlighted above could also be revised to address additional goals and objectives related to mitigation and added to the next update of the plan. Additionally, hazard mitigation could be discussed in more detail in the environmental mitigation chapter of the plan. Instead of solely discussing mitigation of environmental impacts of transportation projects in this section, this section could also describe how reducing impacts on the environment can mitigate hazards. For example, integrating stormwater management improvements into roadway projects not only reduces pollution in nearby waterways, but it can also alleviate the impacts of floods. Likewise, mitigating hazard impacts will help preserve transportation infrastructure throughout McKean County.

### **Integration of Hazard Mitigation into Local Mechanisms**

Integration of hazard mitigation principles into local mechanisms can be efficient for McKean County. With twenty-two municipalities, local mitigation mechanisms can directly interface with the McKean County HMP. These potential integration items include municipal comprehensive plans, municipal flood plans, or development plans for transportation and community resources. The municipalities should review the completed HMP and utilize items identified in the risk assessment, mitigation strategy, and capability assessment sections. Previously, hazard mitigation information from the McKean County plans has been integrated into other planning mechanisms. All municipalities can also utilize portions of the hazard mitigation plan into their planning mechanisms, but this can be completed under the authority of McKean County. These planning mechanisms could include comprehensive plans, flood plans, or development plans for transportation. Previous successful mitigation and plan integration has occurred in the development of comprehensive plans at the local level and this information and integration should continue through the formal update process of all plans in McKean County. This includes utilizing the previous hazard mitigation plan when municipalities are developing their own

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planning items and programs. The 2019 McKean County Hazard Mitigation Plan was not used during the development of the 2020 McKean County Comprehensive Plan (Northern Pennsylvania Tri-County Comprehensive Plan). However, this hazard mitigation plan could be utilized during the anticipated 2030 update to the tri-county comprehensive plan.

Further discussion on plan integration can be found in section 7.3 of this hazard mitigation plan.

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## 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-one objectives identified in the 2019 hazard mitigation plan. The 2025 McKean County Hazard Mitigation Plan Update contains five 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 80 – 2019 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 thirty actions identified in the 2019 mitigation strategy. A review of the 2019 mitigation actions was completed by the local planning team. The results of this review are identified in *Table 81 – 2019 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 80 - 2019 Mitigation Goals and Objectives Review*

McKean County 2019 Mitigation Goals and Objectives Review		
Goal/Objective	Description	Comment
Goal 1	<b>Attempt to reduce the current and future risk of flood damage in McKean County.</b>	<b>2024 Review Comment:</b> The verbiage of this goal was updated.
Objective 1.1	McKean County will attempt to reduce the current and future risk of flood damage in McKean County by directing new development away from high hazard areas by reviewing existing regulations to ensure adequacy in reducing the amount of	<b>2024 Review Comment:</b> No comment.

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McKean County 2019 Mitigation Goals and Objectives Review		
Goal/Objective	Description	Comment
	future development in identified hazard areas.	
Objective 1.2	Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.	<b>2024 Review Comment:</b> No comment.
Objective 1.3	Continue to leverage state Department of Community and Economic Development assistance in updating municipal floodplain ordinances that meet or exceed NFIP standards.	<b>2024 Review Comment:</b> No comment.
Objective 1.4	Improve the enforcement of existing floodplain regulations.	<b>2024 Review Comment:</b> This objective was moved into a new action.
Objective 1.5	Municipalities identify and digitally map storm sewer systems to facilitate routine maintenance.	<b>2024 Review Comment:</b> This objective was moved into a new action.
Objective 1.6	Municipalities maintain a running database of roadside ditch excavation and regular maintenance.	<b>2024 Review Comment:</b> This objective was moved into a new action.
<b>Goal 2</b>	<b>Reduce the potential impact of natural and man-made disasters on public and private property.</b>	<b>2024 Review Comment:</b> The verbiage of this goal was updated and combined with goal three.
Objective 2.1	Encourage participation in the NFIP.	<b>2024 Review Comment:</b> The verbiage was updated to focus on NFIP participation.
Objective 2.2	Protect McKean County’s most vulnerable populations, buildings, and critical facilities through the implementation of cost-effective and	<b>2024 Review Comment:</b> The verbiage of this objective was updated.

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McKean County 2019 Mitigation Goals and Objectives Review		
Goal/Objective	Description	Comment
	technically feasible mitigation projects.	
Objective 2.3	Support continued enforcement of the Uniform Construction Code in all jurisdictions.	<b>2024 Review Comment:</b> No comment.
Objective 2.4	Review existing zoning regulations and recommend municipalities that do not currently have zoning to adopt zoning.	<b>2024 Review Comment:</b> No comment.
<b>Goal 3</b>	<b>Improve upon the protection of the citizens of McKean County from all natural and man-made hazards.</b>	<b>2024 Review Comment:</b> The verbiage of this goal was updated and combined with goal two.
Objective 3.1	Evaluate existing shelters to determine adequacy for current and future populations.	<b>2024 Review Comment:</b> This objective was moved into a new action.
Objective 3.2	Promote adequate training and resources for emergency organizations and personnel.	<b>2024 Review Comment:</b> No comment.
Objective 3.3	Improve emergency preparedness in McKean County and its municipalities.	<b>2024 Review Comment:</b> No comment.
Objective 3.4	Improve coordination and communication among disaster response organizations, local, and county governments.	<b>2024 Review Comment:</b> No comment.
Objective 3.5	Evaluate cost-effective ways of augmenting existing broadcast and communication systems to monitor warning information continuously and to disseminate the appropriate warnings.	<b>2024 Review Comment:</b> No comment.

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McKean County 2019 Mitigation Goals and Objectives Review		
Goal/Objective	Description	Comment
<b>Goal 4</b>	<b>Reduce or redirect the impact of natural disasters (especially floods) away from at-risk population areas.</b>	<b>2024 Review Comment:</b> The verbiage of this goal was updated.
Objective 4.1	Research possible mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow/infiltration problems. Some projects may include reservoirs, levees, floodwalls, diversions, channel modification, and storm sewers.	<b>2024 Review Comment:</b> No comment.
<b>Goal 5</b>	<b>Protect existing natural resources and open space, including parks and wetlands, within the floodplain and watershed to improve their flood control function.</b>	<b>2024 Review Comment:</b> No comment.
Objective 5.1	Protect McKean County’s natural resources through the implementation of cost-effective and technically feasible mitigation projects.	<b>2024 Review Comment:</b> This objective was moved under goal one.
Objective 5.2	Protect McKean County’s natural resources through the implementation of recreation planning and stormwater management planning.	<b>2024 Review Comment:</b> This objective was moved under goal one.
<b>Goal 6</b>	<b>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.</b>	<b>2024 Review Comment:</b> The verbiage of this goal was updated.
Objective 6.1	Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation.	<b>2024 Review Comment:</b> No comment.

