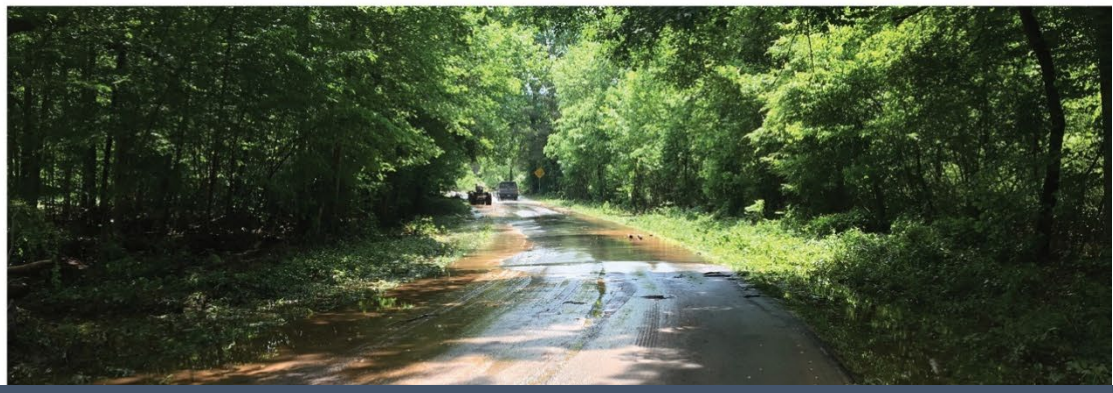
2027
BERKELEY & MORGAN COUNTIES HAZARD MITIGATION PLAN









Region 9

PREPARED FOR

Eastern Panhandle Regional Planning and
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CERTIFICATION OF ANNUAL REVIEW MEETINGS

Year	Date of Meeting	Public Outreach Addressed?*	Signature
2022	N/A	N/A	To the best knowledge of the Berkeley and Morgan Counties Hazard Mitigation Steering Committee (HMSC) no HMP meetings were held before the beginning of the HMP Update process. See **Section 3** of the Berkeley and Morgan Counties HMP Update for details regarding the meetings held during this process.
2023	N/A	N/A	
2024	N/A	N/A	
2025	N/A	N/A	
2026	See Section 3	See Section 3	
2027	See Section 3	See Section 3	

**Confirm here annually and describe on record of changes page.*

RECORD OF CHANGES

Date	Description Of Change Made, Mitigation Action Completed, Or Public Outreach Performed	Change Made By (Print Name)	Change Made By (Signature)
2022-2026	To the best knowledge of the Berkeley and Morgan Counties HMSC no HMP progress reports were submitted from municipalities for the period from 2022 through 2026, although mitigation actions were accomplished in this period.	N/A	N/A

REMINDER: Please attach all associated meeting agendas, sign-in sheets, handouts, and minutes.

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Acknowledgements

Recognition and special thanks is hereby extended to the following project partners for their leadership, expertise, resources, and dedication devoted to the preparation of this 2027 hazard mitigation plan update.

Eastern Panhandle Regional (Region 9) Planning and Development Council

Steering Committee Members:

Berkeley County Council
Berkeley County Office of Homeland Security and Emergency Management
Berkeley County Planning Department
Town of Hedgesville
City of Martinsburg
Berkeley County Development Authority
Martinsburg-Berkeley County Chamber of Commerce
Berkeley County Ambulance Authority
Berkeley County E-911

Morgan County Commission
Morgan County Office of Homeland Security and Emergency Management
Morgan County Economic Development Authority
Morgan County Planning Commission
Morgan County E-911
Town of Paw Paw
Town of Bath

Consultants:

Michael Baker International
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Funding for this project was made available through the Hazard Mitigation Grant Program (HMGP) administered within West Virginia by the West Virginia Emergency Management Division (WVEMD). In addition, funding and in-kind services were also provided by the Eastern Panhandle Regional (Region 9) Planning and Development Council.

1. Introduction

1.1. Background

Across the United States, natural and human-made disasters have led to increasing levels of deaths, injuries, property damage, and interruption of business and government services. The time, money, and effort needed to recover from these disasters exhausts resources, diverting attention from important public programs and private agendas.

Berkeley and Morgan Counties in West Virginia have experienced a significant number of statewide and county-specific disaster declarations since 1954. The emergency management community, citizens, elected officials, and other stakeholders in these Counties recognize the impact of disasters on the community and have concluded that proactive efforts need to be taken to reduce the impact of natural and human-caused hazards. To that purpose, the Counties are committed to updating and maintaining the Berkeley and Morgan Counties Hazard Mitigation Plan (HMP).

"Hazard mitigation" describes actions taken to prevent or reduce the long-term risks to life and property caused by a hazard event. Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to ending the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, mitigation actions can be long-term, cost-effective measures taken to reduce the risk of loss.

To reduce the community burden from the effects of all hazards, the Counties, in partnership with a consultant and Region 9, developed the 2027 HMP Update. This plan was developed in accordance with the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 provides the legislative basis for the Federal Emergency Management Agency (FEMA) hazard mitigation planning requirements and funding before and after a hazard event.

The Berkeley and Morgan Counties HMP is updated every five years, in accordance with FEMA requirements. This 2027 plan Update is intended to enable the county and its jurisdictions to effectively plan for and reduce the potential risks of identified hazards to the health, safety and property of the residents. The 2027 update will also allow Berkeley and Morgan Counties jurisdictions to maintain their eligibility for a range of financial assistance following hazard events. The 2027 plan Update includes a thorough review and evaluation of the 2022 plan.

1.2. Purpose

This project will update the 2022 Region 9 Eastern Panhandle Regional Hazard Mitigation Plan for Berkeley and Morgan Counties, which was approved by FEMA in 2022. Region 9 will evaluate the previously identified natural hazards and risk assessments to determine if any revisions or additions are needed. The consultant will provide an updated asset inventory, risk assessment, and mapping of

critical facilities within the plan area.

This Hazard Mitigation Plan was developed for the purpose of:

- Providing a blueprint for reducing property damage and saving lives from the effects of future natural and human-caused disasters in Berkeley and Morgan Counties;
- Identifying and implementing cost-effective hazard mitigation measures in order to accomplish county goals and objectives and to raise awareness and acceptance of hazard mitigation.
- Complying with state and federal legislative requirements for county mitigation in order for the county to be eligible for federal and technical assistance from state and federal hazard mitigation programs; and
- Improving community resiliency following a disaster event.

Adoption of this plan ensures that Berkeley and Morgan Counties and participating jurisdictions continue to be eligible to apply for and receive certain federal grant funds that are administered by the State of West Virginia for FEMA. This plan complies with the requirements of the Disaster Mitigation Act of 2000 and its implementing regulations published in Title 44 of the Code of Federal Regulations (CFR) Section 201.6.

1.3. Scope

This 2027 Hazard Mitigation Plan Update has been prepared to meet requirements set forth by the Federal Emergency Management Agency (FEMA) and the West Virginia Emergency Management Division (WVEMDD) in order for Berkeley and Morgan Counties to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will be updated and maintained to address both natural and human-caused hazards determined to be probable and/or present a risk for multiple deaths/injuries and property damages to the local municipalities within the region. Updates will take place following significant disasters or at a minimum this plan will be subject to review and update on an annual basis.

In accordance with the Disaster Mitigation Act (DMA) of 2000, the HMP Update documents the following topics:

- Planning Process;
- Hazard Identification;
- Risk Assessment;
- Mitigation Strategy: Goals, Objectives, and Actions;
- Formal Adoption by the Participating Jurisdictions; and
- WVEMD and FEMA approval.

The report format is structured in accordance with the most current planning guidance from FEMA,

Local Mitigation Handbook (June 2025), and PEMA, Standard Operating Guide (SOG) (2025). PEMA guidance was consulted because there is currently no SOG for the State of West Virginia. The plan Update was led by the Hazard Mitigation Planning Team (HMPT) and informed by the Hazard Mitigation Plan Steering Committee (HMPSC). Community leaders and other agency and organizational stakeholders were invited by Region 9 to participate in the plan update process.

It should be noted that future funding for certain mitigation projects will be contingent upon having each jurisdiction in Berkeley and Morgan Counties adopt the plan after the counties adopt the Update. Any jurisdiction that does not adopt the 2027 plan Update will become ineligible for FEMA pre- and post-disaster mitigation funds.

Organization of the Plan

The 2027 Hazard Mitigation Plan Update consists of eight chapters, each focusing on a different aspect of the planning process. Chapter 1 includes the prerequisites of the plan including its purpose and scope. Chapter 2 introduces the plan update process and includes an overview of the socio-economic and demographic characteristics. Chapter 3 discusses the planning process. Chapter 4 comprises the hazard identification and risk assessment and examines vulnerability and the potential losses from the top priority hazards. Chapter 4 also includes a historic profile of hazard types and associated losses, and a vulnerability assessment, which analyzes the potential for future damages due to the hazards identified. Chapter 5 contains a capability assessment including a review of existing plans and ordinances from the counties and municipalities. Chapter 6 discusses the mitigation strategy including updated mitigation goals and objectives, mitigation actions, and the method for prioritization and implementation of mitigation actions. Chapter 7 outlines how Region 9 and its municipalities will implement the plan once it is adopted and ways to monitor progress and ensure continued public involvement. Chapter 8 includes letters of adoption by the county's Commission and the individual municipalities.

1.4. Authority and Reference

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; and
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq.
- Executive Order 12989 on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. February 1994.
- Executive Order 13985 on Advancing Racial Equity and Support for Underserved Communities

Through the Federal Government. January 2021.

- Executive Order 14008 on Tackling the Climate Crisis at Home and Abroad. January 2021.
- Executive Order 14030 on Climate-Related Financial Risk. May 2021.I

Authority for this plan originates from the following State of West Virginia source:

- West Virginia Code § 15-5 Public Safety
- WVEMDD: *West Virginia Statewide Standard Hazard Mitigation Plan Update 2023*

The following FEMA guides and reference documents were used to prepare this document:

- FEMA 386-1: Getting Started. September 2002.
- FEMA 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001.
- FEMA 386-3: Developing the Mitigation Plan. April 2003.
- FEMA 386-4: Bringing the Plan to Life. August 2003.
- FEMA 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007.
- FEMA 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005.
- FEMA 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003.
- FEMA 386-8: Multijurisdictional Mitigation Planning. August 2006.
- FEMA 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008.
- FEMA: Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials. March 2013
- FEMA: Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. January 2013.
- FEMA: National Fire Incident Reporting System 5.0: Complete Reference Guide. January 2015.
- FEMA: Hazard Mitigation Assistance Unified Guidance. February 2015.
- FEMA. Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program FAQ. June 2020.
- FEMA. Region 3 High Hazard Potential Dams: Local and Tribal Mitigation Planning Tips. July 2024.
- FEMA: Local Mitigation Planning Policy Guide. April 2025.
- FEMA: Local Mitigation Planning Handbook. June 2025.

The following additional guidance documents were used to update this plan:

- NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs*. 2007
- PEMA: *Pennsylvania's Hazard Mitigation Planning Standard Operating Guide*. 2025.

2. Community Profile

This section includes a profile of Berkeley and Morgan Counties. Information on each county's geographic profile, climate, demographic profile, and employment and industry profile are included below. While some information such as the study area boundaries and geography have remained unchanged, other information such as the demographic, employment, and industry information were updated using the latest U.S. Census, Comprehensive Plans, and other recent Economic Development Strategy and planning documents.

2.1. Geography and Environment

Berkeley County covers approximately 322 square miles and Morgan County contains about 230 square miles. The two counties are divided by Cherry Run and the Sleepy Creek Wildlife Management Area. Berkeley, Morgan, and Jefferson County are the northeastern-most counties of West Virginia and make up the Eastern Panhandle Region. This geography can be seen in Figure 2.1-1. Berkeley and Morgan Counties are within the Valley and Ridge physiographic province, an area characterized by eroded features of sedimentary rock formations seen in the steep anticlines and synclines of the Appalachian Mountains (USGS, 2015). Both counties contain two municipalities, as seen in Table 2.1-1. The County Seat for Berkeley County is Martinsburg, while the County Seat for Morgan County is Bath (Berkeley Springs).

Adjacent areas include Maryland to the north, Virginia to the south, Jefferson County east of Berkeley County, and Hampshire County southwest of Morgan County. It is important to note this region's proximity to Washington, D.C. and the National Capital Region (NCR), as Berkeley and Morgan Counties would likely receive an influx of people and major roads would receive heavy traffic if a disaster were to strike the NCR.

The most significant watercourses are the Potomac River, which forms the northern border of both counties, Opequon Creek, Cherry Run, Sleepy Creek, Back Creek, and the Cacapon River. Water bodies make up approximately 0.3 percent of Berkeley and Morgan Counties combined geographic area. Figure 2.1-2, displays the watersheds and major water areas in Berkeley and Morgan Counties, which are the Cacapon River Watershed and Potomac River Direct Drains Watershed. Figure 2.1-3 shows the average annual precipitation in Berkeley and Morgan Counties. Southeast Morgan County appears to receive the least precipitation, while an area along the southern border between Berkeley and Morgan Counties appears to receive the most.

Table 2.1-1: Municipalities Covered under 2027 HMP.

Name	Type	County
Martinsburg	City	Berkeley
Hedgesville	Town	Berkeley
Bath (Berkeley Springs)	Town	Morgan
Paw Paw	Town	Morgan

Figure 2.1-1: Basemap of Berkeley and Morgan Counties.

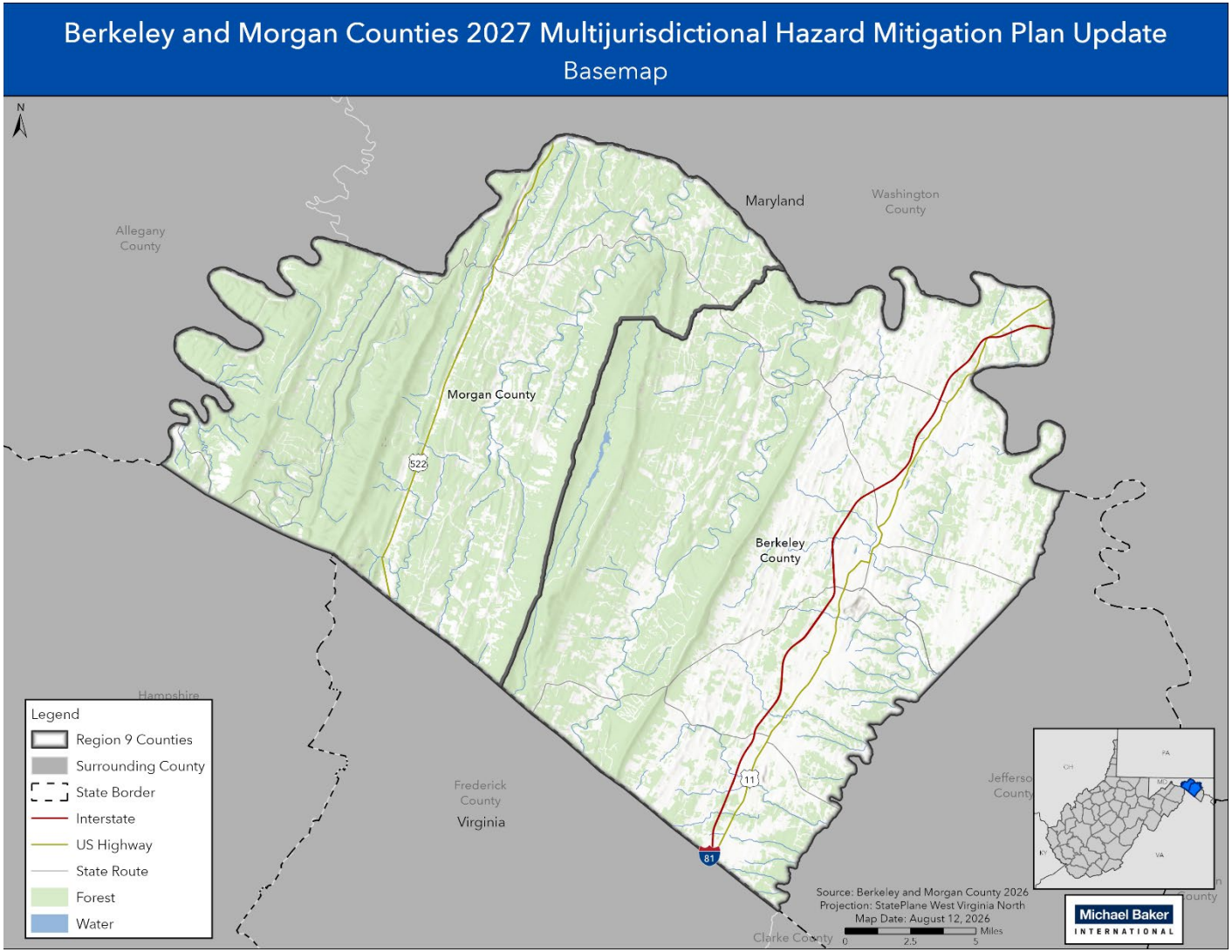
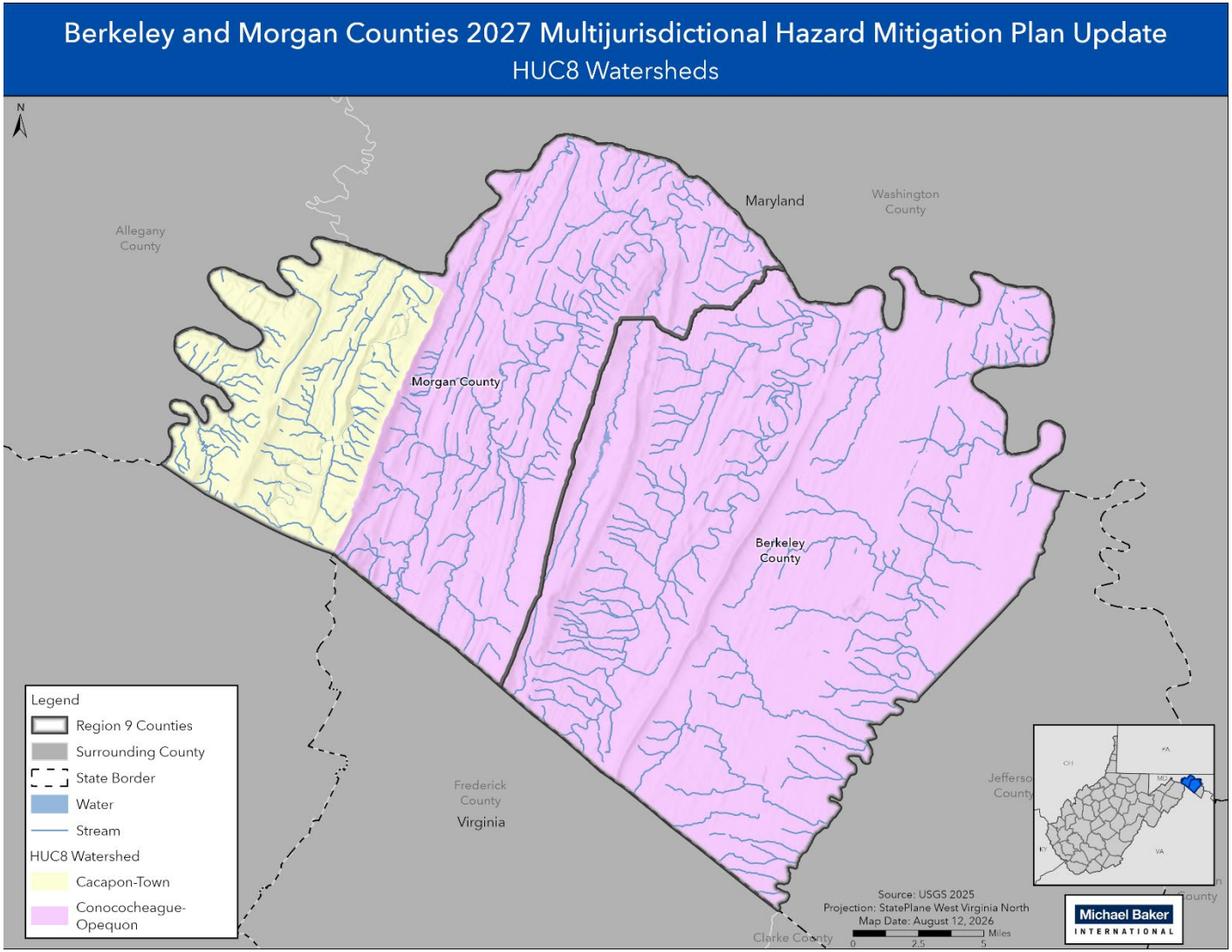


Figure 2.1-2: Watersheds of Berkeley and Morgan Counties.



2.2. Community Facts

History

Berkeley County was formed from Frederick County, Virginia in 1772 and named for Norborne Berkeley, Governor of Virginia from 1768 to 1770. The County Seat was established in the colonial village of Martinsburg, named for Thomas Bryan Martin, Lord Fairfax's nephew, and was incorporated in 1778. The arrival of the B&O Railroad in the 1840's gave Martinsburg and Berkeley County an economic boost. Today, Martinsburg continues to be the focus of the business area of Berkeley County, although continued development throughout the county, particularly in the Tabler Station, Inwood, and Spring Mills areas is altering the county's landscape. The county's economy is continuing its transition from agriculture and manufacturing to more service oriented and government related businesses. However, with the recent decision by Proctor & Gamble to develop a large manufacturing facility, it is clear manufacturing will continue to have a role in Berkeley County (Berkeley County, 2016).