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<b>McKean County 2019 Mitigation Goals and Objectives Review</b>		
<b>Goal/Objective</b>	<b>Description</b>	<b>Comment</b>
Objective 6.2	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness.	<b>2024 Review Comment:</b> No comment.
Objective 6.3	Assist municipalities in interpreting floodplain maps and materials, and in identifying the SFHAs on the ground.	<b>2024 Review Comment:</b> No comment.

Table 81 - 2019 Mitigation Actions Review

<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions</i>  <i>(2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<i>No Progress</i>	<i>In Progress / Not Yet</i>	<i>Continuous</i>	<i>Completed</i>	<i>Discontinue</i>	
1 Elevate and/or flood-proof critical municipal infrastructure to protect against flood damage.	<b>X</b>					<b>2024 Comments:</b> No comment.
2 Encourage municipalities and responsible authorities/parties (i.e Flood Control Authorities) to maintain flood control structures along the Allegheny River and tributaries to USACE specifications and standards.		<b>X</b>				<b>2024 Comments:</b> Eldred Borough continues to seek funds for dike maintenance.  Port Allegany Borough is unable to expand dike due to logistical issues

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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
3 Conduct (1) regular stream maintenance and restorations, (2) regular maintenance, repair, and replacement of drainage infrastructure, and (3) other various infrastructures along water features to mitigate flooding, erosion, and drainage issues.		<b>X</b>				<b>2024 Comments:</b> Conservation District performs stream bank stabilization with a juvenile probation project.
4 Regularly perform maintenance on rip rap in drainage ditches to attempt to mitigate localized flooding.	<b>X</b>					<b>2024 Comments:</b> No comment.
5 Elevate Township Road 375 (Crosby Crossroad) to mitigate flooding issues.					<b>X</b>	<b>2024 Comments:</b> This was a DES recommendation.

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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
<p>6 Conduct regular maintenance on roads, culverts, and other infrastructure to mitigate flooding on or near Roadways. In conjunction with Action No. 11, coordinate with Railroad Operators to compile annual lists of railroad maintenance that may result in flooding mitigation on or near railroad lines</p>	<b>X</b>					<p><b>2024 Comments:</b> Ongoing municipal projects.</p>
<p>7 Arrange with PEMA/FEMA/DCED to hold training sessions with the County and the municipalities on the National Flood Insurance Program (NFIP), its requirements, and the Community Rating System requirements.</p>	<b>X</b>					<p><b>2024 Comments:</b> No comment.</p>

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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
<p>8 Work with PEMA to collect updated information of the number, location, and structural details of repetitive loss properties throughout the county and the municipalities in order to plan future mitigation activities and to target and prioritize at-risk structures, completing Hazard Mitigation opportunity forms and meeting with homeowners about the benefits of mitigating as appropriate. If funding becomes available perform acquisitions, demolitions, relocations, and elevations.</p>	<b>X</b>					<p><b>2024 Comments:</b> No comment.</p>
<p>9 MCPC and applicable municipal offices review comprehensive plans to suggest that designated growth areas are not in high hazard areas</p>		<b>X</b>				<p><b>2024 Comments:</b> No comment.</p>

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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
<p>10 Encourage municipal offices and the planning commissions 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. Planning Commission(s) to review Subdivision and Land Development Ordinance.</p>		<b>X</b>				<p><b>2024 Comments:</b> No comment.</p>

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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<i>No Progress</i>	<i>In Progress / Not Yet</i>	<i>Continuous</i>	<i>Completed</i>	<i>Discontinue</i>	
<p>11 Monitor maintenance of railroads through the county to ensure they are inspected and maintained and prevent transportation accidents and transportation-related hazardous material releases. Catalog and inventory completed and scheduled maintenance of railroads and railroad right of ways with the railroad operators for each calendar year. EMA &amp; GIS departments will attempt to coordinate their findings with the municipalities as it becomes available to us.</p>	<b>X</b>					<p><b>2024 Comments:</b> No comment.</p>

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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
12 Develop a database of existing hazards in GIS. Information can include maps, data, charts, past occurrences, etc. to be used in future mitigation activities. Also, establish computerized database of municipal streets that provides information regarding the condition and maintenance status of roads.			<b>X</b>			<b>2024 Comments:</b> No comment.
13 Conduct commodity flow study to fully understand hazardous materials flow in the county. Using information gathered from this study, enhance local hazardous material response capabilities through training and equipment purchases.		<b>X</b>				<b>2024 Comments:</b> A commodity flow study was being planned for 2024.
14 Encourage participation in the Ready PA initiative for municipalities and critical facilities.			<b>X</b>			<b>2024 Comments:</b> This action was promoted by DES when appropriate.

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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
<p>15 Continue to work with non-governmental organizations to promote mitigation education and awareness by creating public speaking series on hazard related topics such as types of natural disasters and risks, how to develop a family disaster plan and disaster supply kit, sheltering in place, how to develop a business continuity plan, simple types of mitigation projects for homeowners and businesses, etc.</p>			X			<p><b>2024 Comments:</b> This action was promoted by DES when appropriate.</p>
<p>16 Continue to conduct National Weather Service Skywarn training by partnering with the National Weather Service to provide training to people throughout McKean County on inclement weather events.</p>			X			<p><b>2024 Comments:</b> These sessions are conducted every two years.</p>

*McKean County, Pennsylvania  
2025 Hazard Mitigation Plan*

<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
<p>17 Maintain information and pamphlets on social media, in print media, and in public places with information and pictures that support and enhance education on risk, mitigation and preparedness, and distribute this information to municipalities when the opportunity arises Simultaneously, continue to utilize the media for the distribution and publication of hazard information by sending news releases and public service announcements to local newspapers, radio stations, and social media about pre-disaster information. Lastly, conduct community outreach that encourages precautions and preventive measures while also educating the public about various kinds of hazards.</p>	<b>X</b>					<p><b>2024 Comments:</b> No comment.</p>

*McKean County, Pennsylvania  
2025 Hazard Mitigation Plan*

<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
18 Update the county website to provide hazard related information that is easily accessible and may be expanded and updated as needed and appropriate to benefit all County residents.			<b>X</b>			<b>2024 Comments:</b> This action was promoted by DES when appropriate. Social media was utilized more than the website.
19 Promote all shelters within McKean County have adequate emergency power resources. Work with the McKean-Potter Counties Chapter of the American Red Cross towards upgrading all shelter resources.			<b>X</b>			<b>2024 Comments:</b> No comment.

*McKean County, Pennsylvania  
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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
<p>20 Develop emergency shelter and evacuation plans for animals (domestic pets and livestock) by establishing a committee of representative of all areas of the County that will include veterinarians, pet store owners, the Humane Society, animal shelters and other interested parties to work on animal-specific evacuation and sheltering needs. Simultaneously, work with CART to develop Animals in Disaster Displays that will be used at 4-H Clubs, Agricultural Fair, in Veterinarians Offices and other places that animal owners may gather. The display will have information about preparing and making a disaster plan and a disaster supply kit for animals.</p>	<b>X</b>					<p><b>2024 Comments:</b> No comment.</p>

*McKean County, Pennsylvania  
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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<i>No Progress</i>	<i>In Progress / Not Yet</i>	<i>Continuous</i>	<i>Completed</i>	<i>Discontinue</i>	
21 Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, law enforcement, and other emergency responders. Develop a list of training opportunities that are available and to distribute the list to all local emergency responders.			X			<b>2024 Comments:</b> No comment.
22 Encourage local elected officials to implement recruitment and retention initiatives to mitigate the loss of first responders. This includes reliance and utilization of the Seneca Highlands IU9 Career and Technical Center, Senate Resolution 6, and other various programs.			X			<b>2024 Comments:</b> No comment.

*McKean County, Pennsylvania  
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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
23 Implement curriculum at the Seneca Highlands Career and Technical Center Essential Services Program pertaining to hazard mitigation education and awareness, provide information on emergency alert systems and discuss ways to better integrate mitigation into the curriculum.				<b>X</b>		<b>2024 Comments:</b> This program is up and running and it is supported by DES.
24 Enhance emergency communication options available to municipalities to enhance telecommunication capabilities to aid in mitigation, response, and recovery from hazards.			<b>X</b>			<b>2024 Comments:</b> This action is nearing completion of partnership with PA STAR-Net.

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2025 Hazard Mitigation Plan*

<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
25 Review the existing McKean County Emergency Operations Plan (EOP) and update where necessary based on the recommendations of the McKean County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually and/or biannually.			<b>X</b>			<b>2024 Comments:</b> No comment.
26 Maintain & replace water systems to ensure fire protection capabilities and potable drinking water for residents.		<b>X</b>				<b>2024 Comments:</b> Municipal and local government systems are continually maintained and improved.
27 Develop a county-wide plan that addresses storm damage response and institutes debris and detritus removal procedures.	<b>X</b>					<b>2024 Comments:</b> No comment.

*McKean County, Pennsylvania  
2025 Hazard Mitigation Plan*

<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions  (2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<b>No Progress</b>	<b>In Progress / Not Yet</b>	<b>Continuous</b>	<b>Completed</b>	<b>Discontinue</b>	
28 Enhance the ability of refineries to notify of an emergency that requires the public to take action.	<b>X</b>					<b>2024 Comments:</b> No comment.
29 Meet with and encourage county businesses to develop a Business Continuity Plan. Raise the awareness level of WHY it is important to have a Business Continuity Plan, HOW to develop a plan, and encourage businesses to make sure that their plan fits in with the County's plan. Creating and using a display appropriate for use at local Chamber of Commerce meetings and activities, civic group events, and other business-related gatherings.	<b>X</b>					<b>2024 Comments:</b> No comment.

**McKean County, Pennsylvania  
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<b>2025 McKean County Mitigation Actions Review Worksheet</b>						
<i>Existing Mitigation Actions</i>  <i>(2019 HMP)</i>	<i>Status</i>					<i>Review Comments</i>
	<i>No Progress</i>	<i>In Progress / Not Yet</i>	<i>Continuous</i>	<i>Completed</i>	<i>Discontinue</i>	
30 Encourage municipalities to work in coordination with the McKean County Conservation District (MCCD) and their Invasive Plant Management Program (APIPMA). Also, encourage municipalities to take advantage of the training and programs hosted by the MCCD.	<b>X</b>					<b>2024 Comments:</b> 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 six goals and twenty-two corresponding objectives were developed. *Table 82 – 2025 Goals and Objectives* details the mitigation goals and objectives established for the 2025 McKean County Hazard Mitigation Plan.

*Table 82 - 2025 Goals and Objectives*

<b>McKean County 2025 Goals and Objectives</b>	
<b>Goal Objective</b>	<b>Description</b>
<b>Goal 1</b>	<b>Seek methods by which to reduce current and future flooding, flash flooding, and ice jam flooding risk, and protect existing natural resources and open space, including parks and wetlands, within the floodplain and watershed to improve their flood control function.</b>

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<b>McKean County 2025 Goals and Objectives</b>	
<b>Goal Objective</b>	<b>Description</b>
Objective 1.1	McKean County will attempt to reduce the current and future risk of flood damage in McKean County 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 hazard areas.
Objective 1.2	Review all comprehensive plans to ensure that designated growth areas are not in hazard areas
Objective 1.3	Continue to leverage state Department of Community and Economic Development assistance in updating municipal floodplain ordinances that meet or exceed NFIP standards.
Objective 1.4	Protect McKean County’s natural resources through the implementation of cost-effective and technically feasible mitigation projects.
Objective 1.5	Protect McKean County’s natural resources through the implementation of recreation planning and stormwater management planning.
<b>Goal 2</b>	<b>Reduce the deleterious effects of natural and human-caused disasters on public and private property and enhance the protection of McKean County residents from natural and human-caused hazards.</b>
Objective 2.1	Continue to encourage participation in the NFIP for participating municipalities.
Objective 2.2	Protect McKean County’s unserved, underserved, and socially vulnerable populations, as well as socially and historically significant sites through cost-effective and technically feasible mitigation projects.
Objective 2.3	Support continued enforcement of the Uniform Construction Code in all jurisdictions.
Objective 2.4	Review existing zoning regulations and recommend municipalities that do not currently have zoning to adopt zoning.
Objective 2.5	Promote adequate training and resources for emergency organizations and personnel.
Objective 2.6	Improve emergency preparedness in McKean County and its municipalities.
Objective 2.7	Improve coordination and communication among disaster response organizations, local, and county governments.
Objective 2.8	Evaluate cost-effective ways of augmenting existing broadcast and communication systems to monitor warning information continuously and to disseminate the appropriate warnings.
NEW Objective 2.9	Conduct hazard-specific vulnerability assessments.
<b>Goal 3</b>	<b>Abate the impact, or redirect the damages, associated with natural disasters (specifically floods) from impacting unserved, underserved, and socially vulnerable populations.</b>

*McKean County, Pennsylvania  
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<b>McKean County 2025 Goals and Objectives</b>	
<b>Goal Objective</b>	<b>Description</b>
Objective 3.1	Research possible mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow/infiltration problems. Some projects may include reservoirs, levees, floodwalls, diversions, channel modification, and storm sewers.
<b>Goal 4</b>	<b>Enhance public health, safety, and welfare by buttressing public education and outreach efforts and by advocating individual and community responsibility in mitigating hazard risk.</b>
Objective 4.1	Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation.
Objective 4.2	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness.
Objective 4.3	Assist municipalities in interpreting floodplain maps and materials, and in identifying the SFHAs on the ground.
NEW Objective 4.4	Enhance community resilience by encouraging proactive preparedness among municipalities, residents, and other stakeholders.
<b>New GOAL 5</b>	<b>Participate in FEMA’s High-Hazard Potential Dam Program (HHPD).</b>
New Objective 5.1	Educate McKean County municipalities, property owners, and businesses about FEMA’s HHPD program.
New Objective 5.2	Reduce long-term vulnerabilities from eligible high-hazard potential dams that pose an unacceptable risk to the public.
New Objective 5.3	Identify, by area, locations in McKean County that could potentially be impacted by FEMA’s HHPD program.