Morgan County was created by an act of the Virginia General Assembly in 1820. It was formed from parts of both Berkeley and Hampshire counties, and named in honor of the revolutionary war general, Daniel Morgan. The first settlers to this area are believed to be squatters who arrived in the 1730s, with the first known cabin being built in 1745. Due to the area's popular warm springs, Lord Thomas Fairfax had the area surveyed in 1748. Due to limited growth of its public infrastructure and the scenic charm of its rural seclusion, the county experienced increasing growth along its rivers and streams into the mid-1900s (Morgan County, 2017).

Transportation

The transportation network of the region includes four main highways:

- Interstate 81
- US Route 11
- US Route 522
- WV Route 9

Several other state routes also serve as secondary transportation routes. The highways serve importance not only locally, but nationally. They serve motorists going in and out of the NCR and traveling north-south along the eastern United States.

Economy

In both counties, the economy (i.e., local work force) is driven by educational services, health care, transportation, and retail trade industries. Other industries with significant work forces vary considerably from county to county. Table 2.2-1 shows the top four industries in each county, with

the number of individuals employed by each. Furthermore, Figure 2.2-1 displays where jobs are concentrated in both counties as of 2023. Jobs are mostly concentrated in the northcentral portion of Morgan County around Bath/Berkeley Springs. Jobs are mostly concentrated along I-81 in Berkeley County (OnTheMap, 2026). Small pockets of jobs can be found throughout the counties.

Table 2.2-1: Top Industries by County, 2020-2024 American Community Survey 5-Year Estimates (US Census Bureau OnTheMap, 2026).

County (Total Employment)	Industry 1 (# of Employees)	Industry 2 (# of Employees)	Industry 3 (# of Employees)	Industry 4 (# of Employees)
Berkeley (64,653)	Educational services, health care, and social assistance (14,672)	Retail trade (7,871)	Manufacturing (8,364)	Transportation and Warehousing, and utilities (5,294)
Morgan (8,180)	Educational services, health care, and social assistance (1,758)	Retail trade (998)	Arts, Entertainment, and recreation, and accommodation and food services (464)	Construction (982)

Both Berkeley and Morgan Counties have available space for development, primarily commercial/business, but also some space for industrial development. Both counties employ Economic Development Authorities (EDAs) that work to bring development and jobs to the counties. The top employers, by jurisdiction, are as follows.

Berkeley County (Berkeley County Development Authority, 2026):

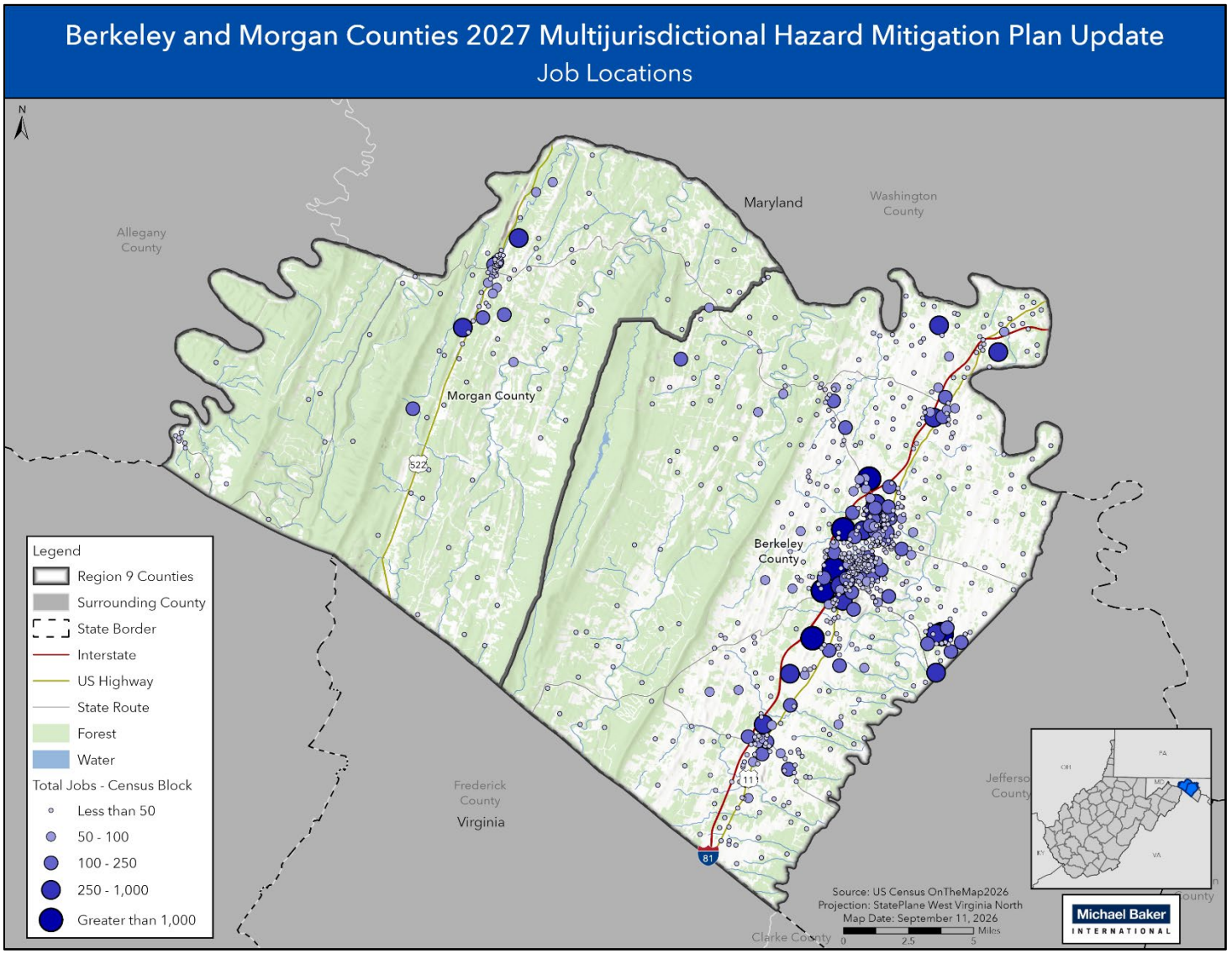
- Berkeley County Board of Education
- Berkeley County Commission
- DSV
- Macy's Corporate Services, Inc.
- Orgill
- Quad/Graphics, Inc.
- Proctor & Gamble Manufacturing Company
- Wal-Mart Associates Inc.
- WVU Medicine
- Zimmerman Associates Inc.

Morgan County (Berkeley Springs – Morgan County Chamber of Commerce):

- Morgan County Board of Education
- Valley Health Systems, Inc.
- Caperton Furniture Works, LLC.
- Berkeley Springs Center, LLC.

- West Virginia Division of Natural Resources
- U.S. Silica Company

Figure 2.4-1: Job Locations Throughout Berkeley and Morgan Counties (U.S. Census Bureau OnTheMap, 2026).



Utilities

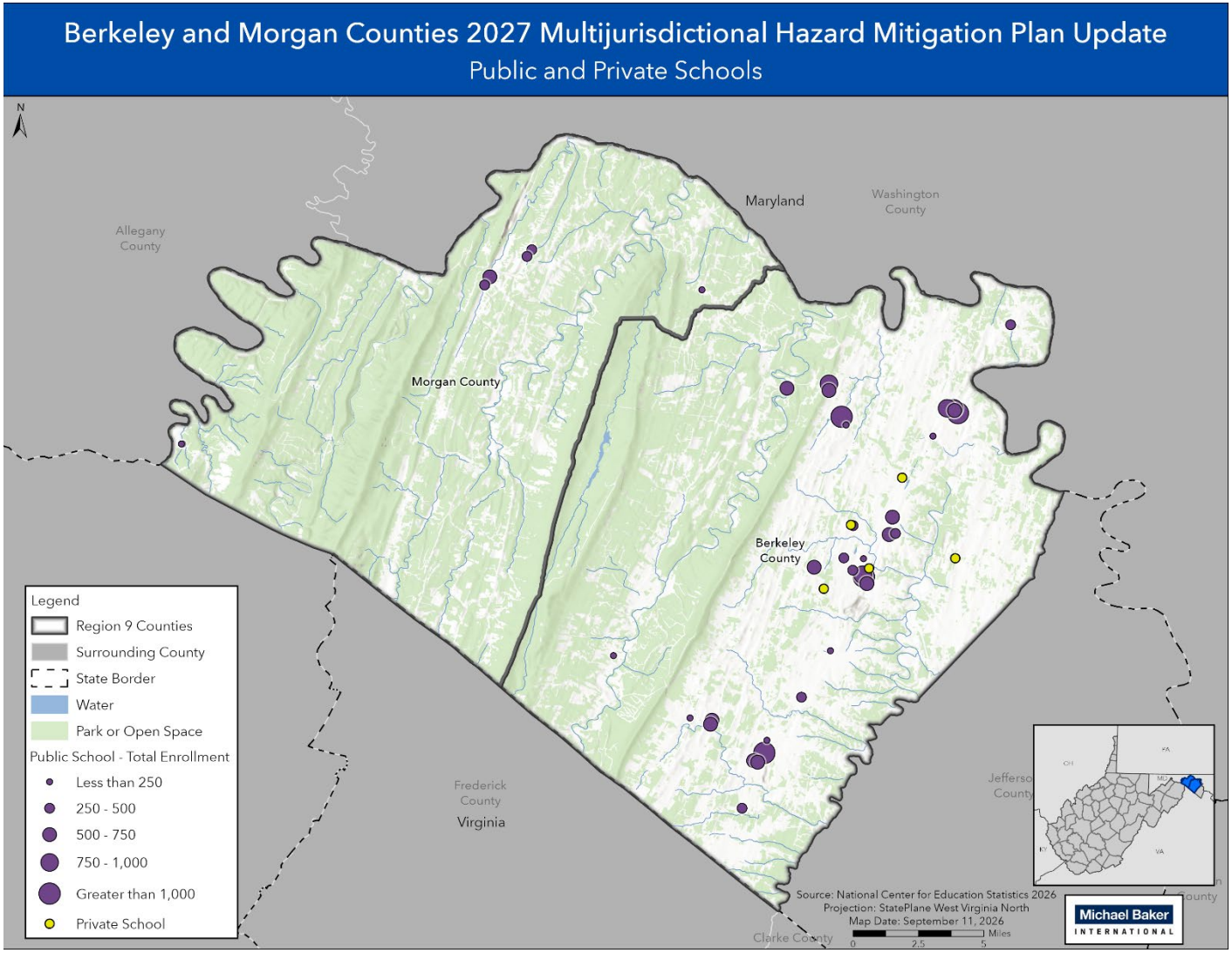
Utilities are provided by many different companies. Major utility provider breakdowns are as follows:

- Berkeley County
  - **Electricity:** Potomac Edison
  - **Natural Gas:** Mountaineer Gas
  - **Water:** Berkeley County Public Service Water District, City of Martinsburg, Valley Water and Sewer
  - **Sewer:** City of Martinsburg, Berkeley County Public Service Sewer District
  - **Telephone:** Frontier Communications
  - **Wireless carriers** are AT&T, T-Mobile, Verizon, and budget carriers. There are some areas where service is virtually non-existent.
- Morgan County
  - **Electricity:** Potomac Edison
  - **Water:** Paw Paw Water Works, Berkeley Springs Water Works
  - **Sewer:** Warm Springs Public Service District
  - **Telephone:** Frontier Communications
  - **Wireless carriers:** AT&T, T-Mobile, Verizon, and budget carriers. There are some areas where service is virtually non-existent.

Schools

There is a much larger number of schools in Berkeley County than Morgan County due to its greater population. Schools in Berkeley County are concentrated around Martinsburg and major transportation routes, especially US Route 81 and WV Route 9. Morgan County schools are concentrated around Bath, Paw Paw, US Route 522, and WV Route 9. School locations can be seen in Figure 2.2-2.

Figure 2.2-2: Public and Private Schools in Berkeley and Morgan Counties.



2.3. Population and Demographics

Table 2.3-2 shows current population estimates for Berkeley and Morgan Counties. The total population of both counties is estimated to be 146,940. Berkeley County's population is currently growing and is much younger than the population in Morgan County. According to the American Community Survey 5-year estimates (2020-2024), the median age in Berkeley County is 38.4 and in Morgan County it is 48.8. Additionally, the elderly population is growing quickly in each county. The percentage of Berkeley County's population that is age 65 and older has increased from 13.6 percent of the population in 2015 to 15.3 percent in 2024. In Morgan County, the population has increased from 21.8 percent in 2015 to 25.2 percent in 2024. With more than 25 percent of Morgan County residents being 65 years or older, the impact of hazards on elderly populations must be carefully considered. The age of the population may also impact which outreach methods work best for hazard mitigation awareness or education actions. Actions involving the internet or cell phones may exclude many seniors. Furthermore, this aging trend is contributing to a slow stagnation in the population growth of Morgan County (U.S. Census Bureau, 2024).

Table 2.3-1: Berkeley and Morgan Counties Age Distribution (U.S. Census Bureau, ACS, 2024).

Age	Berkeley County	Morgan County
Under 5 years	6.1%	4.0%
Under 18 years	23.1%	17.0%
65 years and over	15.3%	25.2%

Table 2.3-2 shows the municipalities located within each county and their corresponding population and population growth. The Martinsburg area and I-81 corridor are some of the fastest growing areas in the region. Morgan County population is also seeing some growth within the municipalities. Ethnic origins of each county can be seen in Table 2.3-3.

Table 2.3-2: Municipality Population Estimates (U.S. Census Bureau, ACS, 2014 and 2024).

Municipality	2014 Population	2024 Population	Population Change
Berkeley County	107,324	129,514	20.68%
Martinsburg	17,508	18,904	7.97%
Hedgesville	270	379	40.37%
Morgan County	17,450	17,426	-0.14
Bath	673	975	44.873%
Paw Paw	506	459	-9.28%

Table 2.3-3: Race and Ethnic Origin in Berkeley and Morgan Counties (U.S. Census Bureau, ACS, 2024).		
Race and Ethnic Origin	**Morgan County**	**Berkeley County**
White Alone	93.7%	78.74%
Black or African American Alone	<1%	6.2%
American Indian and Alaska Native Alone	<1%	0.6%
Asian Alone	<1%	1.1%
Native Hawaiian and Other Pacific Islander Alone	<1%	<1%
Two or More Races	4.8%	7.7%
Hispanic or Latino	1.8%	7.1%

The median income of households (according to 2020-2024 estimates) in Berkeley County is $82,494 and $72,179 in Morgan County. County statistics report that 12.6 percent of the Berkeley County population and 11.2 percent of the Morgan County population live in poverty. According to 2024 estimates, approximately 63,069 total housing units are estimated in both counties, with 53,819 in Berkeley County and 9,250967 in Morgan County. The median monthly housing costs for mortgaged homeowners is $1,521 in Berkeley County and $1,324 in Morgan County. The median rent is $1,233 per month in Berkeley County and $794 in Morgan County.

2.4. Equity in Hazard Mitigation Planning

When planning for natural disasters or other hazardous events, accounting for underserved and socially vulnerable communities through an equitable approach is critical for minimizing negative impacts. Social vulnerability is understood as the potential for loss within an individual or social group, recognizing that some characteristics influence an individual's or group's ability to prepare, respond, cope or recover from an event. These characteristics can overlap within populations to create heightened vulnerability, which may be compounded by infrastructure deficiencies. Looking at these communities through an equitable approach consists of ensuring the fair and just distribution of resources, opportunities, and support tailored to meet the unique needs of different groups ensuring that everyone can thrive.

Berkeley and Morgan Counties have census tracts that range from low to high in terms of challenges according to FEMA's Community Resilience Challenges Index (CRCI), as shown in Figure 2.4-1. Table 2.4-1 provides details on the challenges faced by census tracts within higher percentiles. The CRCI uses the following 22 indicators:

- Population:
    - No High School Diploma.
    - Age 65 or older.
    - Disabilities.
- Household:
    - No vehicle.
    - Limited English.
    - Single Parent Households.
    - No Smartphone.
- Housing:
    - Mobile Home Share.
    - Owner-Occupied Housing.
- Healthcare:
    - Number of Hospitals.
    - Medical Professionals per 1,000.
    - Population without Insurance.
- Economic:
    - Unemployment.
    - Income Inequality.
    - Median Household Income.
    - Unemployed Women.
    - Population Below Poverty Level.
    - Employment in Predominant Sector.
- Connection to Community:
    - Inactive Voters.
    - Civic and Social Organizations.
    - No Religious Affiliation.
    - Population Change.

Figure 2.4-1: FEMA's Community Resilience Challenges Index Applied to Berkeley and Morgan Counties.

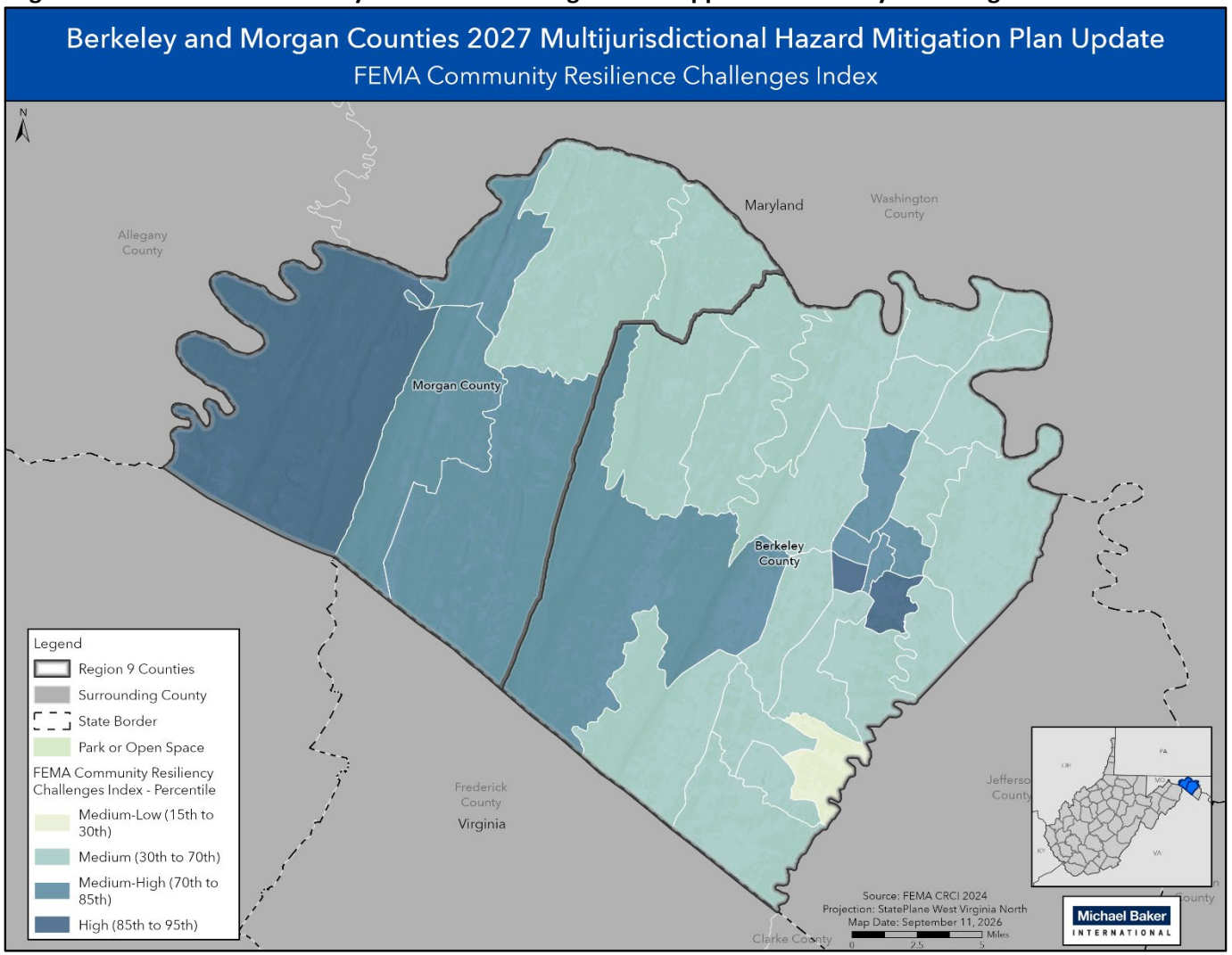


Table 2.4-1: Underserved and Socially Vulnerable Census Tracts in Berkeley and Morgan Counties (FEMA, 2024).			
Census Tract	**County**	**Challenge Percentile**	**High Indicators**
9720.02	Berkeley	90.1	No High School Diploma, Disabilities, No Vehicle, Single Parents, Mobile Home Share, Owner-Occupied Housing, Population Below Poverty Level, Median Income, Employment in Predominant Sector, No Religious Affiliation, Income Inequality
9717	Berkeley	88.6	No High School Diploma, No Vehicle, Single Parents, Uninsured, Population Below Poverty Level, Median Income, Unemployed Women, Unemployment, No Religious Affiliation
9709	Morgan	86.4	No High School Diploma, Population over 65 Years Old, Disabilites, No Smartphone, Mobile Home Share, Number of Hospitals, Population Below Poverty Level, Median Income, Unemployment, Unemployed Women, Civic and Social Organizations, No Religious Affiliation
9710.01	Morgan	84.0	Population over 65 Years Old, Disabilities, No Smartphone, Mobile Home Share, Number of Hospitals, Population Below Poverty Level, Median Income, Unemployment, Unemployed Women, Civic and Social Organizations, No Religious Affilitation
9708	Morgan	79.6	Population over 65 Years Old, Disabilities, No Vehicle, No Smartphone, Mobile Home Share, Number of Hospitals, Population Below Poverty Level, Unemployment, Unemployed Women, Median Income, Civic and Social Organizations, No Religious Affiliation
9716	Berkeley	75.0	Population over 65 Years Old, Disabilities, No Vehicle, Single Parents, Population Below Poverty, Median Income, No Religious Affiliation
9718.02	Berkeley	74.8	Population over 65 Years Old, Disabilities, No Smartphone, Mobile Home Share, Owner-Occupied Housing, Unemployed Women, Employment Predominant Sector, No Religious Affiliation
9713.01	Berkeley	73.1	No Vehicle, Mobile Home Share, Population Below Poverty, Median Income, Unemployment, Unemployed Women, No Religious Affiliation

Table 2.4-1: Underserved and Socially Vulnerable Census Tracts in Berkeley and Morgan Counties (FEMA, 2024).			
Census Tract	**County**	**Challenge Percentile**	**High Indicators**
9715	Berkeley	72.8	No High School Diploma, Population over 65 Years Old, Disabilities, No Vehicle, Single Parents, Population Below Poverty, Median Income, No Religious Affiliation
9714.02	Berkeley	72.3	No High School Diploma, Disabilities, Single Parents, Medical Professionals, Uninsured, Population Below Poverty, Median Income, Unemployment, Unemployed Women, No Religious Affiliation
9710.02	Morgan	70.3	Population over 65 Years old, Disabilities, Single Parents, No Smartphone, Mobile Home Share, Owner-Occupied Housing, Number of Hospitals, Employment in Predominant Sector, Civic and Social Organizations

The map and table show the most vulnerable census tracts, but each census tract in the county is impacted by many of the 22 indicators in the CRCI. It is important for municipalities to be aware of and understand their vulnerable populations. In each hazard profile, municipalities with communities that may be particularly vulnerable to the hazard's impacts are identified.