Goal 5 and Objective 5.1, Objective 5.2, and Objective 5.3 relate to multiple mitigation actions in *Table 84 – 2025 Mitigation Action Plan*. Objective 5.1 relates to any mitigation actions that have a prefix of 5.1. Objective 5.2 relates to any mitigation actions that have a prefix of 5.2. Finally, Objective 5.3 relates to any mitigation actions that have a prefix of 5.3. All three of the mitigation actions are covered by Goal 5 of the goals and objectives for the 2025 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.

## *McKean County, Pennsylvania* *2025 Hazard Mitigation Plan*

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### **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 reduce 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

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- 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 83 – 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 84 – 2025 Mitigation Action Plan*.

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Table 83 - Mitigation Strategy Technique Matrix

<b>McKean County Mitigation Strategy Technique Matrix</b>				
<b>Hazard</b>	<b>MITIGATION TECHNIQUE</b>			
	<b>Planning and Regulations</b>	<b>Structure and Infrastructure</b>	<b>Natural Systems Protection</b>	<b>Education and Awareness</b>
Blighted Properties	X			X
Civil Disturbance	X			X
Dam Failure	X	X	X	X
Disorientation	X			X
Drought	X			X
Earthquake	X			X
Emergency Services	X			X
Environmental Hazards	X	X		X
Extreme Temperature	X			X
Flood, Flash Flood & Ice Jam	X	X		X
Invasive Species	X		X	X
Landslide	X			X
Pandemic and Infectious Disease	X			X
Radon Exposure	X			X
Subsidence, Sinkhole	X			X
Substance Use Disorder	X			X
Terrorism	X			X
Tornado, Windstorm	X			X
Transportation Accidents	X			X
Urban Fire & Explosion	X			X
Utility Interruption	X			X
Wildfire	X			X
Winter storm	X			X

### **6.4. Mitigation Action Plan**

The McKean County Hazard Mitigation Local Planning Team (LPT) immediately began work on the mitigation strategy section of the 2025 hazard mitigation plan (HMP) update after the risk assessment section was completed. The LPT started this section by reviewing the 2019 HMP mitigation strategy section. A review of the previous goals, objectives, actions, and project opportunities documented in the 2019 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.

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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 are included in Appendix C.

Mitigation measures for the 2025 McKean County HMP are listed in the mitigation action plan. *Table 84 – 2025 Mitigation Action Plan* is the 2025 McKean County Mitigation Action Plan. This plan outlines mitigation actions and projects that comprise a strategy for McKean 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 84 – 2025 Mitigation Action Plan* is a matrix that identifies the county and/or municipalities responsible for mitigation actions in the new mitigation action plan. *Table 85 – Municipal Hazard Mitigation Actions Checklist* shows which actions tie to specific municipalities for responsibilities. *Table 86 – Objective to Action Checklist* shows that each mitigation objective has a mitigation action item related to it. *Table 87 – 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

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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?

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- 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 with 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 not 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.

## McKean County, Pennsylvania 2025 Hazard Mitigation Plan

Table 84 - 2025 Mitigation Action Plan

McKean County 2025 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	Structure and Infrastructure	Elevate and/or flood-proof critical municipal infrastructure to protect against flood damage.	Flooding	X			2025-2030	HMGP, Local	McKean County DES Director  Bradford City, Eldred Borough, Foster Township, Liberty Township, Port Allegany Borough, Smethport Borough Representatives
1.1.2	Structure and Infrastructure	Encourage municipalities and responsible authorities/parties (i.e. Flood Control Authorities) to maintain flood control structures along the Allegheny River, and tributaries, to USACE specifications and standards.	Flooding	X			2025-2030	HMGP, Local	McKean County DES Director  Bradford City, Eldred Borough, Foster Township, Liberty Township, Port Allegany Borough, Smethport Borough Representatives

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<b>McKean County 2025 Mitigation Action Plan</b>									
<b>Action Number</b>	<b>Mitigation Actions</b>		<b>Hazard Vulnerability</b>	<b>Prioritization</b>			<b>Implementation</b>		
	<b>Category</b>	<b>Description/ Action Items</b>		<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Schedule</b>	<b>Funding</b>	<b>Local Champion</b>
1.2.1	Planning and Regulations	Encourage municipal offices and the planning commissions 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. Planning Commission(s) to review Subdivision and Land Development Ordinance.	All Hazards		X		2025-2030	Local	McKean County DES Director  McKean County Planning Commission Director
1.3.1	Planning and Regulations	Update municipal floodplain ordinances with the assistance of Department of Community and Economic Development offices.	Flooding, Flash Flooding, Ice Jam Flooding		X		2025-2030	FMA, Local	McKean County Municipal Representatives
1.4.1	Structure and Infrastructure	Conduct regular stream maintenance and restorations, and perform regular maintenance, routine repair, and replacement of drainage infrastructure and other infrastructures along water features to mitigate flooding, erosion, and drainage issues.	Flooding, Flash Flooding	X			2025-2030	FMA, BRIC, Local	McKean County Municipal Representatives
1.4.2	Planning and Regulations	Conduct regular maintenance on roads, culverts, and other infrastructure to mitigate flooding on or near roadways; coordinate with railroad operators to compile annual lists of railroad maintenance that may result in flooding mitigation on or near railroad lines.	Flooding	X			2025-2030	FMA, BRIC, Local	McKean County Municipal Representatives

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<b>McKean County 2025 Mitigation Action Plan</b>									
<b>Action Number</b>	<b>Mitigation Actions</b>		<b>Hazard Vulnerability</b>	<b>Prioritization</b>			<b>Implementation</b>		
	<b>Category</b>	<b>Description/ Action Items</b>		<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Schedule</b>	<b>Funding</b>	<b>Local Champion</b>
1.4.3	Structure and Infrastructure	Maintain & replace water systems to ensure fire protection capabilities and potable drinking water for residents.	Environmental hazards	X			2025-2030	BRIC, Local	McKean County Municipal Representatives
1.4.4	Natural Systems Protections	Continue to participate in natural system protection groups like the Allegheny Plateau Invasive Plant Management Areas (APIPMA) and the Partnerships for Regional Invasive Species Management (PRISM).	Invasive Species		X		2025-2030	Local	McKean County Conservation District Director
1.5.1	Planning and Regulations	Regularly perform maintenance on rip rap in drainage ditches to attempt to mitigate localized flooding.	Flooding	X			2025-2030	FMA, Local	McKean County Municipal Representatives
1.5.2	Planning and Regulations	Develop a database of existing hazards in GIS. Information can include maps, data, charts, past occurrences, etc. to be used in future mitigation activities. Also, establish computerized database of municipal streets that provides information regarding the condition and maintenance status of roads.	All Hazards		X		2025-2030	Local	McKean County DES Director  McKean County GIS Coordinator