Incorporating equity into mitigation plans ensures that these populations receive the attention and resources necessary to reduce their risk and enhance their resilience. This approach not only addresses existing social inequalities but also leads to more effective and sustainable disaster management outcomes, ensuring that all communities can thrive despite their risks.

2.5. Land Use and Development

Most of Berkeley and Morgan Counties fall under the deciduous forest land use category, followed by hay and pasture. There are also significant amounts of open water, cultivated crops, and evergreen forest scattered across both counties. Developed land uses are found concentrated in areas of higher population density and near major travel routes. This can be seen in Figure 2.5-1.

The region continues to see significant development as a part of the National Capital Region (NCR); however, population growth and influx of industry is more apparent in Berkeley County. As such, the potential for development is likely to continue. The proximity of the I-81 and US-522 corridors help to drive this development of the region. Topography often drives development to flatter areas which are often in or near floodplains in mountainous areas. Much of the population in Berkeley County is centered in Martinsburg, along I-81. Based on the 2026 Berkeley County Comprehensive Plan, future growth is expected to remain concentrated in these urban areas around the City of Martinsburg and

the Town of Hedgesville. Based on the 2017 Morgan County Comprehensive Plan, the bulk of Morgan County's population growth continues to be in the Central Valley Region. According to the plan, the growth rate is shifting slightly towards the southern districts of Timber Ridge and Rock Gap.

With growing population and development comes a myriad of concerns for vulnerability to natural and man-made hazards. Increase in flooding may be the most cited cause of concern during development. Local floodplain development regulations carefully balance the needs for economic development and growth in the employment sector with a basic responsibility to buffer potential and existing businesses from the effects of hazards. Both counties indicated that most of the commercial and industrial development in their county is located in or near the municipalities. Several development sites have been established along the primary roadways throughout the region. Large warehouses and their associated impervious surfaces lend to increasing flood vulnerability, due to decreased permeable surfaces. In 2018, there was significant run-off issues from the P&G facility that caused flooding in a nearby subdivision. The 2026 Berkeley County Future Land Use Map can be seen in Figure 2.5-2.

Figure 2.5-1: Land Cover in Berkeley and Morgan Counties.

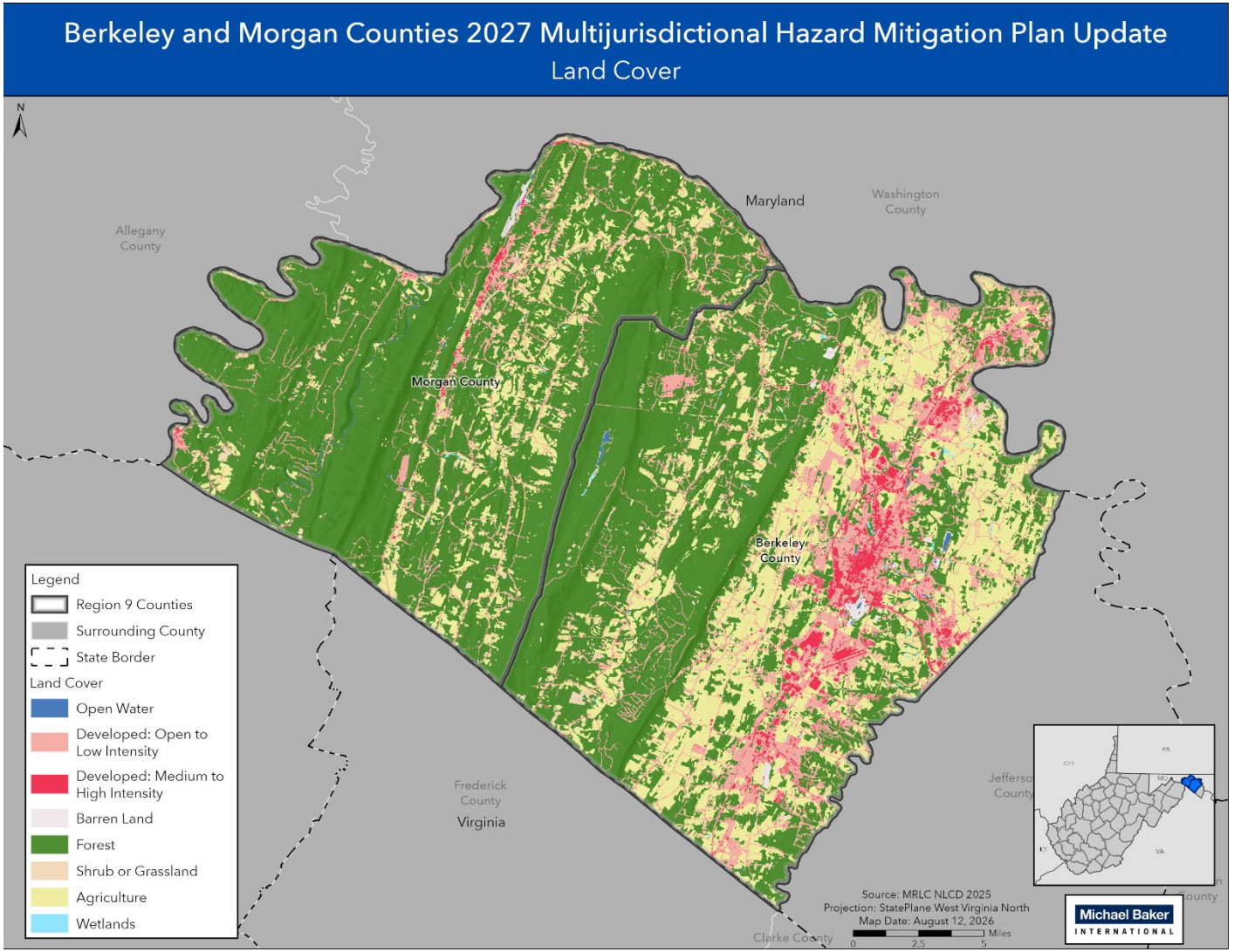
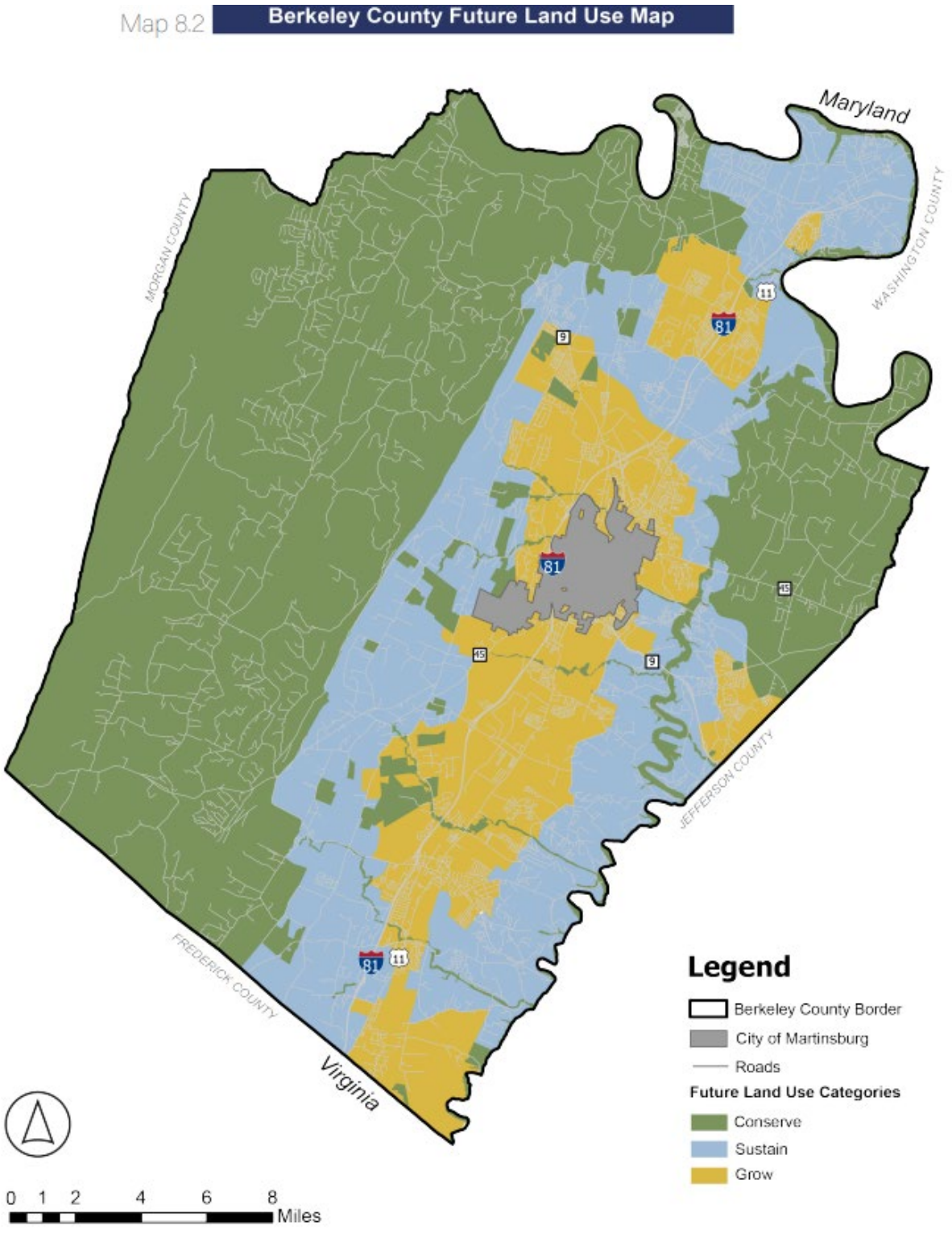


Figure 2.5-2: Future Land Use Map in Berkeley County (Berkeley County Comprehensive Plan, 2026).



2.6. Data Sources and Limitations

Geographic Information System (GIS) data used in the mapping and analysis of hazards throughout the HMP were provided by a few different sources. Much of the data was retrieved from the online West Virginia State GIS Data Clearinghouse which is maintained by the West Virginia GIS Technical Center (WV GISTC) at West Virginia University (WVU). These datasets include park locations, critical facilities, wildfire susceptibility, landslide susceptibility, karst areas, and source water protection areas. Many basemap features were obtained from the US Census Bureau including roads, railroads, water features, boundary features, and employment statistics. The National Oceanic and Atmospheric Association (NOAA) provided multiple datasets including flash flood events, hail events, hurricane tracks, tornado tracks, and 30-year climate normals which provided precipitation, temperature, and snowfall averages. The Federal Emergency Management Agency (FEMA) provided special flood hazard areas, and the community resilience challenges index (CRCI). The US Environmental Protection Agency (EPA) provided toxic release inventory (TRI) facilities and radon zones. The United States Geological Survey (USGS) provided watersheds and earthquake related data. Several other agencies provided singular datasets such as the National Land Cover Database, the National Center for Education Statistics, the US Drought Monitor, National Interagency Fire Center, and WV DOT.

Population and demographic data from the 2024 ACS five-year estimates were obtained from the U.S. Census Bureau. Additional information used to complete the risk assessment for this plan was taken from various government agencies and non-government agency sources. Those sources are cited where appropriate throughout the plan with full references listed in **Appendix A – Bibliography**. Online local news sources were also used extensively to identify the previous occurrence of a hazard, detail the hazard's extent and impact, and provide photographs. News media is important in hazard mitigation planning as both a source of data and to facilitate public interest and involvement. The news sources cited can be found in Appendix A as well.

To assess the vulnerability of different jurisdictions to the hazards, hazard data from the National Centers for Environmental Information (NCEI) database was utilized. NCEI is a division of the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by NCEI from data gathered by the National Weather Service (NWS), another division of NOAA. NCEI then presents it on its website in various formats. The data used for this plan came from the U.S. Storm Events database, which is "a collection of significant weather phenomena that have sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce in the United States and adjacent water bodies (NOAA NCEI, 2026b). The database currently contains hazard event data from January 1950 to May 2026.

Other federal datasets were sourced from USGS, the National Hurricane Center, and NOAA's Storm Prediction Center. High Hazard Potential Dam (HHPD) data was collected from WV DEP and USACE's National Dam Inventory (NDI) and incorporated into the Dam Failure profile (Appendix F). WV DEP

provided information on dams, and the counties provided information from Emergency Action Plans including risk and population vulnerability.

Throughout the risk and vulnerability assessments included in **Section 4 – Risk Assessment**, descriptions of data indicate some areas in which the counties and municipalities can improve their ability to identify vulnerable structures and improve loss estimates. As the counties 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.

The plan describes the vulnerability of assets to the identified hazards and looks at the risk that makes them susceptible to damage from the identified hazards. Assets considered include:

- People (including underserved communities and socially vulnerable populations).
- Structures (including facilities, lifelines and critical infrastructure).
- Systems (including networks and capabilities).
- Natural, historic, and cultural resources.
- Activities that have value to the community.

Assets were identified using multiple methods. One of those methods was through reviewing FEMA's community lifelines. FEMA community lifelines are essential services that enable the continuous operation of critical government and business functions, which are crucial for human health, safety, and well-being. These lifelines, which are listed in Figure 2.6-1, form the backbone of a community's resilience to disasters. Additionally, community lifelines will serve as a focal point for assessing vulnerabilities and implementing strategies to minimize disruptions.

Figure 2.6-1: FEMA's Community Lifelines

 Law Enforcement/ Security, Fire Service, Search and Rescue, Government Service, Community Safety	 Food, Hydration, Shelter, Agriculture	 Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management	 Power Grid, Fuel

 Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch	 Highway/Roadway/ Motor Vehicle, Mass Transit, Railway, Aviation, Maritime	 Facilities, HAZMAT, Pollutants, Contaminants	 Potable Water Infrastructure, Wastewater Management

This HMP evaluates the vulnerability of the area's critical facilities. For the purposes of this plan, critical facilities are those entities that are essential to the health and welfare of the community. This includes police departments, fire stations, emergency medical services (EMS), schools, and hospitals and medical centers. Types of critical facilities vary between Berkeley and Morgan Counties, as each county defined and supplied data for critical facilities separately. For a full list of critical facilities, please see **Appendix E – Critical Facilities.**

3. Planning Process

3.1. Update Process and Participation Summary

A successful planning process builds partnerships and brings together members representing government agencies, the public, and other stakeholders to reach consensus on how the community will prepare for and respond to hazards that are most likely to occur. Applying a comprehensive and transparent process adds validity to the plan. Those involved gain a better understanding of the problem or issue and how solutions and actions were devised. The result is an updated set of common community values and widespread support for directing financial, technical, and human resources to an agreed-upon action. The planning process has been an integral part of updating the Berkeley and Morgan Counties Multi-Jurisdictional HMP. This section describes Berkeley and Morgan Counties update process and how the HMP evolved since it was first approved by the Federal Emergency Management Agency (FEMA).

At the beginning of the 2027 HMP update, Hazard Mitigation Steering Committees (HMSC) were formed for each county, consisting of county planning staff, local emergency management officials, and municipal representatives. Region 9 staff and Michael Baker International were also present at steering committee meetings. Stakeholders including news media, staff from local utilities, educators, healthcare professionals, regional employers, neighboring communities, and the public were also invited to participate in HMP draft review process as part of the Steering Committee. All four

municipalities in Berkeley and Morgan Counties were considered in the vulnerability assessment and the development of the Mitigation Strategy to address these vulnerabilities. Details on the members of the HMSC and Planning Team are included in Section 3.2 – The Planning Team.

To begin this process, each county hosted a Kick-Off on August 4, 2026. During this meeting, attendees reviewed the Hazard Mitigation Planning process, as well as changes to the planning process promoted by FEMA's release of updated planning guidance. Additionally, the attendees discussed the scheduling of HMSC and public meetings and HMSC participation for the 2027 update process. Details on this and other meetings are included in Section 3.3 – Meetings and Documentation.

In addition to stakeholders from Berkeley County, Morgan County, and local municipalities, the HMSC identified additional stakeholders to be included in the HMP planning process. Detailed information about stakeholder participation is included in Section 3.4 – Public & Stakeholder Participation. The municipal involvement in developing the 2027 HMP Update is detailed in Section 3.5 – Multi-Jurisdictional Planning. All four municipalities in Berkeley and Morgan Counties met the participation requirements in the 2027 update process. Figure 3.1-1 below lists the types of stakeholders invited to participate in this update.

Figure 3.1-1: Berkeley and Morgan Counties HMP Stakeholder Types.

Local and regional agencies involved in hazard mitigation activities.*	Examples include municipalities, municipal authorities, public works, emergency management, local floodplain administration and Geographic Information Systems (GIS) departments.
Agencies that have the authority to regulate development.	Examples include zoning, planning, community and economic development departments; building officials; planning commissions; or other elected officials.
The General Public.	Examples include citizens and/or property community lifeline owners at-large.
Neighboring communities.	Examples include adjacent local governments, including special districts, such as those that are affected by similar hazard events, contain critical assets, or share a mitigation action or project that crosses boundaries.
Representatives of businesses, academia, and other private organizations.	Examples include private utilities or major employers that sustain community lifelines.
Representatives of nonprofit organizations.	Examples include housing, healthcare, or social services agencies.

The HMPT used several worksheets to gather information from each municipality and participant in the planning process. These worksheets were designed to inform the planning process, from gathering information about the hazards that affected the counties and each of the municipalities to updating the mitigation strategy. The use of these forms is detailed in **Section 3.3 – Meetings and Documentation** and the submitted forms are included in **Appendix C – Meeting and Other Participation Documentation.**

The report format is structured in accordance with the most current planning guidance from FEMA's Local Mitigation Planning Policy Guide (2025) and PEMA's Commonwealth of Pennsylvania's All-Hazard Mitigation Planning SOG (2025). The Plan Update was led by the Hazard Mitigation Planning Team (HMPT) and informed by the Hazard Mitigation Plan Steering Committee (HMPSC). Community leaders and other agencies and organizational stakeholders were invited by Region 9 to participate in the Plan Update process.

3.2. The Planning Team

During development of the 2027 Hazard Mitigation Plan Update, the following individuals served as members of the Hazard Mitigation Planning Team (HMPT).

Table 3.2-1: Participants of the 2027 Berkeley and Morgan Counties HMP Hazard Mitigation Planning Team (HMPT).

Name	Title
Eastern Panhandle Regional Planning and Development Council (Region 9)	
Rachel Miller	Director
Jennifer O'Brien	Assistant Director
Olivia Shores	Environmental Coordinator
Berkeley County Office of Emergency Management	
Randy Lilly	Director
Hope Friis	Emergency Management Specialist
Morgan County Office of Emergency Services	
Jason Hoover	Director
Michael Baker International	
Troy Truax	Michael Baker International, AICP, Project Manager
Angela Bard Welt	Michael Baker International, Lead Planner
Victoria Petrillo	Michael Baker International, Planner

Additionally, the community representatives shown in Table 3.2-2 served on the 2027 countywide Hazard Mitigation Steering Committee (HMSC) and were invited to actively participate in the planning process.