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McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
1.5.3	Planning and Regulations	Develop a county-wide plan that addresses storm damage response and institutes debris and detritus removal procedures.	Environmental Hazards/ Flooding			X	2025-2030	FMA, Local	McKean County Planning Commission Director  McKean County Conservation District Director
2.1.1	Education and Awareness	Conduct outreach to municipalities to ensure continued compliance with the NFIP.	Flooding, Flash Flooding, Ice Jam Flooding			X	2025-2030	FMA, Local	McKean County DES Director

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McKean County 2025 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	Develop emergency shelter and evacuation plans for animals (domestic pets and livestock) by establishing a committee of representatives of all areas of the County that will include veterinarians, pet store owners, the Humane Society, animal shelters, and other interested parties to work on animal-specific evacuation and sheltering needs. Simultaneously, work with CART to develop Animals in Disaster Displays that will be used at 4-H Clubs, Agricultural Fairs, in Veterinarians Offices, and other places that animal owners may gather. The display will have information about preparing and making a disaster plan and a disaster supply kit for animals.	All Hazards		X		2025-2030	BRIC, Local	McKean County Municipal Representatives
2.2.2	Planning and Regulation	Review, and update, the county definition of socially vulnerable populations during annual reviews and five-year updates to better determine the location and extent of these populations throughout the county.	All Hazards			X	2025-2030	HMGP	McKean County DES Director and LPT Members
2.2.3	Planning and Regulation	Identify mobile homes, manufactured structures, and areas that could be adversely impacted by flooding events to determine if populations located in those areas are socially vulnerable.	Flood, Flash Flood		X		2025-2030	Local, FMA	McKean County DES and LPT Members

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

<b>McKean County 2025 Mitigation Action Plan</b>									
<b>Action Number</b>	<b>Mitigation Actions</b>		<b>Hazard Vulnerability</b>	<b>Prioritization</b>			<b>Implementation</b>		
	<b>Category</b>	<b>Description/ Action Items</b>		<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Schedule</b>	<b>Funding</b>	<b>Local Champion</b>
2.3.1	Planning and Regulations	Continue to enforce the Uniform Construction codes in all municipalities within McKean County.	Flooding, Flash Flooding, Ice Jam Flooding	X			2025-2030	Local	McKean County Municipal Representatives
2.4.1	Planning and Regulations	Review existing zoning regulations and recommend municipalities that do not currently have zoning to adopt zoning.	All Hazards Except; Civil Disturbance, Disorientation, Drought, Emergency Services, Invasive Species, Pandemic and Infectious Disease, Substance Use Disorder, Terrorism.			X	2025-2030	Local	McKean County DES Director  McKean County Planning Commission Director

**McKean County, Pennsylvania**  
**2025 Hazard Mitigation Plan**

McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
2.5.1	Planning and Regulations	Monitor maintenance of railroads through the county to ensure they are inspected and maintained to prevent transportation accidents and transportation-related hazardous material releases. Catalog and inventory completed and scheduled maintenance of railroads and railroad right of ways with the railroad operators for each calendar year. EMA & GIS departments will attempt to coordinate their findings with the municipalities as it becomes available to us.	Environmental Hazards			X	2025-2030	Local	McKean County Municipal Representatives
2.5.2	Planning and Regulations	Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, law enforcement, 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	2025-2030	Local	McKean County Municipal Representatives
2.5.3	Planning and Regulations	Encourage local elected officials to implement recruitment and retention initiatives to mitigate the loss of first responders. This includes reliance on, and utilization of, the Seneca Highlands IU9 Career and Technical Center, Senate Resolution 6, and other various programs.	Emergency Services		X		2025-2030	Local	McKean County DES Director

**McKean County, Pennsylvania  
2025 Hazard Mitigation Plan**

McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
2.5.4	Planning and Regulations	Review the existing McKean County Emergency Operations Plan (EOP) and update where necessary based on the recommendations of the McKean County Hazard Mitigation Plan. Include participation from all municipalities in the update process by ensuring that their EOPs are reviewed and updated annually and/or biannually.	All Hazards	X			2025-2030	Local	McKean County Municipal Representatives
2.6.1	Education and Awareness	Continue to work with non-governmental organizations to promote mitigation education and awareness by creating public speaking series on hazard related topics such as types of natural disasters and risks, how to develop a family disaster plan and disaster supply kit, sheltering in place, how to develop a business continuity plan, and simple types of mitigation projects for homeowners and businesses, etc.	All Hazards		X		2025-2030	Local	McKean County Municipal Representatives
2.7.1	Education and Awareness	Continue to conduct National Weather Service Skywarn training by partnering with the National Weather Service to provide training to people throughout McKean County on inclement weather events.	Drought, Earthquake, Extreme Temperatures, Flood, Flash Flood, Tornado, Windstorm, Winter Storm		X		2025-2030	Local	McKean County Municipal Representatives

**McKean County, Pennsylvania**  
**2025 Hazard Mitigation Plan**

McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
2.7.2	Planning and Regulations	Enhance emergency communication options available to municipalities to enhance telecommunication capabilities to aid in mitigation, response, and recovery from hazards.	All Hazards	X			2025-2030	Local	McKean County Municipal Representatives
2.7.3	Planning and Regulations	Enhance the ability of refineries to notify of an emergency that requires public action.	Emergency Services/ All Hazards		X		2025-2030	BRIC, Local	Bradford City, Bradford Township, Foster Township, Keating Township, Smethport Borough Representatives
2.8.1	Education and Awareness	Develop and maintain a warning system that allows residents to sign up to receive emergency alerts from the Department of Emergency Services.	All Hazards	X			2025-2030	Local	McKean County DES Director
2.9.1	Planning and Regulations	Conduct a commodity flow study to fully understand hazardous materials flows in the county. Using information gathered from this study, enhance local hazardous material response capabilities through training and equipment purchases.	Environmental Hazards		X		2025-2030	Local	McKean County Municipal Representatives
3.1.1	Planning and Regulations	Encourage municipalities to submit project opportunity forms during annual HMP reviews and during the five-year HMP update cycle.	All Hazards			X	2025-2030	HMPG, Local	McKean County DES Director