Table 3.2-2: Participants in the 2027 Berkeley and Morgan Counties HMP Update.		
Name	**Title**	**Organization**
Berkeley County Hazard Mitigation Steering Committee		
Blair, Robert	Sheriff	Berkeley County Sheriff's Department
Blake, Andy*	City Manager	City of Martinsburg
Boyd, H.D.	Commissioner	Berkeley County Commission
Catlett, Mary Sue*	Town Councilor	Hedgesville
Catlett, Steve	Commissioner	Berkeley County Commission
Costello, Brian	Director	Berkeley County Ambulance Authority
Czaja, Timothy	Community Corrections Director	Berkeley County Community Corrections
Donaldson, Kurt	Senior Project Manager	West Virginia GIS Technical Center
Doyle, Scott*	Captain	City of Martinsburg Police
Gano, Carey	Mayor	Hedgesville
Gibbons, Erin	Chief of Police	Martinsburg Police Department
Gochenour, Eddie	Commission President	Berkeley County Commission
Harding, Cara*	Director/Administrator	Berkeley County Health Department
Hardy, John	Commissioner	Berkeley County Commission
Henderson, Susanna	Project Manager	Eastern Panhandle Regional Planning and Development Council (Region 9)
Hoover, Jason*	Batalla Chief	Martinsburg Fire Department
Knieriem, Brad*	Fire Chief	Martinsburg Fire Department
Knowles, Kevin	Mayor	City of Martinsburg
McKinley, Jay*	Utilities Director	City of Martinsburg
Mullenax, Matt*	Executive Director	HEPMPO
Ondick, Glenn*	Registered Sanitarian	Bekeley/Morgan County Health Department
Ouellet, Jim	Executive Director	Berkeley County Public Service Water District
Repham, Matthew*	Captain	Sheriffs Office
Roberts, Martin	Fire Department Chief	Berkeley County Office of Homeland Security and Emergency Management
Ross, Brian	Department Head	Berkeley County Planning Department
Stanley, Reiley	Planning Director	City of Martinsburg

Table 3.2-2: Participants in the 2027 Berkeley and Morgan Counties HMP Update.		
Name	**Title**	**Organization**
Swisher, Jennifer	Director Emergency Communications	Berkeley County E-911
Tomlin, Jared*	Stormwater Coordinator	City of Martinsburg
Truman, Brandon*	Chief of Field Operation	Berkeley County Ambulance Authority
Whitacre, Jim	Commissioner	Berkeley County Commission
Wilkerson, Jeff*	Public Works Director	City of Martinsburg
Wilson, Paula*	Director 911	Berkeley County Emergency Comm 911
Wine, Gary	Administrator	Berkeley County
Zollinger, Matt	Deputy Chief	Martinsburg Police Department
Morgan County Hazard Mitigation Steering Committee		
Butcher, Thomas R		First Energy Corp
Clark, Bill*	Commissioner	Morgan County Commission
Clingerman, Misty*	County Administrator	Morgan County Administrator
Crowell, Rodney*		WV DOH
Darlington, Felicia*	Commission Secretary/Grants Administrator	Morgan County Grant Administrator
Davis, Ron*	Town Administrator	Town of Paw Paw
Forney, Sean*	Commissioner	Morgan County Commission
Fortney, Scott*		Cacapon / Berkeley Spring
Goodwin, Lyn*	Director	Morgan County Economic Development Authority
Harding, Cara*		Morgan County Health Department
Henderson, Susanna	Project Manager	Eastern Panhandle Regional Planning and Development Council (Region 9)
Hickey, Mary Lynn*	Council	Town of Bath
Moore, Alex*	GIS/Planning Director	Morgan County Planning Commission
Morris, Audrey*	Director	Morgan County Starting Points
Schene, Grege	Mayor	Town of Bath
Schetrompf, Jennifer	Threat Preparedness Coordinator	Berkely-Morgan County Health Departments
Shores, Olivia	Environmental Coordinator	Eastern Panhandle Regional Planning and Development Council (Region 9)
Smith, Kelly*		Cacapon / Berkeley Spring
Stotler, Melody*	Morgan County Partnership/Life or Drugs	

Table 3.2-2: Participants in the 2027 Berkeley and Morgan Counties HMP Update.		
Name	**Title**	**Organization**
Tuttle, Joel	Commissioner	Morgan County Commission
Younker, Marshall*	Director	911 Center
Zimmerman, Barbara		Morgan County WV Historical & Genealogical Society

***Denotes Member attended at least one meeting**

The primary roles of the HMSC included providing risk assessment, determining capability updates, and providing technical expertise and mitigation action development. To represent the diverse stakeholders in each county, stakeholders were also invited to meetings during the planning process. The stakeholders listed in Table 3.2-3 were sent invitations to participate in the planning process through attendance at meetings, completion of assessment surveys, or submission of comments. All invited stakeholders and other participation documentation including meeting sign-in sheets are provided in **Appendix C – Meeting and Other Participation Documentation.**

Two special districts are seeking adoption for this plan update; the Warm Springs Public Service District (PSD) and the Berkeley County PSD. Both attended one meeting.

Table 3.2-3: Berkeley and Morgan Counties Stakeholders	
Name	**Organization**
Berkeley County Stakeholders	
Abe, Darlene	Paw Paw
Allensworth, Kenneth	Martinsburg VA
Bartoldson, Elaine*	Eastern Panhandle Transit Authority
Bishop, Jason	CSX
Brandyburg, Tyrone	National Park Service
Butcher, Thomas	First Energy
Byrd, Bryan	Shentel
Clohan, Ken*	WV Division of Highways
Collis, Jason	Hedgesville Volunteer Fire Department
Criwell, Rodney*	WVDOH
Daugherty, Nathan	Comcast
DeHaven, Brian	Back Creek Valley Volunteer Fire Department
DeRidder, Steven*	Berkeley County Public Service Water District

Table 3.2-3: Berkeley and Morgan Counties Stakeholders	
Name	**Organization**
Diehl, Nicolas	Eastern WV Regional Airport Authority
Duckwall, Kevin	Morgan County Rescue Service
Giroir, John	WV DEP
Green, Sandy	WVEMD
Grimley, Matt	South Berkeley Volunteer Fire Department
Grubb, Donnie	WVU Medicine Berkeley
Harmison, Kory	WV Farm Bureau--Region 1
Hill, Tom	Morgan County Farm Bureau
Hogbin, Clint	Berkeley County Solid Waste Authority
Horacek, Katlyn	Berryville Graphics
Hott, Jesse	American Red Cross
Hoy, Brandon*	Mountaineer Gas
Hutchens, Carl	US Silica
Jainniney, Ron	Paw Paw Water
Jenkins, Adaira	Hospice of the Panhandle
Jenkins, Mike*	Warm Springs Sewer / Morgan County EMS
Kanehl, Mike	WV DEP
Kees, Robin	Habitat for Humanity of the Eastern Panhandle
Kees, Tammy	Senior Life Services of Morgan County, Inc
Keller, Curtis	Berkeley County PSSD/PSSWD
Kolani, Navonya	Martinsburg Housing Authority
Kolb, Dustin*	WV Division of Natural Resources
Lee Thorne, J.	DOH District 5 Engineer
Liebelt, Michael	CSX
Long, Doug	W&W (OmniTrax)
Long, Sam	Clorox
Marcus, Randy	CSX
Martin, Ron	Morgan Wireless
Mclaughlin, Don	EPA
McMillon, Brett	Department of Natural Resources
Meza, Jake	Valley Health
Moree, Patrick*	Proctor & Gamble

Table 3.2-3: Berkeley and Morgan Counties Stakeholders	
Name	**Organization**
Myers, Dan	W&W (OmniTrax)
Nesselrodte, Dave	Chem-Pak
Newcomb, Tommy	Bedington Volunteer Fire Department
Nichols, Stephanie	Morgan County Day Report Center
O'Brien, Steve	Procter and Gamble
O'Hern , Mark	WVU Medicine
Orndoff, Amy	Berkeley Senior Services
Owens, Jeff	USDA
Owrey, James	Mountaineer Gas
Painter, Tammy	Morgan County Schools - Transportation
Palmer, John	Quikrete
Porter, Penny	United Way
Potts, Timothy	Baker Heights Volunteer Fire Department
Reel, Stephanie	American Water
Rephann, Matthew*	BC Sheriff
Roberts, Robert*	WVU Medicine Berkeley
Robertson, Cynthia	Starting Points
Ryman, Jeff	Shenandoah Community Health
Schene, Greg	Town of Bath
Schetrompf, Jennifer	Berkeley - Morgan County Board of Health
Segal, Mitch*	American Red Cross
Shade, Brian*	Berkeley County Water
Shewbridge, Kristy	Ecolab
Silkworth, Chris	Thompson Gas
Simpson, Tommy	Valley Health
Steiner, James	Morgan County Fire
Swisher, Jennifer*	911
Timmons, JR	Morgan County Solid Waste Authority
Vanorsduk, Jacob*	WVDNR
Walter, John	Morgan County Sheriff's Dept
Ware, Matt	Berkeley County Farm Bureau
Weller, Jason	Frontier Communications

Table 3.2-3: Berkeley and Morgan Counties Stakeholders	
Name	**Organization**
White, Robert*	WVDOH
Winning, Erika	Rust Oleum
Morgan County Stakeholders	
Abe, Darlene	Paw Paw
Allensworth, Kenneth	Martinsburg VA
Baker, Matt*	WVDNR – Parks
Bartoldson, Elaine	Eastern Panhandle Transit Authority
Bishop, Jason	CSX
Brandyburg, Tyrone	National Park Service
Butcher, Thomas*	First Energy
Byrd, Bryan*	Shentel
Clohan, Ken*	WV Division of Highways
Collis, Jason	Hedgesville Volunteer Fire Department
Daugherty, Nathan	Comcast
DeHaven, Brian	Back Creek Valley Volunteer Fire Department
DeRidder, Steven	Berkeley County Public Service Water District
Diehl, Nicolas	Eastern WV Regional Airport Authority
Duckwall, Kevin	Morgan County Rescue Service
Giroir , John	WV DEP
Green, Sandy*	WVEMD
Grimley, Matt	South Berkeley Volunteer Fire Department
Grubb, Donnie	WVU Medicine Berkeley
Harmison, Kory	WV Farm Bureau--Region 1
Hill, Tom	Morgan County Farm Bureau
Hixon, Amber	Warm Springs PSD
Hogbin, Clint	Berkeley County Solid Waste Authority
Horacek, Katlyn	Berryville Graphics
Hott, Jesse*	American Red Cross
Hutchens, Carl	US Silica
Jainniney, Ron	Paw Paw Water
Jenkins, Adaira	Hospice of the Panhandle
Jenkins, Mike*	Warm Springs Sewer / Morgan County EMS

Table 3.2-3: Berkeley and Morgan Counties Stakeholders	
Name	**Organization**
Jones, Scott*	West Virginia Conversation Agency
Kanehl, Mike	WV DEP
Kees, Robin	Habitat for Humanity of the Eastern Panhandle
Kees, Tammy	Senior Life Services of Morgan County, Inc
Keller, Curtis	Berkeley County PSSD/PSSWD
Kolani, Navonya	Martinsburg Housing Authority
Kolb, Dustin	WV Division of Natural Resources
Lee Thorne, J.	DOH District 5 Engineer
Liebelt, Michael	CSX
Long, Doug	W&W (OmniTrax)
Long, Sam	Clorox
Marcus, Randy	CSX
Martin, Ron	Morgan Wireless
McKinley, Jay	Martinsburg Utilities Director
Mclaughlin, Don	EPA
McMillon, Brett	Department of Natural Resources
Meza, Jake	Valley Health
Moree, Patrick	Proctor & Gamble
Myers, Dan	W&W (OmniTrax)
Nesselrodte, Dave	Chem-Pak
Newcomb, Tommy	Bedington Volunteer Fire Department
Nichols, Stephanie	Morgan County Day Report Center
O'Brien, Steve	Procter and Gamble
O'Hern , Mark	WVU Medicine
Orndoff, Amy	Berkeley Senior Services
Oullet, Jim	Berkeley County Water
Owens, Jeff	USDA
Owrey, James	Mountaineer Gas
Painter, Tammy	Morgan County Schools - Transportation
Palmer, John	Quikrete
Porter, Penny	United Way
Potts, Timothy	Baker Heights Volunteer Fire Department

Table 3.2-3: Berkeley and Morgan Counties Stakeholders	
Name	**Organization**
Reel, Stephanie	American Water
Roberts, Robert	WVU Medicine Berkeley
Robertson, Cynthia	Starting Points
Ryman, Jeff	Shenandoah Community Health
Schene, Greg	Town of Bath
Schetrompf, Jennifer	Berkeley - Morgan County Board of Health
Shewbridge, Kristy	Ecolab
Silkworth, Chris	Thompson Gas
Simpson, Tommy	Valley Health
Steiner, James	Morgan County Fire
Timmons, JR	Morgan County Solid Waste Authority
Walter, John	Morgan County Sheriff's Dept
Ware, Matt	Berkeley County Farm Bureau
Weller, Jason	Frontier Communications
White, Robert*	WVDOH
Wilkerson, Jeff	Martinsburg Public Works Director
Winning, Erika	Rust Oleum
Witt, Patricia*	

***Denotes Member attended at least one meeting**

Attempts were made to contact all dam owners in the region. All dam owners were invited to attend a dam owner coordination meeting held virtually on August 26, 2026, and the stakeholder meetings.

3.3. Meetings and Documentation

The following meetings were held during the plan update process. Invitations, agendas, sign-in sheets, and minutes for these meetings are included in **Appendix C.**

Hazard Mitigation Steering Committee Kick-Off Meeting (Hybrid) – August 3, 2026: Held in person and virtually via Microsoft Teams, to introduce the project to local municipalities, inform community representatives of the HMP process and schedule, and evaluate hazards and risk within each county. Invitations were sent to each municipality and the other county departments and stakeholders listed in Table 3.2-3. Meeting attendees were asked to fill out the public survey, the identified hazard identification and risk assessment, and the community lifeline surveys on SurveyMonkey to inform the communities' vulnerabilities in the plan. A photograph of each county meeting can be seen in Figures 3.3-1 and 3.3-2.

Risk Assessment and Mitigation Solutions (RAMS) Workshop 1 Meeting (Hybrid) – August 24, 2026: Held in-person and virtually via Microsoft Teams to discuss Berkeley and Morgan Counties's hazard vulnerability, if any hazards will be added or removed in the 2027 HMP, and what will be included in the hazard profiles. The meeting also summarized the information from the kick-off meeting, updated the HMPT and HMSC on participation regarding the surveys/forms, briefly reviewed the capability assessment and discussed and defined mitigation measures and mitigation action collection as the next step. Photographs of the workshop for each county can be seen in Figures 3.3-3 and 3.3-4.

Dam Owners Coordination Meeting (Virtual) – August 26, 2026: One virtual meeting was held via Microsoft Teams with the dam owners of Berkeley and Morgan Counties. The meeting provided an overview of HMP update, FEMA local mitigation planning requirements, dam inventory and HHPD identification, the HHPD grant program, and the next steps such as completing the HHPD SurveyMonkey and coming to stakeholder meetings.

Risk Assessment and Mitigation Solutions (RAMS) Workshop 2 Meeting (Hybrid) – August 24, 2026: Held in-person and virtually via Microsoft Teams. The purpose of this meeting was to summarize the RAMs meeting, provide participation updates for the surveys/forms, briefly review the risk assessment, provide a finalized hazard ranking for both counties, discuss mitigation strategy and potential actions, and the next steps of the draft public meeting.

Berkeley County Public Meeting – September 29, 2026: The purpose of this final HMPT meeting was to provide information about the update process, evaluation, and general findings in the Berkeley-Morgan Counties HMP. After noting comments received, the HMSC reminded participants about how to review and submit comments on the Draft HMP, as well as a final timeline for the review and submission of the HMP to WVEMD and FEMA.

Morgan County Public Meeting – October 8, 2026: The purpose of this final HMPT meeting was to provide information about the update process, evaluation, and general findings in the Berkeley-Morgan Counties HMP. After noting comments received, the HMSC reminded participants about how to review and submit comments on the Draft HMP, as well as a final timeline for the review and submission of the HMP to WVEMD and FEMA.

Figure 3.3-1: Morgan County HMP Update Kick-Off Meeting on August 3, 2026.



Figure 3.3-2: Berkeley County HMP Update Kick-Off Meeting on August 3, 2026.



Figure 3.3-3: Morgan County HMP Update RAMS Meeting on August 24, 2026.



Figure 3.3-4: Berkeley County HMP Update RAMS Meeting on August 24, 2026.



3.4. Public & Stakeholder Participation

Each municipality was given multiple opportunities to participate in the plan update process through invitation to above outlined meetings, review of risk assessment results and mitigation actions, and an opportunity to comment on a final draft of the 2027 Hazard Mitigation Plan Update. The tools listed below were distributed with meeting invitations and in emails website to solicit information, data, and comments from both local municipalities and other key stakeholders in Berkeley and Morgan Counties. Responses to these worksheets and surveys are included in **Appendix C: Meeting and Other Participation Documentation.**

1. **Community Lifelines Form (SurveyMonkey):** Collected information on the FEMA Community Lifelines in Berkeley and Morgan Counties. Communities listed assets in their community that fall within the different lifeline categories. This form informed **Section 4 – Risk Assessment, Section 6 – Mitigation Strategy, and Appendix E – Critical Facilities.**

2. **Evaluation of Identified Hazards and Risk Worksheet / Jurisdictional Hazard Risk Ranking Form (SurveyMonkey):** The Evaluation of Identified Hazards and Risk Worksheet was re-created using an online survey platform called SurveyMonkey and was combined with the Jurisdictional Hazard Risk Ranking Form. The Evaluation of Identified Hazards and Risks collected information from the HMPT on whether there have been changes to the frequency of occurrence, magnitude of impact, or geographic extent of hazards identified in the 2022 plan. In addition, the survey asked respondents to identify any additional hazards they believe should be considered in the 2027 plan. The Jurisdictional Hazard Risk Ranking collected information on the perceived risk of hazards in each municipality compared to the ranked hazards for the counties. Communities listed whether the jurisdictional risk is greater, equal to, or less than the counties risk. This form informed **Section 4 – Risk Assessment.**

3. **Capability Assessment Worksheet Form:** Collected information on local planning, regulatory, administrative, technical, fiscal, political, and resiliency capabilities that can be included in the plan's capability assessment. This form informed **Section 5 – Capability Assessment.**

4. **National Flood Insurance Program (NFIP) Worksheet Form:** Collected community-level NFIP capabilities. This form informed **Section 5 – Capability Assessment.**

5. **New Mitigation Action Form:** Allowed communities to submit new mitigation actions for the HMP Update. This form collected details about the action, including priority, responsible parties, potential funding sources, implementation timeframe, and more. This form informed **Section 6 – Mitigation Strategy**.

6. **Mitigation Action Progress Form Worksheet:** This form is specific to each jurisdiction and included all actions for that jurisdiction in the 2022 HMP. Space was provided to note the status of each action and to document any progress made. This form informed **Section 6 – Mitigation**

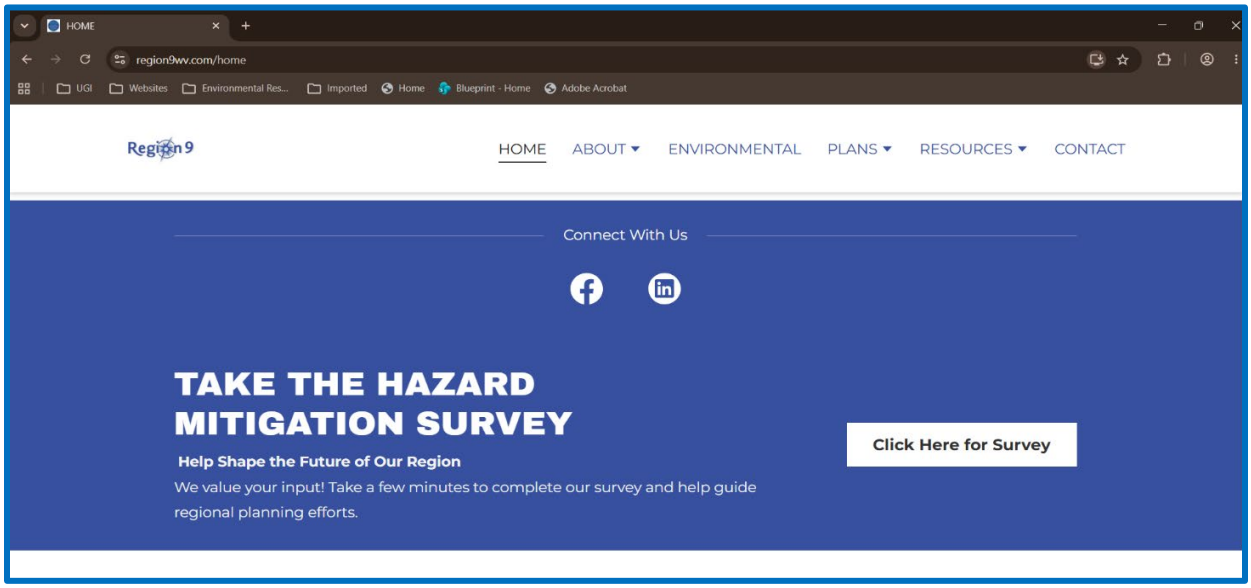
Strategy.

7. **2027 Berkeley-Morgan Counties HHPD Survey (SurveyMonkey):** Provided information regarding the condition, operation, and management of dam facilities.

8. **Plan Comment Form:** Provided an opportunity for communities and the public to comment on the plan during the review period.

Community participation and comments were encouraged throughout the planning process. Public input was also solicited through an online hazard mitigation survey composed by the consultant and disseminated on the Region 9 website. The survey collected demographic data of respondents, had respondents assess hazard risks, discussed communication strategies, and gauged respondents' insurance. About 208 residents participated, a sharp decrease from the 890 participants in the 2022 survey. More information regarding the results of the community survey can be found in Section 4.4.5 Public Survey. Additionally, the full Survey results can be found in **Appendix C**. A screenshot of the Region 9 website with the direct link to the public survey is provided below.