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
4.1.1	Education and Awareness	Maintain information and pamphlets on social media, in print media, and in public places with information and pictures that support and enhance education on risk, mitigation, and preparedness, and distribute this information to municipalities when the opportunity arises. Simultaneously, continue to utilize the media for the distribution and publication of hazard information by sending news releases and public service announcements to local newspapers, radio stations, and social media about pre-disaster information. Lastly, conduct community outreach that encourages precautions and preventive measures while also educating the public about various kinds of hazards.	All Hazards		X		2025-2030	Local	McKean County Municipal Representatives
4.1.2	Education and Awareness	Update the county website to provide hazard related information that is easily accessible and may be expanded and updated as needed and appropriate to benefit all McKean County residents.	All Hazards		X		2025-2030	Local	McKean County DES Director  McKean County IT Director

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

<b>McKean County 2025 Mitigation Action Plan</b>									
<b>Action Number</b>	<b>Mitigation Actions</b>		<b>Hazard Vulnerability</b>	<b>Prioritization</b>			<b>Implementation</b>		
	<b>Category</b>	<b>Description/ Action Items</b>		<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Schedule</b>	<b>Funding</b>	<b>Local Champion</b>
4.1.3	Education and Awareness	Promote all shelters within McKean County to have adequate emergency power resources. Work with the McKean-Potter Counties Chapter of the American Red Cross towards upgrading all shelter resources.	All Hazards	X			2025-2030	HMGP, Local	McKean County Municipal Representatives
4.1.4	Education and Awareness	Implement, and ensure the continuation of, curriculum at the Seneca Highlands Career and Technical Center Essential Services Program pertaining to hazard mitigation education and awareness, provide information on emergency alert systems, and discuss ways to better integrate mitigation into the curriculum.	All Hazards			X	2025-2030	Local	McKean County Municipal Representatives
4.2.1	Planning and Regulations	MCPC and applicable municipal offices are to review comprehensive plans and suggest that designated growth areas are not in high hazard areas identified in this plan.	Natural Hazards			X	2025-2030	HMGP, Local	McKean County Municipal Representatives
4.3.1	Planning and Regulations	Municipalities will review FIRMs/DFIRMs to identify structures within the SFHA.	Flood, Flash Flood, and Ice Jam Flood			X	2025-2030	FMA, Local	McKean County Municipal Representatives
4.4.1	Education and Awareness	Encourage participation in the Ready PA initiative for municipalities and critical facilities.	Natural Hazards		X		2025-2030	Local	McKean County Municipal Representatives except Kane Borough

**McKean County, Pennsylvania  
2025 Hazard Mitigation Plan**

McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
4.4.2	Education and Awareness	Meet with, and encourage, county businesses to develop a business continuity plan. Raise the awareness level of why it is important to develop and maintain a business continuity plan and encourage businesses to ensure that their plan aligns with the county plan. Also, create and utilize a display appropriate for use at local Chamber of Commerce meetings and activities, civic group events, and other business-related gatherings.	All Hazards			X	2025-2030	Local	McKean County Municipal Representatives
5.1.1	Education and Awareness	Distribute educational materials about the HHPD program to municipalities, communities, and county residents.	Dam Failure			X	2025-2030	HHPD, Local	McKean County DES Director  McKean County Municipal Representatives
5.2.1	Education and Awareness	Provide education on local mitigation policies and programs that address high-hazard potential dams to municipalities and county residents.	Dam Failure			X	2025-2030	HHPD, Local	McKean County DES Director

**McKean County, Pennsylvania  
2025 Hazard Mitigation Plan**

McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
5.2.2	Planning and Regulations	Ensure continued collaboration with both private and public dam owners, to ensure that their input is included in the local planning team, and the planning process for continued hazard mitigation planning.	Dam Failure			X	2025-2030	HHPD, Local	McKean County DES Director  McKean County Municipal Representatives
5.2.3	Natural Systems Protection	Research the feasibility of installing flood protection measures in areas around McKean County that would be adversely impacted by flooding from a high-hazard potential dam failure, including natural spaces, local parks, and outdoor areas.	Dam Failure	X			2025-2030	HHPD, Local	McKean County DES Director  McKean County LPT Members
5.2.4	Structure and Infrastructure	If funding becomes available, perform acquisitions, elevations, relocations, and foundation stabilization on homes and structures within areas of potential impact from a failure of a high-hazard potential dam in McKean County.	Dam Failure		X		2025-2030	HHPD, Local	McKean County DES Director  McKean County Conservation District Director

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

McKean County 2025 Mitigation Action Plan									
Action Number	Mitigation Actions		Hazard Vulnerability	Prioritization			Implementation		
	Category	Description/ Action Items		High	Medium	Low	Schedule	Funding	Local Champion
5.2.5	Structure and Infrastructure	Review the early warning systems in place for dams in McKean County. If no early warning systems are in place, research the feasibility of constructing or implementing those systems.	Dam Failure		X		2025-2030	HHPD, Local	McKean County DES Director  McKean County Conservation District Director  McKean County LPT Members
5.2.6	Planning and Regulations	Review or develop evacuation plans for the McKean County high-hazard dams.	Dam Failure		X		2025-2030	HHPD, Local	McKean County DES Director  McKean County LPT Members
5.3.1	Education and Awareness	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			2025-2030	HHPD, Local	McKean County DES Director  McKean County LPT Members

Table 85 - Municipal Hazard Mitigation Actions Checklist

Municipal Hazard Mitigation Actions Checklist								
Municipality	1.1.1	1.1.2	1.2.1	1.3.1	1.4.1	1.4.2	1.4.3	1.4.4
Annin Township				X	X	X	X	
Bradford City	X	X		X	X	X	X	
Bradford Township				X	X	X	X	

**McKean County, Pennsylvania**  
**2025 Hazard Mitigation Plan**

<b>Municipal Hazard Mitigation Actions Checklist</b>								
<b>Municipality</b>	<b>1.1.1</b>	<b>1.1.2</b>	<b>1.2.1</b>	<b>1.3.1</b>	<b>1.4.1</b>	<b>1.4.2</b>	<b>1.4.3</b>	<b>1.4.4</b>
Ceres Township				X	X	X	X	
Corydon Township				X	X	X	X	
Eldred Borough	X	X		X	X	X	X	
Eldred Township				X	X	X	X	
Foster Township	X	X		X	X	X	X	
Hamilton Township				X	X	X	X	
Hamlin Township				X	X	X	X	
Kane Borough				X	X	X	X	
Keating Township				X	X	X	X	
Lafayette Township				X	X	X	X	
Lewis Run Borough				X	X	X	X	
Liberty Township	X	X		X	X	X	X	
Mount Jewett Borough				X	X	X	X	
Norwich Township				X	X	X	X	
Otto Township				X	X	X	X	
Port Allegany Borough	X	X		X	X	X	X	
Sergeant Township				X	X	X	X	
Smethport Borough	X	X		X	X	X	X	
Wetmore Township				X	X	X	X	
McKean County		X	X					X