Figure 3.4-1: Region 9 Website with Link for Public Survey.



200 postcards were printed and distributed throughout Berkeley and Morgan Counties with a QR code to the Public Survey on July 23rd, 2026. Figure 3.4-2 below displays the postcards.

Berkeley County Postcard Survey Dropoff Locations:

1. Martinsburg City Hall: 232 N Queen St, Martinsburg, WV 25401
2. Berkeley County Courthouse – Judicial Center: 380 W South St, Martinsburg, WV 25401
3. Berkeley County Commission: 400 W Stephen St Ste 201, Martinsburg, WV 25401

4. Berkeley County Health Department: 122 Waverly Ct, Martinsburg, WV 25403
5. Martinsburg Public Library: 101 W King St, Martinsburg, WV 25401
6. WVU Medicine – Berkeley Medical Center: 2500 Hospital Dr, Martinsburg, WV 25401
7. Tuscarora Ruritan: 8316 Tuscarora Pike, Martinsburg, WV 25403
8. Hedgesville Public Library: 207 N Mary St, Hedgesville, WV 25427
9. Hedgesville Town Hall: 105 Potato Hill St, Hedgesville, WV 25427
10. Musselman South Berkeley Library: 126 Excellence Way, Inwood, WV 25428
11. W. Randy Smith Recreation Center: 40 Excellence Way, Inwood, WV 25428

Morgan County Postcard Survey Dropoff Locations:

1. Morgan County Courthouse: 77 Fairfax St #104, Berkeley Springs, WV 25411
2. Morgan County Public Library: 105 Congress St, Berkeley Springs, WV 25411
3. Senior Life Services of Morgan County: 106 Sand Mine Rd #1, Berkeley Springs, WV 25411
4. Morgan County Wellness Center: 23 Fitness Ln, Berkeley Springs, WV 25411
5. Morgan County Health Department: 137 County Rte 9/40, Berkeley Springs, WV 25411
6. Blue Ridge Community and Technical College Morgan County Center: 109 War Memorial Drive, Berkeley Springs, WV 25411
7. War Memorial Hospital: 1 Healthy Way, Berkeley Springs, WV 25411
8. Town of Bath Municipality Building: 271 Wilkes Street, Berkeley Springs, WV 25411
9. Museum of the Berkeley Springs: 2 Fairfax Street, Berkeley Springs, WV 25411
10. Paw Paw Public Library: 250 Moser Ave, Paw Paw, WV 25434
11. Paw Paw Town Hall: 122 Winchester St, Paw Paw, WV 25434

Figure 3.4-2: Public Survey Postcard.



Along with being posted on the Region 9 website, the public survey was shared on both Counties, the City of Martinsburg, and the Town of Hedgevilles Facebook page. Berkeley County also created a post on Linkedin with the Public Survey link. Figures 3.4-3 through 3.4-6 below show the Facebook posts.

Figure 3.4-3: Berkeley County Public Survey Promotion Facebook Post on July 28, 2026.



Figure 3.4-4: Morgan County Public Survey Promotion Facebook Post on July 30, 2026.

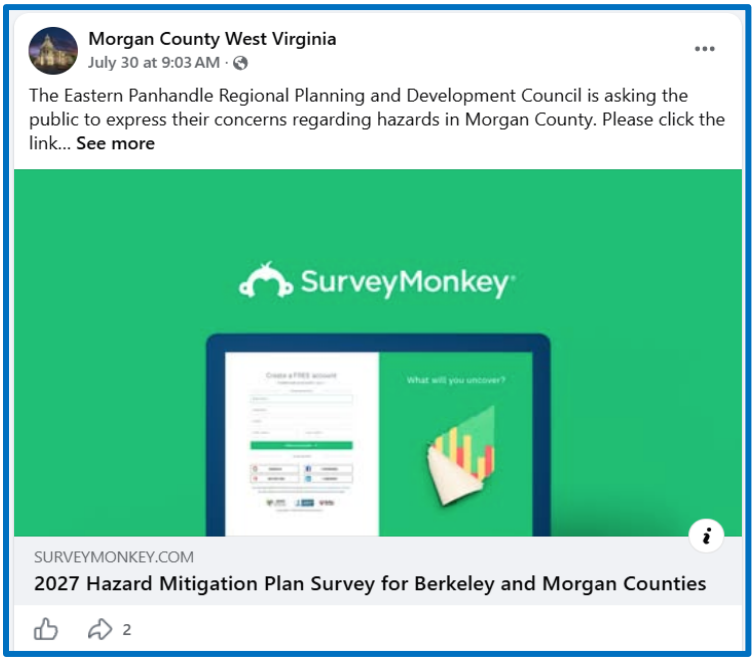
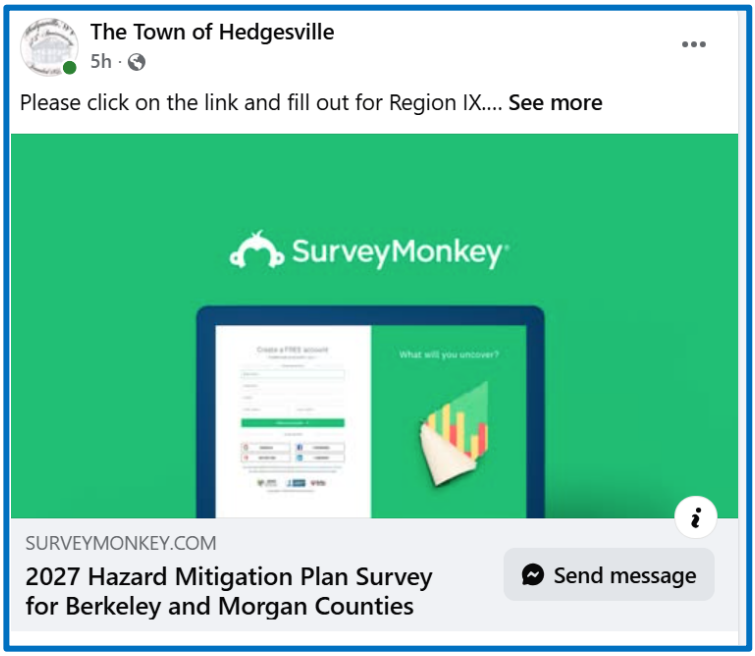


Figure 3.4-5: City of Martinsburg Public Survey Promotion Facebook Post on July 29, 2026.



Figure 3.4-6: Town of Hedgesville Public Survey Promotion Facebook Post on August 3, 2026.



Region 9, their consultant, and Berkeley County were live on the radio show WEPM 1340 AM / 93.7 FM "Panhandle Live !" to discuss the HMP update and promote the HMP Public survey on August 7, 2026. A subsequent Journal article covering the show and also encouraging survey participation was published here: https://www.journal-news.net/news/health/hazard-mitigation-survey-seeks-input-from-berkeley-morgan-county-residents/article_0ebd802f-bada-5e04-bb9d-f8c593355d70.html.

A newspaper notice was published in the Journal notifying citizens of the public meeting in Berkeley County held on September 29, 2026. Similarly, a public notice was published in the Morgan Messenger for the Morgan County public meeting held on October 8, 2026. Figure 3.4-7 and Figure 3.4-8 for a copy of the newspaper notices. All invitations and notices are included in **Appendix C**.

Figure 3.4-7: The Journal Public Notice for the Berkeley County Draft Plan Review Meeting.

COPY OF ADVERTISEMENT

https://onp.navigahub.com/ew/onp/localstorage/ad/materials/346516/insertion_1.jpg

PUBLIC NOTICE
Berkeley and Morgan County Hazard Mitigation Plan Update
Public Review and Comment Meetings

Berkeley County and Morgan County, in cooperation with the Eastern Panhandle Regional Planning and Development Council (Region 9), West Virginia Emergency Management Division and FEMA, are updating the **Berkeley and Morgan County Hazard Mitigation Plan**. The Hazard Mitigation Plan identifies natural and human-caused hazards affecting the counties and its municipal jurisdictions, evaluates community vulnerabilities, and establishes strategies to reduce future risks to lives, property, infrastructure, and the environment. As part of the planning process, citizens, business owners, community organizations, and other interested stakeholders are invited to attend a public review meeting to provide comments and recommendations regarding the draft Hazard Mitigation Plan update. Public participation is encouraged and will assist in the development of a comprehensive and effective mitigation strategy for both counties.

Berkeley County Public Meeting
Date: Tuesday, September 29, 2026
Time: 6:00 PM
Location:
Berkeley County Sheriff's Office
(Training Room)
510 South Raleigh Street
Martinsburg, WV 25401

Morgan County Public Meeting
Date: Thursday, October 8, 2026
Time: 6:00 PM
Location:
Morgan County Courthouse (Room 104)
77 Fairfax Street
Berkeley Springs, WV 25411

All interested persons are encouraged to attend and provide input. Written comments may also be submitted at the meetings for consideration by the planning team, or by emailing written comments to Olivia Shores at Region 9 at oshores@region9wv.com.

The meeting locations are accessible to persons with disabilities. Individuals requiring special accommodations should contact the applicable county emergency management office at least three (3) business days prior to the meeting.

Published by Order of the Berkeley County Commission and Morgan County Commission.

Figure 3.4-8: The Morgan Messenger Public Notice for the Morgan County Draft Plan Review Meeting.

PUBLIC NOTICE

Berkeley and Morgan County Hazard Mitigation Plan Update

Public Review and Comment Meetings

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The meeting locations are accessible to persons with disabilities. Individuals requiring special accommodations should contact the applicable county emergency management office at least three (3) business days prior to the meeting.

Published by Order of the Berkeley County Commission and Morgan County Commission.

9-23-1tm

Figure 3.4-9: Region 9 Website with the 2027 Draft Plan.

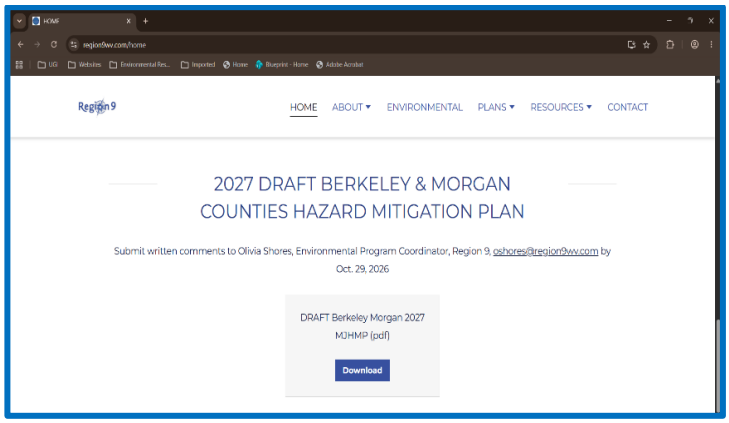


Figure 3.4-10: Region 9 Social Media Post.



The 2027 Draft HMP was posted on Region 9's website beginning September 29, 2026, and a public comment period was held for 30 days. The availability of the draft HMP was made public by posting the plan on Region 9's website and disseminating the information to the HMSC via email. People were instructed to submit comments via email to Region 9 staff. Several comments were received from residents of the Town of Paw Paw regarding the town's mitigations actions. Figure 3.4-9 displays the draft plan on Region 9's website, while Figure 3.4-10 shows a social media post from Region 9 encouraging public participation during the draft comment period.

3.5. Multi-Jurisdictional Planning

This HMP was developed using a multi-jurisdictional approach. Though county level departments have resources such as technical expertise and data which local jurisdictions may lack; involvement from local municipalities is critical to the collection of local knowledge related to hazard events. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The HMSC and HMPT undertook an intensive effort to involve all four municipalities in the planning process.

Tables 3.5-1 document the jurisdictional presence at the meetings described in Section 3.3 and other involvement from each jurisdiction throughout the planning process. Each municipality was emailed invitations and received email reminders prior to each meeting. Surveys and forms were emailed to jurisdictions. All four municipalities in Berkeley and Morgan Counties participated in the plan, thus achieving 100 percent participation.

Table 3.5-1 Summary of Participation From Local Municipalities During the Berkeley-Morgan Counties 2027 HMP Update.

Community	Kick-Off Meeting 8/3/2026	RAMS Meeting 8/24/2026	RAMS 2 Meeting 9/21/2026	Final Draft Meeting 09/29/2026 or 10/8/2026	Hazard and Risk Assessment Survey (Online)	Community Lifelines Survey (Online)	Community Capability Assessment	Checking in on the NFIP	New Mitigation Action	Mitigation Action Progress Form
Region 9	X	X	X	X	X		X		X	X
City of Martinsburg	X	X	X		X	X	X	X	X	X
Town of Hedgesville		X	X		X		X	*X	-[1]	X[2]
Berkeley County	X	X	X	X	X	X	X	X	X	X
Berkeley County Health Department (BCHD)				X						
Berkeley County PSD		X							X	
Town of Bath	X	X	X		X	X	X	*X	X	X
Town of Paw Paw		X		X	X	X	X	*X	X	X
Morgan County	X	X	X	X	X	X	X	X	X	X
Warm Springs PSD			X						X	

*Floodplain Administrator for the county covers the municipality.
[1]No new actions for the 2027 update.
[2]Gave updates on actions via email rather than form (included in Appendix C)

4. Risk Assessment

4.1. Update Process Summary

To reduce the potential for damage due to hazards, it is necessary to identify hazards that may affect the region. This risk assessment provides a factual basis for activities proposed by the counties in the mitigation strategy. Hazards that may affect Berkeley and Morgan Counties are identified and defined in terms of location and geographic extent, magnitude of impact, previous events, and likelihood of future occurrence. All information from the previous plan has been included or updated in the 2027 Berkeley and Morgan Counties HMP Update, unless otherwise indicated.

The HMPT reviewed the hazards profiled in the 2022 Berkeley and Morgan Counties MJHMP Update during the August 3, 2026, Kick-Off Meeting. The HMPT determined that all the existing hazards should be carried over into the 2027 plan update. The hazards selected by the HMPT were then reviewed at the August 24, 2026, Risk Assessment and Mitigation Solutions Workshop. The municipalities completed an Evaluation of Hazards and Risk Survey via SurveyMonkey to indicate their jurisdictional risk to each hazard that would be profiled in the 2027 plan. The HMPSC reviewed comments and feedback to inform the Risk Assessment and Risk Assessment Prioritization Matrix.

Hazard profiles were then developed to define the characteristics of each hazard as it applies to Berkeley and Morgan Counties. This process was completed using published information and websites that address hazards globally, nationally, within West Virginia, or specifically within the counties, as well as anecdotal information provided by members of the HMPT.

Following hazard identification and profiling, a vulnerability assessment was performed to identify the impact of natural hazard events on people, buildings, infrastructure, and the community. Each natural hazard is discussed in terms of its potential impact on individual communities in Berkeley and Morgan Counties, including the types of parcels and critical facilities that may be at risk. This assessment allows the region and its municipalities to focus mitigation efforts on areas most likely to be damaged or most likely to require

Hazard profiles in the 2027 HMP include the following Natural and Human-Made Hazards:

- Drought
- Earthquake
- Extreme Temperatures
- Flooding
- Hailstorm
- Hurricane and Tropical Storm
- Invasive Species
- Landslide and Land Subsidence
- Pandemic and Infectious Disease
- Radon Exposure
- Thunderstorm, Lightning Strike
- Wildfire
- Windstorm, Tornado
- Winter Storm, Nor'easter
- Civil Disturbance
- Cyber Terrorism
- Dam Failure*
- Hazardous Materials Incident
- Substance Use Disorder
- Source Water Contamination
- Terrorism
- Transportation Incidents
- Utility Interruption

*Due to data sensitivity, the Dam Failure profile can be found in **Appendix F**.

early response to a hazard event. A vulnerability analysis was performed which identifies structures, critical facilities, or people that may be impacted by hazard events and describes what those events can do to physical, social, and economic assets. Depending upon data availability, assessment results consist of an inventory of vulnerable structures or populations.

Each hazard profile has an "Populations at Risk (PAR)" section, which expands on how certain socioeconomic factors can result in hazards having a disproportionate impact on certain populations or communities. This assessment allows the counties and its municipalities to focus mitigation and preparedness efforts more adequately by allocating resources more fairly, improving emergency responses, and enhancing overall community resilience. Each hazard profile also identifies community lifelines that may be affected by the associated natural hazards. The community lifelines are listed in Figure 2.6-1. **Appendix E** also includes insights from the Community Lifelines Forms that were completed by communities. The appendix includes a table for each lifeline listing the assets that were identified as being a part of each lifeline per municipality.

4.2. Hazard Identification

4.2.1. Table of Presidential Disaster Declarations

Natural hazards have led to costly disasters in Berkeley and Morgan Counties resulting in disaster declarations. Presidential Disaster and Emergency Declarations are issued when it has been determined that state and local governments need assistance in responding to a disaster event. Table 4.2-1 identifies Presidential Disaster Declarations (DR) and Emergency Declarations (EM) issued between 1955 through 2026 that have affected Berkeley and Morgan Counties. Additional information can be found on the FEMA website at: https://www.fema.gov/disaster/declarations.

Table 4.2-1: Presidential Disaster and Emergency Declarations affecting Berkeley and Morgan Counties, 1955-2026 (FEMA, 2026b).

Declaration #	County Impacted	Date	Event
3639*	Berkeley and Morgan	January 24, 2026	West Virginia Severe Winter Storm
4517	Berkeley and Morgan	April 3, 2020	West Virginia COVID-19 Pandemic
3450*	Berkeley and Morgan	March 13, 2020	West Virginia COVID-19
4738	Morgan	May 28, 2018	Severe Storms, Flooding, Landslides, And Mudslides
3358*	Berkeley and Morgan	October 29, 2012	Hurricane Sandy
4071	Berkeley	July 23, 2012	Severe Storms and Straight-Line Winds
3345*	Berkeley and Morgan	June 30, 2012	Severe Storms
1903	Berkeley and Morgan	April 23, 2010	Severe Winter Storms and Snowstorms
3221*	Berkeley and Morgan	September 5, 2005	Hurricane Katrina Evacuation
1558	Berkeley and Morgan	September 20, 2004	Severe Storms, Flooding and Landslides
1496	Berkeley and Morgan	September 23, 2003	Hurricane Isabel

Table 4.2-1: Presidential Disaster and Emergency Declarations affecting Berkeley and Morgan Counties, 1955-2026 (FEMA, 2026b).			
Declaration #	**County Impacted**	**Date**	**Event**
1474	Berkeley	June 21, 2003	Severe Storms, Flooding and Landslides
1137	Berkeley and Morgan	September 11, 1996	Hurricane Fran
1096	Berkeley and Morgan	January 25, 1996	Flooding
1084	Berkeley and Morgan	January 13, 1996	Blizzard
3109*	Berkeley and Morgan	March 17, 1993	Severe Snowfall and Winter Storm
753	Berkeley and Morgan	November 7, 1985	Severe Storms, Flooding
344	Berkeley and Morgan	July 3, 1972	Tropical Storm Agnes
* Presidential Emergency Declaration			

Since 1954, declarations have been made for various hazard events including hurricanes or tropical storms, severe summer and winter storms, flooding, landslides, and blizzards. A unique Presidential Emergency Declaration was issued in September 2005. Through Emergency Declaration 3221, President George W. Bush declared that a state of emergency existed in the State of West Virginia and ordered federal aid to supplement state and local response efforts to help people evacuated from their homes due to Hurricane Katrina. All counties within the state, including Berkeley and Morgan Counties, were indirectly affected by Hurricane Katrina because of evacuee assistance.

In coincidence with Presidential Emergency Declaration 3450, West Virginia Governor declared that a state of emergency existed in the State of West Virginia, in conjunction with the closure of public and governmental spaces, schools, nursing homes, recreation facilities, and retail and food service locations. All counties within the state were subsequently affected by the COVID-19 pandemic because of these orders.

4.2.2. Summary of Hazards

Each county HMSC was provided with a standard list of hazards to consider for evaluation in the 2027 HMP. Following a review of the hazards evaluated in the 2022 HMP and the standard list of hazards, the HMSCs decided that the 2027 plan should identify, profile, and analyze 23 hazards. All hazards identified in 2022 plan were included in the 2027 HMP update. No new hazards were added based on the results of Evaluation of Identified Hazards and Risk/Jurisdictional Hazard Risk Ranking SurveyMonkey.

Table 4.2.2-1 contains a complete list of the 23 hazards that have been identified as having the potential to impact Berkeley and Morgan Counties as identified through risk assessments, public concern, and input from the HMSC members and stakeholders. Hazard profiles are included in Section 4.3 for each of these hazards.

Table 4.2-1: Natural and Human-made Hazards included in the 2027 HMP.	
Hazard	**Hazard Description**
Natural Hazards	
	A drought is "a deficiency of precipitation over an extended period of time (usually a season or more), resulting in a water shortage" (NOAA NIDIS, 2026a). Indicators of drought include precipitation, temperature, streamflow, ground and reservoir water levels, soil moisture, and snowpack (NOAA NIDIS, 2026b). This hazard is of particular concern in Berkeley and Morgan Counties due to the prevalence of farms and other water-dependent industries, water-dependent recreation uses, and residents who depend on wells for drinking water.
	An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10 to 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 (Ready.gov, 2026a).
	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 (Ready.gov, 2026b). 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, 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 (NOAA NWS, 2026a).
	Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all the natural hazards in West Virginia. Flooding occurs when excess water from snowmelt or rainfall fills a stream, causing it to overflow onto the stream banks and adjacent floodplains. Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods.
	Hail is a form of precipitation consisting of solid ice that forms inside thunderstorm updrafts. Hailstones are formed when raindrops are carried upward by thunderstorm updrafts into extremely cold areas of the atmosphere and freeze. Hailstones then grow by colliding with liquid water drops that freeze onto the hailstone's surface. The hail falls in the form of balls or irregularly shaped masses of ice when the thunderstorm's updraft can no longer support the weight of the hailstone, which can occur if the stone becomes large enough or the updraft weakens (NOAA NSSL, 2026e). Hailstorms can cause significant damage to homes, vehicles, livestock, and people.