<b>Municipal Hazard Mitigation Actions Checklist</b>									
<b>Municipality</b>	<b>1.5.1</b>	<b>1.5.2</b>	<b>1.5.3</b>	<b>2.1.1</b>	<b>2.2.1</b>	<b>2.2.2</b>	<b>2.2.3</b>	<b>2.3.1</b>	<b>2.4.1</b>
Annin Township	X				X			X	
Bradford City	X				X			X	
Bradford Township	X				X			X	
Ceres Township	X				X			X	
Corydon Township	X				X			X	
Eldred Borough	X				X			X	
Eldred Township	X				X			X	
Foster Township	X				X			X	
Hamilton Township	X				X			X	
Hamlin Township	X				X			X	
Kane Borough	X				X			X	
Keating Township	X				X			X	
Lafayette Township	X				X			X	
Lewis Run Borough	X				X			X	
Liberty Township	X				X			X	
Mount Jewett Borough	X				X			X	

**McKean County, Pennsylvania**  
**2025 Hazard Mitigation Plan**

<b>Municipal Hazard Mitigation Actions Checklist</b>									
<b>Municipality</b>	<b>1.5.1</b>	<b>1.5.2</b>	<b>1.5.3</b>	<b>2.1.1</b>	<b>2.2.1</b>	<b>2.2.2</b>	<b>2.2.3</b>	<b>2.3.1</b>	<b>2.4.1</b>
Norwich Township	X				X			X	
Otto Township	X				X			X	
Port Allegany Borough	X				X			X	
Sergeant Township	X				X			X	
Smethport Borough	X				X			X	
Wetmore Township	X				X			X	
McKean County		X	X	X		X	X		X

<b>Municipal Hazard Mitigation Actions Checklist</b>							
<b>Municipality</b>	<b>2.5.1</b>	<b>2.5.2</b>	<b>2.5.3</b>	<b>2.5.4</b>	<b>2.6.1</b>	<b>2.7.1</b>	<b>2.7.2</b>
Annin Township	X	X		X	X	X	X
Bradford City	X	X		X	X	X	X
Bradford Township	X	X		X	X	X	X
Ceres Township	X	X		X	X	X	X
Corydon Township	X	X		X	X	X	X
Eldred Borough	X	X		X	X	X	X
Eldred Township	X	X		X	X	X	X
Foster Township	X	X		X	X	X	X
Hamilton Township	X	X		X	X	X	X
Hamlin Township	X	X		X	X	X	X
Kane Borough	X	X		X	X	X	X
Keating Township	X	X		X	X	X	X
Lafayette Township	X	X		X	X	X	X
Lewis Run Borough	X	X		X	X	X	X
Liberty Township	X	X		X	X	X	X
Mount Jewett Borough	X	X		X	X	X	X
Norwich Township	X	X		X	X	X	X
Otto Township	X	X		X	X	X	X
Port Allegany Borough	X	X		X	X	X	X
Sergeant Township	X	X		X	X	X	X
Smethport Borough	X	X		X	X	X	X
Wetmore Township	X	X		X	X	X	X
McKean County			X			X	

<b>Municipal Hazard Mitigation Actions Checklist</b>							
<b>Municipality</b>	<b>2.7.3</b>	<b>2.8.1</b>	<b>2.9.1</b>	<b>3.1.1</b>	<b>4.1.1</b>	<b>4.1.2</b>	<b>4.1.3</b>
Annin Township			X		X		X
Bradford City	X		X		X		X

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<b>Municipal Hazard Mitigation Actions Checklist</b>							
<b>Municipality</b>	<b>2.7.3</b>	<b>2.8.1</b>	<b>2.9.1</b>	<b>3.1.1</b>	<b>4.1.1</b>	<b>4.1.2</b>	<b>4.1.3</b>
Bradford Township	X		X		X		X
Ceres Township			X		X		X
Corydon Township			X		X		X
Eldred Borough			X		X		X
Eldred Township			X		X		X
Foster Township	X		X		X		X
Hamilton Township			X		X		X
Hamlin Township			X		X		X
Kane Borough			X		X		X
Keating Township	X		X		X		X
Lafayette Township			X		X		X
Lewis Run Borough			X		X		X
Liberty Township			X		X		X
Mount Jewett Borough			X		X		X
Norwich Township			X		X		X
Otto Township			X		X		X
Port Allegany Borough			X		X		X
Sergeant Township			X		X		X
Smethport Borough	X		X		X		X
Wetmore Township			X		X		X
McKean County		X		X		X	

<b>Municipal Hazard Mitigation Actions Checklist</b>							
<b>Municipality</b>	<b>4.1.4</b>	<b>4.2.1</b>	<b>4.3.1</b>	<b>4.4.1</b>	<b>4.4.2</b>	<b>5.1.1</b>	<b>5.2.1</b>
Annin Township	X	X	X	X	X	X	
Bradford City	X	X	X	X	X	X	
Bradford Township	X	X	X	X	X	X	
Ceres Township	X	X	X	X	X	X	
Corydon Township	X	X	X	X	X	X	
Eldred Borough	X	X	X	X	X	X	
Eldred Township	X	X	X	X	X	X	
Foster Township	X	X	X	X	X	X	
Hamilton Township	X	X	X	X	X	X	
Hamlin Township	X	X	X	X	X	X	
Kane Borough	X	X	X		X	X	
Keating Township	X	X	X	X	X	X	
Lafayette Township	X	X	X	X	X	X	
Lewis Run Borough	X	X	X	X	X	X	
Liberty Township	X	X	X	X	X	X	

**McKean County, Pennsylvania**  
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<b>Municipal Hazard Mitigation Actions Checklist</b>							
<b>Municipality</b>	<b>4.1.4</b>	<b>4.2.1</b>	<b>4.3.1</b>	<b>4.4.1</b>	<b>4.4.2</b>	<b>5.1.1</b>	<b>5.2.1</b>
Mount Jewett Borough	X	X	X	X	X	X	
Norwich Township	X	X	X	X	X	X	
Otto Township	X	X	X	X	X	X	
Port Allegany Borough	X	X	X	X	X	X	
Sergeant Township	X	X	X	X	X	X	
Smethport Borough	X	X	X	X	X	X	
Wetmore Township	X	X	X	X	X	X	
McKean County						X	X

<b>Municipal Hazard Mitigation Actions Checklist</b>						
<b>Municipality</b>	<b>5.2.2</b>	<b>5.2.3</b>	<b>5.2.4</b>	<b>5.2.5</b>	<b>5.2.6</b>	<b>5.3.1</b>
Annin Township	X					
Bradford City	X					
Bradford Township	X					
Ceres Township	X					
Corydon Township	X					
Eldred Borough	X					
Eldred Township	X					
Foster Township	X					
Hamilton Township	X					
Hamlin Township	X					
Kane Borough	X					
Keating Township	X					
Lafayette Township	X					
Lewis Run Borough	X					
Liberty Township	X					
Mount Jewett Borough	X					
Norwich Township	X					
Otto Township	X					
Port Allegany Borough	X					
Sergeant Township	X					
Smethport Borough	X					
Wetmore Township	X					
McKean County	X	X	X	X	X	X

## *McKean County, Pennsylvania 2025 Hazard Mitigation Plan*

*Table 86 - Objective to Action Checklist*

<b>Objective</b>	<b>Number of Actions</b>
Objective 1.1	2
Objective 1.2	1
Objective 1.3	1
Objective 1.4	4
Objective 1.5	3
Objective 2.1	1
Objective 2.2	3
Objective 2.3	1
Objective 2.4	1
Objective 2.5	4
Objective 2.6	1
Objective 2.7	3
Objective 2.8	1
Objective 2.9	1
Objective 3.1	1
Objective 4.1	4
Objective 4.2	1
Objective 4.3	1
Objective 4.4	2
Objective 5.1	1
Objective 5.2	6
Objective 5.3	1

*Table 87 - Actions Tied to Hazard*

<b>Actions Tied to Hazard</b>	
<b>Hazard</b>	<b>Actions Related</b>
Blighted Properties	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Civil Disturbance	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Dam Failure	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2, 5.1.1, 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.3.1

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<b>Actions Tied to Hazard</b>	
<b>Hazard</b>	<b>Actions Related</b>
Disorientation	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Drought	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.5.4, 2.6.1, 2.7.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.2
Earthquake	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Emergency Services	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.5.2, 2.5.3, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 2.9.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Environmental Hazards	1.2.1, 1.4.3, 1.5.2, 1.5.3, 2.2.1, 2.2.2, 2.4.1, 2.5.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.1, 4.4.2
Extreme Temperature	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Flash Flood	1.2.1, 1.3.1, 1.4.1, 2.1.1, 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.4.1, 2.5.4, 2.6.1, 2.7.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.3.1, 4.4.1, 4.4.2
Flood	1.1.1, 1.1.2, 1.2.1, 1.3.1, 1.4.1, 1.4.2, 1.5.1, 1.5.2, 1.5.3, 2.1.1, 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.4.1, 2.5.4, 2.6.1, 2.7.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.3.1, 4.4.1, 4.4.2
Ice Jam	1.2.1, 1.3.1, 1.5.2, 2.1.1, 2.2.1, 2.2.2, 2.3.1, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.3.1, 4.4.1, 4.4.2
Invasive Species	1.2.1, 1.4.4, 1.5.2, 2.2.1, 2.2.2, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Landslide	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2

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<b>Actions Tied to Hazard</b>	
<b>Hazard</b>	<b>Actions Related</b>
Pandemic and Infectious Disease	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Radon Exposure	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Subsidence and Sinkhole	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Substance Use Disorder	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Terrorism	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Tornado, Windstorm	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Transportation Accidents	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Urban Fire and Explosion	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Utility Interruption	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.4.2
Wildfire	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2
Winter storm	1.2.1, 1.5.2, 2.2.1, 2.2.2, 2.4.1, 2.5.4, 2.6.1, 2.7.1, 2.7.2, 2.7.3, 2.8.1, 3.1.1, 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.2.1, 4.4.1, 4.4.2

## **7. Plan Maintenance**

### **7.1. Update Process Summary**

Monitoring, evaluating, and updating this plan is critical to maintaining its value and success in McKean 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 2025 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 McKean County is the responsibility of all levels of government (i.e., county, and local), as well as the citizens of the county. The McKean 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. The Director and the Deputy Director with the McKean County Department of Emergency Services and the Emergency Management Agency will be the primary individuals responsible for reviewing and updating the plan at least once every five years. 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 McKean 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:

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- 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. The capability assessment surveys from the previous hazard mitigation plan will be reviewed and new capability assessment forms can be distributed to the municipalities during the annual review process.

Complete a review of the mitigation strategy section. Review the goals and objectives identified in the 2025 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 McKean County Department of Emergency Services will maintain a copy of these records and place them in Appendix I of this plan. McKean 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.

The McKean County local planning team should also be reviewed annually to address any changes to the membership that may have occurred over the past calendar year. The LPT can be expanded and updated with new stakeholders to address potential changes in guidance by the Commonwealth of Pennsylvania and the Federal Emergency Management Agency.

### **7.3. Continued Public Involvement**

The McKean County Department of Emergency Services will ensure that the 2025 McKean County Hazard Mitigation Plan is posted and maintained on the McKean County website and will continue to encourage public review and comment on the plan. The McKean County website that the plan will be located at is as follows: <https://www.mckeancountypa.gov/>.

The public will have access to the 2025 McKean County HMP through their local municipal office, the McKean County Planning Department, or the McKean County Department of Emergency Services. 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 McKean County are encouraged to submit their comments to elected officials and/or members of the McKean County HMP Local Planning Team. To promote public participation, the McKean County Local Planning Team will post a public comment form as well

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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 McKean County Hazard Mitigation Planning Team.

Once the McKean County 2025 Hazard Mitigation Plan is adopted by the McKean County Board of County Commissioners, the plan will be disseminated to various county agencies and local municipalities that develop and implement specific plans and ordinances. Each participating municipality will be responsible for implementing the specific recommendations in section 5.2.5, plan integration, of the capability assessment into their local planning documents including comprehensive plans, zoning ordinances, land development, and subdivision regulations. Whenever possible, the McKean County Department of Emergency Services will serve as a liaison to assist with these integrations and updates. As discussed above in section 7.2, progress on multi-jurisdictional plan integration will be addressed as part of the annual review conducted by the McKean County Local 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 2025 McKean 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**

<b>APPENDIX A:</b>	<b>References</b>
<b>APPENDIX B:</b>	<b>FEMA Local Mitigation Review Tool</b>
<b>APPENDIX C:</b>	<b>Meetings and Support Documents</b>
<b>APPENDIX D:</b>	<b>Municipal Flood Maps</b>
<b>APPENDIX E:</b>	<b>Critical and Community Lifeline Facilities</b>
<b>APPENDIX F:</b>	<b>2025 HAZUS Reports</b>
<b>APPENDIX G:</b>	<b>2025 Mitigation Project Opportunities</b>
<b>APPENDIX H:</b>	<b>2025 Mitigation Action Evaluation &amp; Prioritization</b>
<b>APPENDIX I:</b>	<b>Annual Review Documentation</b>
<b>APPENDIX J:</b>	<b>McKean County &amp; Municipal Adoption Resolutions</b>