Table 4.2-1: Natural and Human-made Hazards included in the 2027 HMP.	
Hazard	**Hazard Description**
	Tropical storms systems (i.e. hurricanes, tropical storms, tropical depressions) impacting Berkeley and Morgan Counties develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea (NOAA NOS, 2025). Potential threats from these storms include powerful winds, heavy rainfall, storm surges, coastal and inland flooding, rip currents, tornadoes, and landslides.
	An invasive species is a non-native species to the ecosystem whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and other living organisms (e.g., microbes) (USDA, 2026).
	A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening slopes due to construction, erosion, earthquakes, and changes in groundwater levels. Landslides occur primarily in colluvial (loose) soil and old landslide debris on steep slopes. Steep mountain slopes across the state have experienced debris avalanches associated with extreme rainfall or rain-on-snow events. Mudflows, mudslides, rockfalls, rockslides, and rock topples are all forms of a landslide. Land subsidence occurs in areas of abandoned mines and karst area underlain by carbonate rock. These formations often contain several underground caves that could collapse, causing subsidence on top of the ground.
	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. (Ready.gov. 2026c).

Table 4.2-1: Natural and Human-made Hazards included in the 2027 HMP.	
Hazard	**Hazard Description**
	Radon is a radioactive gas produced by the breakdown of uranium in soil, rock, and water that can lead to lung cancer in people exposed over a long period of time. Most exposure comes from breathing in radon gas that enters homes and buildings through foundation cracks and other openings (EPA, 2016).
	Lightning is a giant spark of electricity resulting from the build-up of positive and negative charges within a thunderstorm. The flash or "bolt" of light can occur within the thunderstorm cloud or between the cloud and the ground. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms.
	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 (Ready.gov, 2026d).
	A tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground (NOAA NSSL, 2026j). The impact of tornado or windstorm hazards is ultimately dependent on the population or amount of property (i.e., buildings, infrastructure, agricultural land, etc.) present in the area in which they occur. Tornado events are often so severe that property loss or human fatality is typically inevitable if evacuation or proper construction standards are not implemented.
	Winter storms are regional events which affect Berkeley and Morgan Counties, adjacent counties, other areas of West Virginia, or even the larger eastern U.S. Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. Winter storms are made with three ingredients cold air, lift, and moisture (NOAA NSSL, 2026m).
Human-made Hazards	

Table 4.2-1: Natural and Human-made Hazards included in the 2027 HMP.	
Hazard	**Hazard Description**
	A civil disturbance is a civil unrest activity (such as a demonstration, riot, or strike) that disrupts a community and requires intervention to maintain public safety.
	Cyber terrorism 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" (Denning, 2000).
	Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. The consequences of dam failures can include property and environmental damage and loss of life (ASDSO, 2026). This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides.
	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 because of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events.
	Source water refers to the surface water and groundwater used to supply water for public drinking water supply systems. This source water becomes contaminated through the addition of any substance or property preventing the use of or reducing the usability of water for ordinary purposes such as drinking, preparing food, bathing, washing, recreation, and cooling. Contamination can pose a serious risk to public health and welfare (Denchak, 2018).

Table 4.2-1: Natural and Human-made Hazards included in the 2027 HMP.	
Hazard	**Hazard Description**
	Substance Use Disorder (SUD) is complex a condition in which there is uncontrolled use of a substance despite harmful consequence. People with SUD have an intense focus on using a certain substance(s) such as alcohol, tobacco, or illicit drugs, to the point where the person's ability to function in day-to-day life becomes impaired. People keep using the substance even when they know it is causing or will cause problems (Torrise, 2024).
	Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons (FBI, 2023).
	Transportation incidents are technological hazards involving the nation's system of land, sea, and air transportation infrastructure. A flaw or breakdown in any component of this system can and often does result in a major disaster involving loss of life, injuries, property and environmental damage, and economic consequences.
	Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications, public works, and information network sectors. Utility interruption hazards include the following: • Geomagnetic Storms • Fuel or Resource Shortage • Electromagnetic Pulse • Information Technology Failure • Ancillary Support Equipment • Public Works Failure • Telecommunications System Failure • Major Energy, Power, Utility Failure • Transmission Facility or Linear Utility Accident

4.3. Hazard Profiles

NATURAL HAZARDS

Natural hazards are naturally occurring physical phenomena caused by geophysical, hydrological, climatological, meteorological, or biological events. Within this HMP, profiled naturals hazards include drought, earthquake, extreme temperatures, flooding, hailstorm, hurricane/tropical storm, invasive species, landslides and land subsidence, pandemic and infectious diseases, radon exposure, thunderstorm/lightning strike, wildfire, windstorm/tornado, and winter storm/Nor'easter.

4.3.1. Drought



4.3.1.4. Location and Extent

Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length resulting in a water shortage (NDMC, 2026a). Droughts are regional climatic events, so they typically impact all communities in a relatively uniform fashion with only minor localized variations in rainfall events. The spatial extent can range from county level to the entire mid-Atlantic Region. Areas with extensive agricultural land use can experience particularly significant impacts. This hazard is of particular concern in Morgan and Berkeley County due to the presence of farms as well as water-dependent industries and recreation areas across the Eastern Panhandle. A prolonged drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses.

Locations of droughts nationwide are monitored continuously by USGS and the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln. Maps showing locations currently experiencing drought conditions are posted on various websites (including https://dashboard.waterdata.usgs.gov/app/nwd/en/?aoi=default) and show locations where stream flow is below normal and where drought conditions exist or are emerging.

According to the NDMC (2026c), there are four different types of droughts. The first three (meteorological, agricultural, and hydrological) measure drought as a physical phenomenon, while the final (socio-economic) is about supply and demand and tracking the effects of lack of water through socioeconomic systems. Figure 4.3.1-1 displays the sequence of drought occurrence and impacts.

1. Meteorological Drought – Defined usually based on the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period.

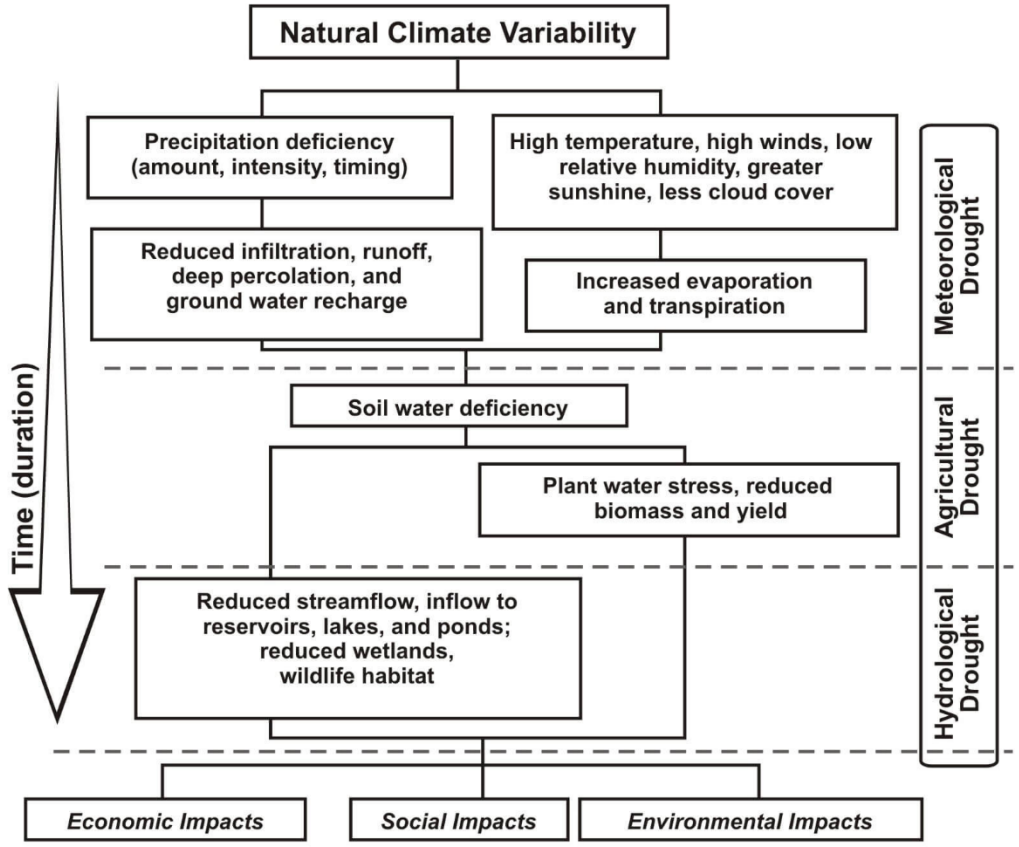
2. Agricultural Drought – Agricultural drought links various characteristics of meteorological (or

hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth.

3. Hydrological Drought – Associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, groundwater). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale.

4. Socio-economic Drought – Associate the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought. It differs from the other types of droughts because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts. Socioeconomic drought occurs when the demand for economic goods exceeds supply as a result of a weather-related shortfall in water supply.

Figure 4.3.1-1: Sequence of drought occurrence and impacts for drought types (NDMC, 2026c).



4.3.1.5. Range of Magnitude

Droughts can have varying effects, depending on the month in which they occur, as well as the severity, duration, and location of the event. Even short-term droughts can be devastating, especially in conjunction with extreme temperatures.

Hydrologic drought events result in a reduction of stream flows, reduction of lake/reservoir storage, and a lowering of groundwater levels. These events have adverse impacts on public water supplies for human consumption, rural water supplies for livestock consumption and agricultural operations, water quality, natural soil water or irrigation water for agriculture, soil moisture, conditions conducive to wildfire events, and water for navigation and recreation. The WVEMD Emergency Operations Plan (EOP) uses a combination of five indices to determine the magnitude of a drought. The 2018 draft WV EOP was used since it was the only plan available online (State of West Virginia, 2018). Descriptions of the indices from the EOP are as follows:

a. Palmer Drought Severity Index

The PDSI attempts to measure the duration and intensity of the long- term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months.

b. Palmer Z Index

The Palmer Z index is a variation of the PDSI that measures short-term drought on a monthly scale.

c. Crop Moisture Index (CMI)

This index uses a meteorological approach to monitor week-to-week crop conditions by evaluating short-term moisture conditions across major crop-producing regions. It is based on the mean temperature and total precipitation for each week within a climate division, as well as the CMI value from the previous week. The CMI responds rapidly to changing conditions, and it is weighted by location and time so that maps can be used to compare moisture conditions at different locations.

d. Standardized Precipitation Index (SPI)

This is a probability index that considers the probability of recording a given amount of precipitation. The probabilities are standardized so that an index of zero indicates the median precipitation amount where half of the historical precipitation amounts are below the median, and half are above the median. The index is negative for drought, and positive for wet conditions. The SPI is computed by the National Climatic Data Center (NCDC) for several time scales, ranging from one (1) month to 24 months, to capture both short-term and long-term drought.

e. National Fire Danger Rating System

A broad scale system that incorporates science, technology and local experience to analyze the various factors of fuels, weather, topography and risk, in combination, to assess the daily fire potential of an area including the potential for a fire to ignite, spread and require suppression action. Fire danger is usually expressed in numeric or adjective terms.

Precipitation, ground water, stream flow, reservoir levels, PDSI, CMI, SPI, Fire Weather Forecast, and the Fire Danger drought criteria are assessed by the WVEMD each month, the WVEMD then assigns one of four stages of concern as shown in Table 4.3.1-1.

Table 4.3.1-1: WVEMD EOP Levels of Concern for Drought.

Level of Concern	Indices		
	PDSI	CMI	SPI
Normal (Stage I)	Normal levels	Normal levels	Normal levels
Alert (Stage II)	-2.00 to -2.99 Moderate Drought	-1.0 to -1.9 Abnormally Dry	-1.00 to -1.49 Moderately Dry
Conservation (Stage III)	-3.00 to -3.99Severe Drought	-2.0 to -2.9 Excessively Dry	-1.50 to -1.99 Severely Dry
Emergency (Stage IV)	-4.00 and below Extreme Drought	3.0 or less Severely Dry	-2.00 and less Extremely Dry

I. Stage I refers to conditions that do not negatively impact water supplies, vegetation or water quality in the state. No action needed.

II. Stage II (Alert) is reached When the PDSI reads -2.00 to -2.99 and stream flow, reservoir levels and ground water levels are below normal over a several month period and/or the WVDHSEM Director, in coordination with appropriate state officials, determines Stage II activities are required, the Governor is to be requested to make a Drought Alert Declaration.

III. Stage III is reached when the PDSI is between -3.00 to -3.99 and/or when the Director of WVDHSEM, in coordination with appropriate state officials, determines that Stage III activities are required. Stream flow, reservoir levels and ground water levels continue to decline and forecasts indicate an extended period of below normal precipitation.

IV. Stage IV is reached when the PDSI is lower than -4.00 and/or the Director of WVDHSEM, in coordination with appropriate State officials, determines that Stage IV activities are required. The Governor may issue a Drought Emergency Declaration when water supplies are inadequate to meet projected demands and extreme measures must be taken. Forecasts are to indicate that precipitation levels, stream flows, reservoir levels, and ground water levels will continue to decline.

According to the NDMC (2026b), Environmental impacts of drought include:

- Reduced water and food availability, potentially increased disease in wild animals.
- Fish and wildlife habitat loss or destruction.
- Wildlife migration.
- Increased stress on endangered species and/or potential extinction.
- Lower water levels in reservoirs, lakes, and ponds.
- Wetlands loss.
- Increased number and severity of wildfires.
- Wind and water erosion of soils.
- Poor soil quality.

Further consequences include reductions in crop yields, rangeland, and forest productivity that may lower incomes of farmers and agribusinesses; increase in prices of food and timber; increase in unemployment; reduction of tax revenues as expenditures decline; increase in crime, foreclosures, and migration; and depletion of disaster relief funds. The many impacts of drought can be categorized as economic, environmental, or social. The worst-case scenario for Berkeley and Morgan Counties would be a protracted drought that impacted all commercial crop production as well as livestock losses due to deficient water supplies. Community lifelines most impacted by droughts are listed in Table 4.3.1-2.

The potential impacts of drought on community lifelines are as follows:

Table 4.3.1-2: Most Likely Lifelines Impacted by Drought.

Lifelines	Notes
	Crops may be damaged or destroyed causing economic and food losses for the community. Lack of water can endanger residents and impede firefighting capabilities. Dry drought conditions allow for a more conducive environment for wildfires to start and grow.
	Food and water shortages could exacerbate health challenges, especially for food-vulnerable populations. This could lead to a burden on health and medical facilities if a surge of people are hospitalized or seeking care.

4.3.1.6. Past Occurrence

Minor droughts occur frequently in Berkeley and Morgan Counties, but extended periods of severe drought that creates major disruption and economic loss are rare. The most recent severe drought in the planning area occurred in 1999. Between June 1998 and June 1999, the area received about 12 inches less rainfall than average. The local agricultural economy was impacted significantly, and

Berkeley County Public Service District and the City of Martinsburg enacted emergency water restrictions (Tuckwiller, 1999). President Bill Clinton declared a disaster declaration for the entire state of West Virginia (Tuckwiller, 1999).

On October 3, 2019, West Virginia Governor Jim Justice declared a State of Emergency for all 55 West Virginia counties due to a prolonged shortage of rainfall that caused moderate drought conditions across much of the state and severe drought conditions in southern West Virginia (State of West Virginia Executive Department, 2019). The emergency declaration proclaimed the drought reflected both meteorological and agricultural drought characteristics, and included some restrictions on water usage, as well as some voluntary measures.

Tables 4.3.1-3 and 4.3.1-4 lists periods of droughts in Berkeley and Morgan Counties between 2000 and 2026. Berkeley County has experienced a total of 21 droughts, while Morgan County has experienced 22 droughts. This is excluding the current drought both counties have been in since September 2025. Figure 4.3.1-2 below displays the drought frequency for both Counties and West Virginia from 2000 to 2026. Both counties are within the highest tier, the dark red, indicating that both counties have spent over 201 weeks in a drought.

Table 4.3.1-3: Consecutive Weeks of Drought in Berkeley County Since 2000 (USDM, 2026a).

Start Date	End Date	Weeks	Drought Status
5/15/2001	5/22/2001	1	Moderate
9/11/2001	9/18/2001	1	Moderate
10/16/2001	5/7/2002	29	Moderate to Extreme
7/23/2002	10/15/2002	12	Moderate to Severe
7/5/2005	7/5/2005	0	Moderate
9/20/2005	10/4/2005	2	Moderate
6/13/2006	6/20/2006	1	Moderate
8/22/2006	8/22/2006	0	Moderate
6/26/2007	6/26/2007	0	Moderate
7/17/2007	8/21/2007	5	Moderate to Severe
9/25/2007	10/23/2007	4	Moderate
11/27/2007	12/4/2007	1	Moderate
3/24/2009	4/14/2009	3	Moderate
9/22/2009	10/13/2009	3	Moderate
7/13/2010	11/30/2010	20	Moderate Extreme
8/2/2011	9/6/2011	5	Moderate
11/22/2016	11/29/2016	1	Moderate

Table 4.3.1-3: Consecutive Weeks of Drought in Berkeley County Since 2000 (USDM, 2026a).			
Start Date	**End Date**	**Weeks**	**Drought Status**
10/8/2019	10/22/2019	2	Moderate
7/21/2020	7/28/2020	1	Moderate
4/18/2023	12/26/2023	36	Moderate
6/25/2024	5/27/2025	48	Moderate to Extreme
9/9/2025	Ongoing	Ongoing	Moderate to Severe

Table 4.3.1-4: Consecutive Weeks of Drought in Morgan County Since 2000 (USDM, 2026b).			
Start Date	**End Date**	**Weeks**	**Drought Status**
5/15/2001	5/22/2001	1	Moderate
9/11/2001	9/18/2001	1	Moderate
10/9/2001	5/7/2002	30	Moderate to Extreme
7/23/2002	7/23/2002	0	Moderate
8/27/2002	8/27/2002	0	Moderate
9/10/2002	10/15/2002	5	Moderate to Severe
7/5/2005	7/5/2005	0	Moderate
9/20/2005	10/4/2005	2	Moderate
6/13/2006	6/20/2006	1	Moderate
8/22/2006	8/22/2006	0	Moderate
6/26/2007	6/26/2007	0	Moderate
7/17/2007	8/21/2007	5	Moderate
3/24/2009	4/14/2009	3	Moderate
9/22/2009	10/13/2009	3	Moderate
7/13/2010	11/30/2010	20	Moderate to Extreme
8/2/2011	9/6/2011	5	Moderate
4/26/2016	5/17/2016	3	Moderate
11/22/2016	11/29/2016	1	Moderate
4/18/2023	4/18/2023	0	Moderate
6/13/2023	7/11/2023	4	Moderate
11/7/2023	12/26/2023	7	Moderate
6/25/2024	5/20/2025	47	Moderate to Extreme
9/9/2025	Ongoing	Ongoing	Moderate to Severe

Figure 4.3.1-2: Total Weeks in Drought by County (2000 – 2026).

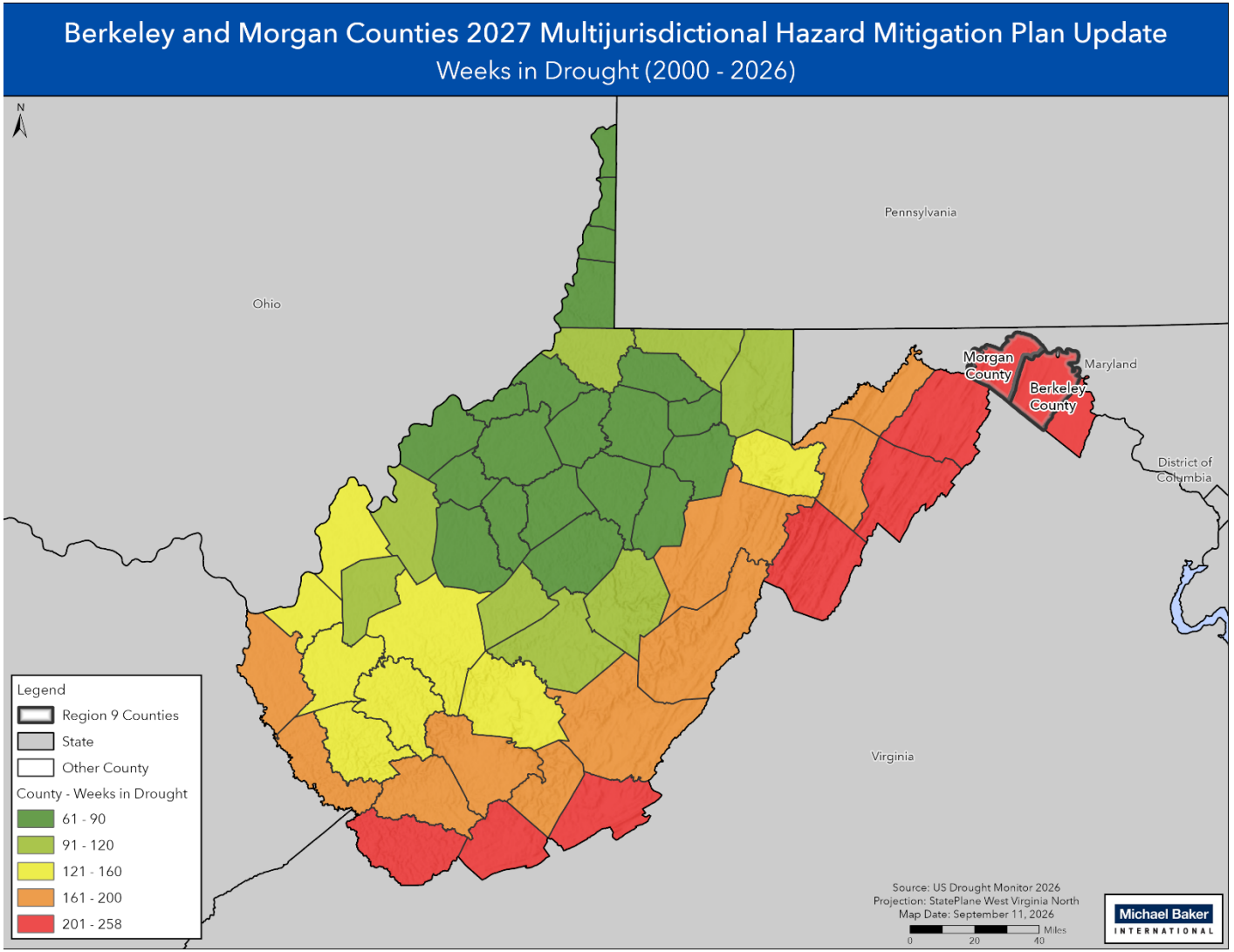
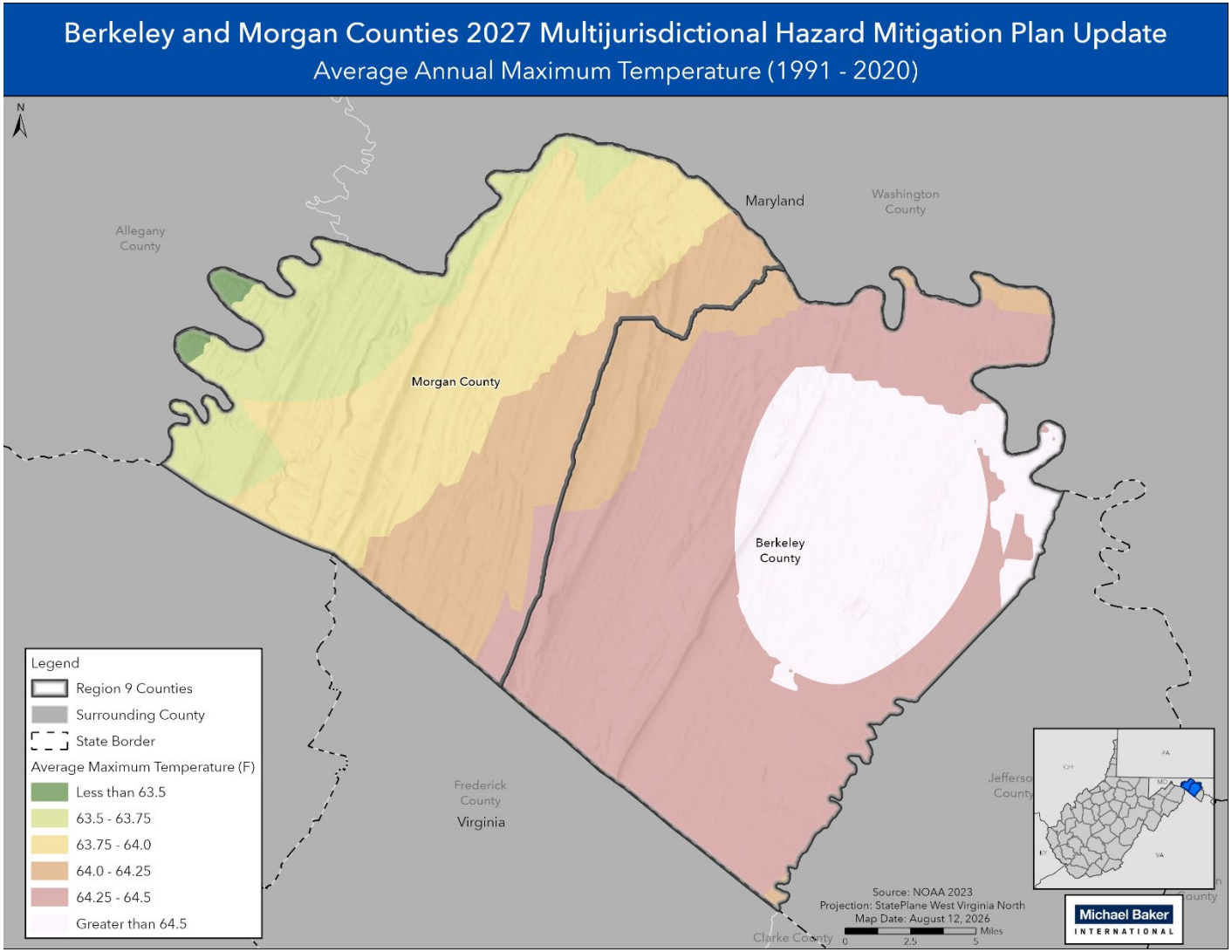


Figure 4.3.1-3: The Average Annual Maximum Temperature in Berkeley and Morgan Counties from 1991-2020.



4.3.1.7. Future Occurrence

It is difficult to forecast the severity and frequency of future drought events in Berkeley and Morgan Counties. Based on past data, the frequency and severity of droughts in the Counties have increased. This is most likely due to the overall increase in temperatures in West Virginia. Since 1970, the average annual temperature in West Virginia increased by 2.9°F (Climate Central, 2026a). Several people expressed concerns over droughts becoming more frequent in the region on the survey.

Hotter temperatures allow for a warmer atmosphere that can hold more water vapor before the air becomes saturated, and precipitation can form. This creates a cycle in which the warmer the planet gets, the more water can evaporate from the landscape and remain stored in the atmosphere longer before it returns to earth as rain or snow. Droughts can form even if precipitation patterns remain within a normal range as higher temperatures and evaporation remove water from soils. They can last longer, cover wider areas, and be even drier with every degree the planet warms (NOAA Research, 2024).

A study conducted on evaporative demand in 2022 by the Desert Research Institute, with funding from NIDIS, found that evaporative demand has increased across nearly all of the U.S. over the past 40 years (from 1980-2020), including West Virginia. A higher evaporative demand means less water is likely to drain into streams, wetlands, and aquifers across the region with soils and vegetation forced into drier conditions (NIDIS, 2022). Therefore, the probability of drought impacting Berkeley and Morgan Counties in any given year is *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

The Climate Mapping for Resilience and Adaptation (CMRA) Tool provides county-level assessment reports for certain hazards, including drought. Figures 4.3.1-4 and 4.3.1-5 below shows the report for drought in Berkeley and Morgan counties. The future climate indicators that may contribute to drought include precipitation and temperature thresholds. According to CMRA, the number of days per year with no precipitation will slightly decrease in all emission scenarios and the total annual precipitation is expected to increase both Counties. In addition, the annual number of days above 90 degrees Fahrenheit is expected to significantly increase in the future under all emission scenarios for both counties.

Figure 4.3.1-4: Berkeley County Drought Hazard Assessment Report (CMRA, 2026).



Future Climate Indicators

Indicator	Mid - 1900s (1951 - 1980) Min - Max	Early Century (2011 - 2040) Lower Emissions Min - Max	Early Century (2011 - 2040) Higher Emissions Min - Max	Mid Century (2041 - 2070) Lower Emissions Min - Max	Mid Century (2041 - 2070) Higher Emissions Min - Max	Late Century (2071 - 2100) Lower Emissions Min - Max	Late Century (2071 - 2100) Higher Emissions Min - Max
Precipitation:							
Average annual total precipitation	**38"** 24 - 58	**40"** 24 - 66	**40"** 23 - 60	**41"** 19 - 63	**42"** 24 - 68	**41"** 26 - 65	**43"** 25 - 67
Days per year with precipitation (wet days)	**88 days** 61 - 117	**89 days** 61 - 123	**90 days** 59 - 119	**91 days** 52 - 125	**91 days** 59 - 130	**90 days** 61 - 120	**90 days** 59 - 122
Days per year with no precipitation (dry days)	**277 days** 248 - 304	**276 days** 242 - 304	**275 days** 246 - 306	**274 days** 241 - 313	**274 days** 235 - 306	**275 days** 245 - 304	**275 days** 243 - 306
Maximum number of consecutive dry days	**23 days** 13 - 53	**23 days** 12 - 49	**23 days** 12 - 49	**23** days 12 - 59	**23 days** 13 - 51	**23 days** 13 - 43	**24 days** 13 - 67
Temperature thresholds:							
Annual days with maximum temperature > 90 °F	**0 days** 0 - 45	**36 days** 11 - 78	**37 days** 11 - 85	**52 days** 12 - 99	**64 days** 20 - 118	**63 days** 20 - 113	**96 days** 36 - 164
Annual days with maximum temperature > 100 °F	**0 days** 0 - 5	**1 days** 0 - 19	**1 days** 0 - 20	**4 days** 0 - 33	**6 days** 0 - 39	**6 days** 0 - 33	**23 days** 0 - 94

N/A = Data Not Available for the selected area

Figure 4.3.1-5: Morgan County Drought Hazard Assessment Report (CMRA, 2026).



Future Climate Indicators

Indicator	Mid - 1900s (1951 - 1980) Min - Max	Early Century (2011 - 2040) Lower Emissions Min - Max	Early Century (2011 - 2040) Higher Emissions Min - Max	Mid Century (2041 - 2070) Lower Emissions Min - Max	Mid Century (2041 - 2070) Higher Emissions Min - Max	Late Century (2071 - 2100) Lower Emissions Min - Max	Late Century (2071 - 2100) Higher Emissions Min - Max
Precipitation:							
Average annual total precipitation	**38"** 23 - 57	**40"** 21 - 63	**40"** 24 - 59	**41"** 20 - 67	**41"** 22 - 70	**41"** 23 - 64	**42"** 23 - 68
Days per year with precipitation (wet days)	**81 days** 56 - 105	**82 days** 50 - 116	**83 days** 54 - 110	**84 days** 52 - 119	**84 days** 52 - 122	**83 days** 53 - 114	**83 days** 55 - 114
Days per year with no precipitation (dry days)	**285 days** 261 - 310	**283 days** 249 - 315	**283 days** 255 - 311	**281 days** 246 - 313	**281 days** 243 - 314	**282 days** 251 - 312	**282 days** 251 - 311
Maximum number of consecutive dry days	**24 days** 12 - 54	**24 days** 13 - 48	**24 days** 14 - 48	**24** days 12 - 60	**24 days** 13 - 53	**24 days** 13 - 58	**25 days** 13 - 69
Temperature thresholds:							
Annual days with maximum temperature > 90 °F	**0 days** 0 - 37	**27 days** 4 - 71	**27 days** 4 - 71	**41 days** 6 - 90	**53 days** 14 - 108	**52 days** 7 - 105	**86 days** 26 - 160
Annual days with maximum temperature > 100 °F	**0 days** 0 - 3	**1 days** 0 - 15	**1 days** 0 - 15	**2 days** 0 - 20	**3 days** 0 - 29	**3 days** 0 - 20	**15 days** 0 - 82

N/A = Data Not Available for the selected area

4.3.1.8. Vulnerability Assessment

Some of the most significant losses resulting from drought events are typically found in the agricultural sector. Both counties are home to agricultural activity, and the local economy could be severely impaired by prolonged drought. According to the Multi-Resolution Land Characteristics Consortium (MRLC) Land Cover Data Sheet (2026), 28.15% of Berkeley County and 10.89% of Morgan County are considered agriculture. The 1999 drought was estimated to have caused more than $200 million in damage to agriculture across the state, and yields were down as low as 50 or 60 percent (Borger, 1999).

Prolonged drought would affect the 849 farms located in Berkeley County, which sold approximately $32,253,000 in agricultural products in 2022 (USDA, 2024a). The major crops in Berkeley County are fruits, tree nuts, and berries which totaled $16,612,000 in sales. According to the USDA 2022 Census of Agriculture, most sales to date have come from crop sales, totaling $25,297,000 (78%). Livestock, poultry, and product sales made up the remaining 22% with $6,956,000 (USDA, 2024a). Although Morgan County has less agricultural activity than Berkeley County, the county is still home to 294 farms that sold about $4,679,000 in 2022. The major crops for Morgan County consist of nursery, greenhouse, floriculture, sod, Cultivated Christmas trees, short rotation, and woody crops, which sold for roughly $1,251,000. Similar to Berkeley County, most agricultural sales for Morgan County come from crops totaling 3,537,000 (76%) while livestock, poultry, and product sales made up the remaining $1,142,000 (24%) (USDA,2024b). Severe economic losses could ensue if a prolonged severe drought impacted the counties since they both mostly rely on crop sales. State agencies and the WVU Extension Service are valuable resources in reducing drought vulnerability through education and other services to area farmers.

Table 4.3.1-5 below breaks down the agricultural acres by jurisdiction. The unincorporated areas of Berkeley and Morgan County contain the highest vulnerability to drought due to having a large acreage of agricultural land.

Table 4.3.1-5: Agriculture Land in Berkeley and Morgan Counties.

Jurisdiction	Total Acres	Total Agriculture Acres	Percent Agriculture
Bath	215	0.0	0.0%
Berkeley Unincorporated	201,446	58,348.7	29.0%
Hedgesville	84	2.4	2.8%
Martinsburg	4,254	241.4	5.7%

Morgan Unincorporated	146,413	16,017.3	10.9%
Paw Paw	339	15.7	4.6%

Wildfire is the most severe secondary effect associated with drought. Wildfires can devastate wooded and agricultural areas, threatening natural resources and farm production facilities. Prolonged drought conditions can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Long-term water shortages can have a high impact on agribusinesses, hydropower-dependent utilities, and other industries reliant on water for production services; all critical infrastructure in Berkeley and Morgan Counties are vulnerable to the effects of a drought. Drought can cause municipalities to enforce water rationing and distribution. It also increases the region's vulnerability to other hazards such as severe weather, extreme heat, and public health emergencies. The special needs population of any county must also be considered during drought conditions.

As with many hazards, determining specific risk and vulnerability areas for drought is difficult. Drought is an "overall" hydrologic condition; that is, if one small area was without precipitation but a nearby area was not, it would be difficult to classify the entire area as "in a drought" due to the eventual seepage of said precipitation to the overall groundwater supply. Consequently, drought is said to affect the entire region evenly.

The Berkeley County Public Service Water District also has its own Drought Contingency Plan (revised in 2023) in place to recognize drought conditions and put water conservation measures in place. Its conservation measures have three stages: drought watch, drought warning, and drought emergency. The stages required are determined by monitoring the following criteria when evaluating drought conditions: USGS Drought Monitoring reports and historical rainfall totals, the level in LeFevre Spring overflow, water levels in the source water wells, water levels in the district quarries, and the flows in the Potomac River at Hancock MD Gauge. With each stage, water restrictions get more severe. Stage I and II are comprised of voluntary restrictions, while Stage III mandates these restrictions. Restrictions in Stage III include the prohibition of non-essential water uses such as washing paved surfaces and building exteriors, ornamental water uses, watering of lawns and golf course fairways, and the non-commercial washing of automobiles and trucks. With regards to Morgan County, no public water system in Morgan County has a Drought Contingency Plan.

Berkeley and Morgan Counties residents that use private domestic wells are also vulnerable to droughts because their wells can dry up. Tables 4.3.1-6 lists the number of domestic wells in Berkeley County. The data was obtained from the West Virginia Well Data, which uses official USGS records. Only one zipcode was found for Morgan County, 25411 (Berkeley Springs), which has 84 wells (west Virginia Well Data, 2026b). The City of Martinsburg, specifically zipcode 25403, has the most wells with 104.

Table 4.3.1-6: Number of Wells in Berkeley County by Zipcode (West Virginia Well Data, 2026a).		
Zipcode	**Jurisdiction**	**Total Wells**
25403	Martinsburg	104
25404	Martinsburg	97
25401	Martinsburg	74
25405	Martinsburg	65
25419	Falling Waters	91
25427	Hedgesville	73
25428	Inwood	64
25420	Gerrardstown	53

Table 4.3.1-7 below shows the expected annual losses to droughts by census tract.

Table 4.3.1-7: Expected Annual Losses to Droughts by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses**	**Expected Annual Loss Rating**
54003971301	Martinsburg City	$11,483.80	Relatively Low
54003971402	Martinsburg City	$0	No Expected Annual Losses
54003971500	Martinsburg City	$0	No Expected Annual Losses
54003971600	Martinsburg City	$0	No Expected Annual Losses
54003971700	Martinsburg City	$0	No Expected Annual Losses
54003971901	Martinsburg City	$19,081.35	Relatively Low
54003971902	Martinsburg City	$30,596.83	Relatively Moderate
54003972002	Martinsburg City	$1,038.14	Relatively Low
54065970900	Paw Paw Town	$11,485.87	Relatively Low
54065970800	Bath (Berkeley Springs) Town	$35,820.81	Relatively Moderate
54003971205	Hedgesville Town	$29,641.96	Relatively Moderate

4.3.1.9. Populations at Risk

Communities within Berkeley and Morgan Counties that live in isolated parts of the county that rely on well water are more at risk to drought. If there is a disruption in water supply, they may have limited opportunities to fill gaps in water usage needs. Community members who are reliant on income from agricultural production would be more susceptible to drought as well. Drought could cause disruptions in their income and livelihood.

4.3.2. 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. They can also result from human activity like mine blasts and nuclear experiments. Future earthquakes are most likely to occur in the same general regions that have had earthquakes previously. Earthquakes can cause damage to buildings and other rigid superstructures, depending on factors like magnitude, distance of local areas to the epicenter, and local geologic conditions. It remains incredibly difficult to predict when and where an earthquake will occur in the northeast U.S. and West Virginia.

4.3.2.1. Location and Extent

Earthquake events in Berkeley and Morgan Counties are sporadic and mild. When events occur, they impact relatively small areas. According to a region-specific seismic hazard map, as seen in Figure 4.3.2-1, the eastern half of Berkeley County faces the possibility of marginally more severe earthquake compared to the western half of Berkeley County or Morgan County. Eastern Berkeley County has a 2 percent chance of exceeding a Peak Ground Acceleration (PGA) of 8-10 %g in 50 years compared to a PGA exceedance of 4-8 %g in the rest of the planning area (USGS, 2018a).

The nearest area of seismic activity is the southeast and south-central United States region, which covers a large area of relatively diffuse, low- rate seismicity. Principle areas of activity include the New Madrid Seismic Zone of the central Mississippi Valley and the Southern Appalachian Seismic Zone, extending from Virginia to Alabama (see Figure 4.3.2-2). These areas of seismic activity increase the chances of Berkeley and Morgan Counties being affected by an earthquake (USGS, 2018a).

Figure 4.3.2-1: Seismic Hazard for Berkeley and Morgan Counties.

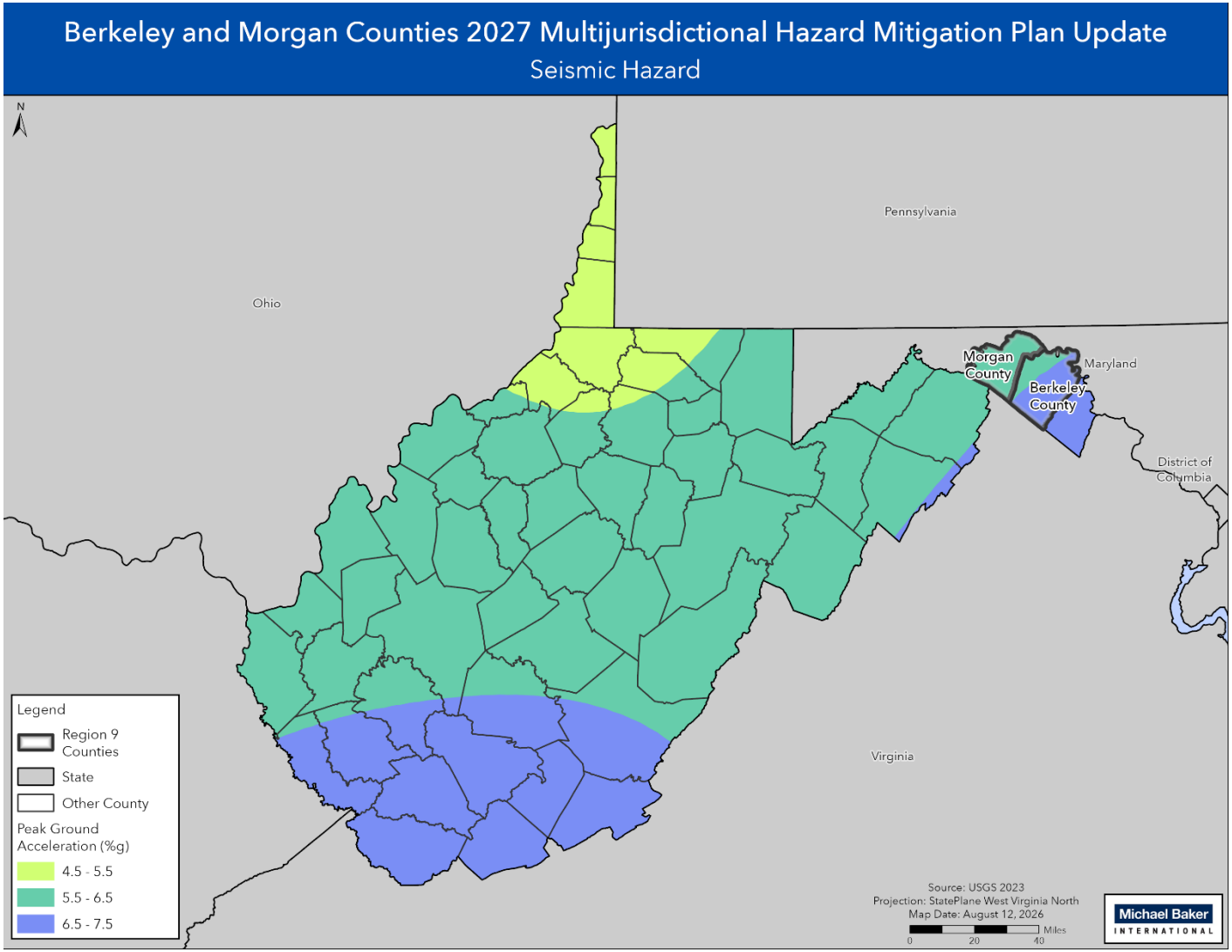
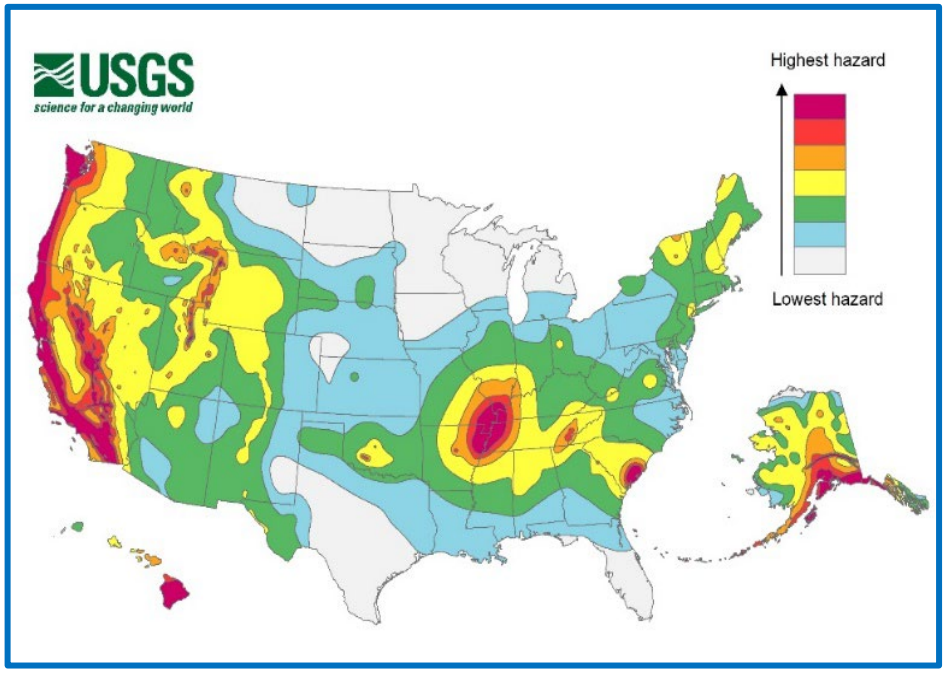


Figure 4.3.2-2: Simplified 2018 USGS Hazard Map, 2% Chance of Exceedance in 50 Years Scaled in Peak Ground Acceleration (PGA) (USGS, 2018a).



4.3.2.2. Range of Magnitude

The map in Section 4.3.2.1 is measured using Peak Ground Acceleration (PGA). This is defined as the maximum acceleration experienced by an area during the motion of an earthquake. This unit of measure is often used because building codes tend to regulate how much horizontal force a building should be able to endure during an earthquake, and force is directly proportional to acceleration. This is measured in %g, referring to the quotient of the PGA divided by the acceleration due to gravity (known as g, which is a constant of 9.80665 m/sec^2) expressed as a percentage. A reference point for this unit of measure is 10%g, which the USGS believes approximates the maximum threshold of damage for pre-1965 or non-earthquake resistant buildings and roughly equates to VI to VII on the Modified Mercalli Intensity Scale, which is defined below (USGS, 2026).

The impact of an earthquake event is often measured in terms of earthquake intensity, which is measured using the Modified Mercalli Intensity (MMI) Scale, shown in Table 4.3.2-1. This scale has a measure of severity from I to XII, and relates to another commonly used scale, the Richter Scale (USGS, 2026).

Table 4.3.2-1: Modified Mercalli Intensity Scale with Associated Impacts.			
Scale	**Intensity**	**Description**	**Corresponding Richter Scale Magnitude**
I	**Instrumental**	Usually detected only on seismographs.	<4.2
II	**Feeble**	Felt only by a few persons at rest, especially on upper floors of buildings.	
III	**Slight**	Felt quite noticeably indoors, especially on upper floors. Most people do not recognize it as an earthquake (i.e. a truck rumbling).	
IV	**Moderate**	Can be felt by people walking; dishes, windows, and doors are disturbed.	
V	**Slightly Strong**	Sleepers are awoken; unstable objects are overturned.	<4.8
VI	**Strong**	Trees sway; suspended objects swing; objects fall off shelves; damage is slight.	<5.4
VII	**Very Strong**	Damage is negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, and considerable in poorly built or badly designed structures; some chimneys are broken.	<6.1
VIII	**Destructive**	Damage is slight in specially designed structures; considerable in ordinary, substantial buildings. Moving cars become uncontrollable; masonry fractures, poorly constructed buildings damaged.	<6.9
IX	**Ruinous**	Some houses collapse, ground cracks, pipes break open; damage is considerable in specially designed structures; buildings are shifted off foundations.	
X	**Disastrous**	Some well-built wooden structures are destroyed; most masonry and frame structures are destroyed along with foundations. Ground cracks profusely; liquefaction and landslides widespread.	<7.3
XI	**Very Disastrous**	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed.	<8.1
XII	**Catastrophic**	Total destruction; trees fall; lines of sight and level are distorted; ground rises and falls in waves; objects are thrown upward into the air.	>8.1

Earthquake magnitude is often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. Table 4.3.2-2 summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. The Richter Scale does not give any indication of the impact or damage of an earthquake, although it can be inferred that higher magnitude events cause more damage. Instead, the Modified Mercalli Intensity Scale is used to measure earthquake intensity (USGS, 2026).

Table 4.3.2-2: Richter Scale Magnitudes and Associated Earthquake Size Effects.

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

The worst earthquake recorded in West Virginia according to records maintained by The West Virginia Geological and Economic Survey was a magnitude 4.6 (or VI MMI) earthquake centered in Mercer County, WV, a county along the southern border of the state. Therefore, a worst-case scenario for this hazard would likely be if an earthquake of similar magnitude occurred in the Eastern Panhandle region or near the border of adjacent counties, which may cause mild damage in populated areas. Structural damage would not be expected in this scenario for most buildings, but blighted structures or those in a state of disrepair might experience further structural damage (West Virginia Geological and Economic Survey, 2016).

Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if indirect impacts like economic impacts are considered. Earthquakes are known for causing induced tsunamis, flooding, landslides, and avalanches; poor water quality; damage to vegetation; and breakage in sewage or toxic material containments. However, because of their geographic location, these impacts are extremely unlikely to occur in Berkeley and Morgan Counties (USGS, 2026).

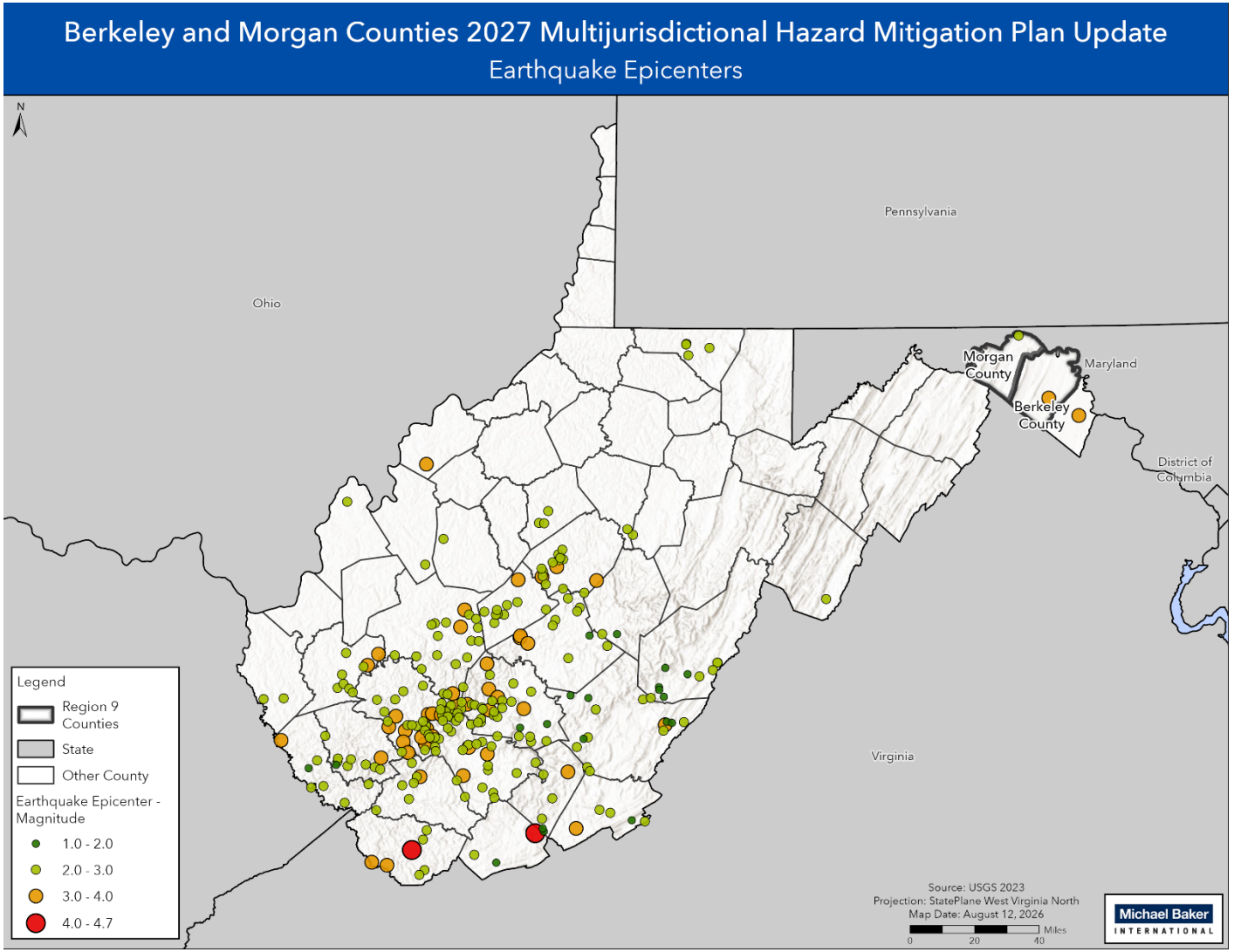
The potential impacts of earthquakes on community lifelines are as follows:

Table 4.3.2-3: Most Likely Lifelines Impacted by Earthquakes.	
Lifelines	**Notes**
	Shelters may be damaged or destroyed depending on severity. Food shortages may occur in the impacted area if the food supply chain is greatly disrupted and crops and food facilities become damaged or destroyed. Similarly, water facilities that become damaged or destroyed could result in a clean water shortage for people and critical facilities in the area.
	Personnel will likely be overutilized in response and recovery, leading to potential gaps in capacity. Health and medical facilities may be directly damaged or destroyed.
	Pipelines and hazardous materials facilities may be affected. If damaged or destroyed, this could result in hazardous materials release, damaging further infrastructure and endangering people and animals.

4.3.2.3. Past Occurrence

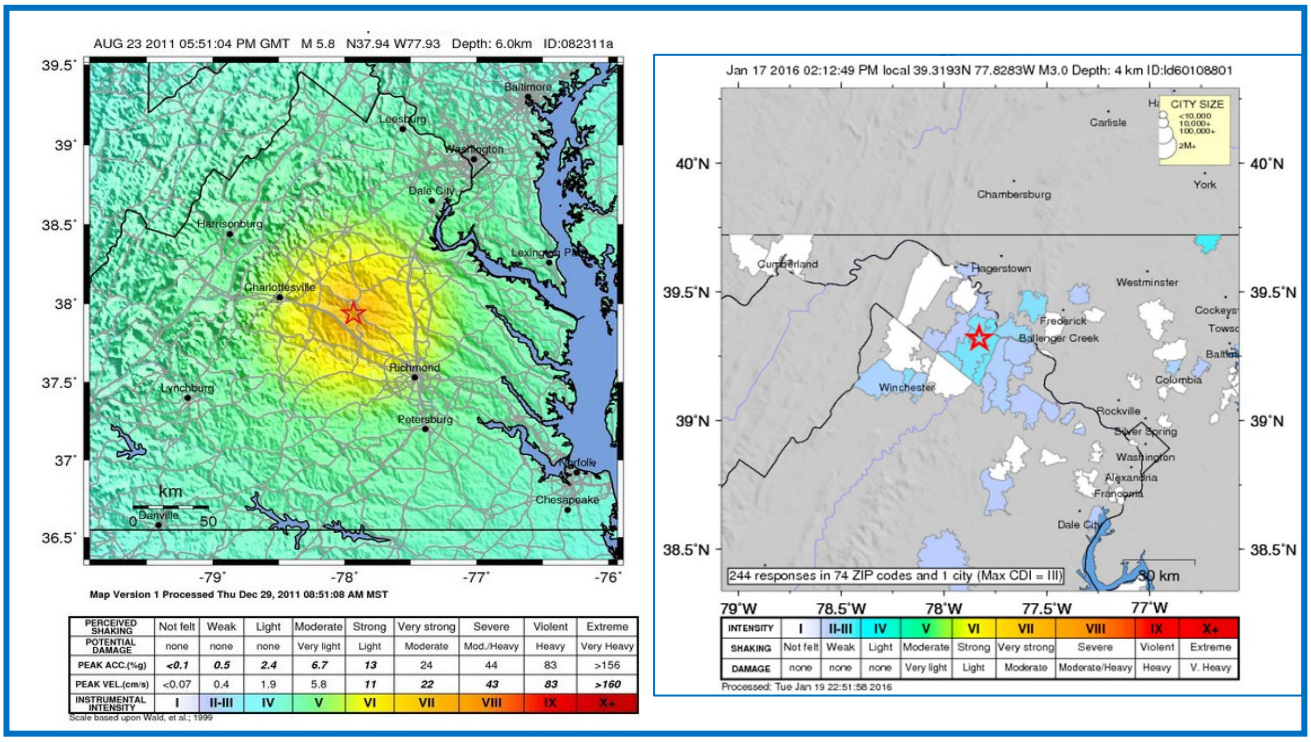
As noted previously, the Eastern Panhandle region does have a history of mild earthquakes. According to the West Virginia Statewide Standard HMP, Morgan County has experienced two small earthquakes with a MMI of I since 1824. Morgan County also had a 2.8 magnitude earthquake occur in 1976. Berkeley County has experienced one earthquake with a MMI of V. This Berkeley County earthquake occurred in the Charles Town-Martinsburg area in April of 1909 (West Virginia Geological and Economic Survey, 2024). It was felt across approximately 6,500 square kilometers. Though certainly noticeable by the public, little damage would be caused by an earthquake of this size. The location of these earthquakes can be seen in Figure 4.3.2-3, as well as other historical earthquake locations throughout West Virginia.

Figure 4.3.2-3: Earthquake Epicenters Throughout Berkeley and Morgan Counties and West Virginia Overall.



The most high-profile earthquake near the Potomac Highlands of West Virginia occurred in August 2011. A magnitude (Richter Scale) 5.7 earthquake centered in Louisa, Virginia (less than 100 miles from the City of Martinsburg in Berkeley County) shook structures throughout West Virginia, Pennsylvania, Virginia, Maryland, and New York. Damage to historic structures like the National Cathedral and the Washington Monument were noted in Washington D.C. Evacuations occurred in D.C. as well as New York City because the general population was not accustomed to experiencing an earthquake of that magnitude. However, the intensity of the earthquake was quite low outside of central Virginia, as seen in Figure 4.3.2-4. More recently, in January 2016, an earthquake shook the West Virginia – Virginia state border. The magnitude was 3.0 according to the Richter Scale and the intensity was minimal, but the earthquake was clearly felt up to 28 miles away in Martinsburg (USGS, 2026). According to USGS records of earthquakes from 1900-Present, the 2016 earthquake is the most recent in the area of this scale (USGS, 2026).

Figure 4.3.2-4: USGS ShakeMaps for August 2011 and January 2016 Earthquakes (USGS, 2016)



4.3.2.4. Future Occurrence

As previously mentioned, eastern Berkeley County has a 2 percent chance of exceeding a Peak Ground Acceleration (PGA) of 8-10 %g in 50 years while the western portion of Berkeley County and Morgan County have a PGA exceedance of 4-8 %g in 50 years according to Figure 4.3.2-1. The probability of

an earthquake occurring in Morgan County and Berkeley County each year is very low, and the probability of a destructive earthquake is highly improbable. Historical records indicate that the future likelihood of an earthquake is *unlikely* (less than 1% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

As of 2021, six seismic monitoring stations exist across West Virginia, with one located in Berkeley County. These stations collect data about any future earthquake events and may help West Virginians further understand their earthquake risk.

4.3.2.5. Vulnerability Assessment

The somewhat random historical occurrences of earthquakes would indicate that all structures throughout Region 9's counties to be equally at risk from earthquakes. The severity of those earthquakes, though, is expected to be very low. Given this low severity, officials in both counties estimated earthquake losses to be almost non-existent. In a mild earthquake of the magnitude typically experienced in West Virginia, no structural damage is anticipated. In other cases, damages are expected to be limited, and examples of anticipated damage are broken dishes and windows and toppled file cabinets.

However, for earthquakes, the available history covers a period of less than 300 years, which is a relatively short period of time for an examination of earthquakes. Large earthquakes may only affect a location every several centuries or millennia. Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if indirect impacts are considered. Some secondary hazards caused by earthquakes may include fire, hazardous material release, landslides, flash flooding, avalanches, tsunamis, and dam failure. These secondary events could also result in disruptions to natural ecosystems, poor water quality, damage to vegetation, and the release of toxic materials and sewage. Impacts to infrastructure could include train derailments, pipe failures, and utility interruptions. A very large earthquake affecting the counties might cause structural damage in dilapidated structures or structures that do not meet current building codes. Thus, the impact of an earthquake might range from negligible to catastrophic. Based on historical data for the counties, damage is likely to be minimal.

Structures identified as potentially at risk of damage due to an earthquake are older structures. All existing buildings have the potential to experience an earthquake. Given no history of damage in the region due to earthquakes, damages are estimated to be limited to the more dilapidated structures and structures with unreinforced masonry. The number of occupied housing units built before 1960 (over 65 years old) in Berkeley and Morgan Counties is 13,058 (U.S. Census Bureau, 2024, ACS).

Table 4.3.2-3: Occupied Housing Units Built Before 1960 (U.S. Census Bureau, 2024, ACS).

Jurisdiction	Units	Percent
Berkeley County	7,385	13.7%

Table 4.3.2-3: Occupied Housing Units Built Before 1960 (U.S. Census Bureau, 2024, ACS).		
Jurisdiction	**Units**	**Percent**
Martinsburg	3,597	42.4%
Hedgesville	48	32.2%
Morgan County	1,676	18.2%
Bath	267	49%
Paw Paw	85	38.2%

All future structures will also have the potential to experience an earthquake. However, given that new structures must also meet current building codes and given the expected magnitude of earthquakes in the region, limited property damages are anticipated.

Table 4.3.2-4 below shows the expected annual losses to earthquakes by census tract.

Table 4.3.2-4: Expected Annual Losses to Earthquakes by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses ($)**	**Expected Annual Loss Rating**
54003971301	Martinsburg City	$73,499.43	Relatively Low
54003971402	Martinsburg City	$30,263.68	Relatively Low
54003971500	Martinsburg City	$66,567.27	Relatively Low
54003971600	Martinsburg City	$83,530.33	Relatively Low
54003971700	Martinsburg City	$72,084.87	Relatively Low
54003971901	Martinsburg City	$76,786.92	Relatively Low
54003971902	Martinsburg City	$41,570.90	Relatively Low
54003972002	Martinsburg City	$19,504.46	Very Low
54065970900	Paw Paw Town	$6,543.93	Very Low
54065970800	Bath (Berkeley Springs) Town	$23,408.85	Relatively Low
54003971205	Hedgesville Town	$22,759.19	Relatively Low

4.3.2.6. Populations at Risk

Communities within Berkeley and Morgan Counties with a large renter population may be more at risk during an earthquake due to a lack of control over the seismic safety of their buildings. Renter protections may also be affected due to a lack of renter protections or access to temporary housing after an earthquake. Low-income communities may also be at greater risk as these households often live in older or poorly constructed housing, which is more likely to sustain damage during an earthquake. People with disabilities or limited mobility also face greater challenges in evacuating during an earthquake and accessing post-disaster services. In terms of emergency notification, households without smartphones and lack of access to the internet will affect how people get

emergency communications. Ensuring equitable access to such technologies and providing information in multiple languages and formats is critical.

4.3.3. Extreme Temperatures

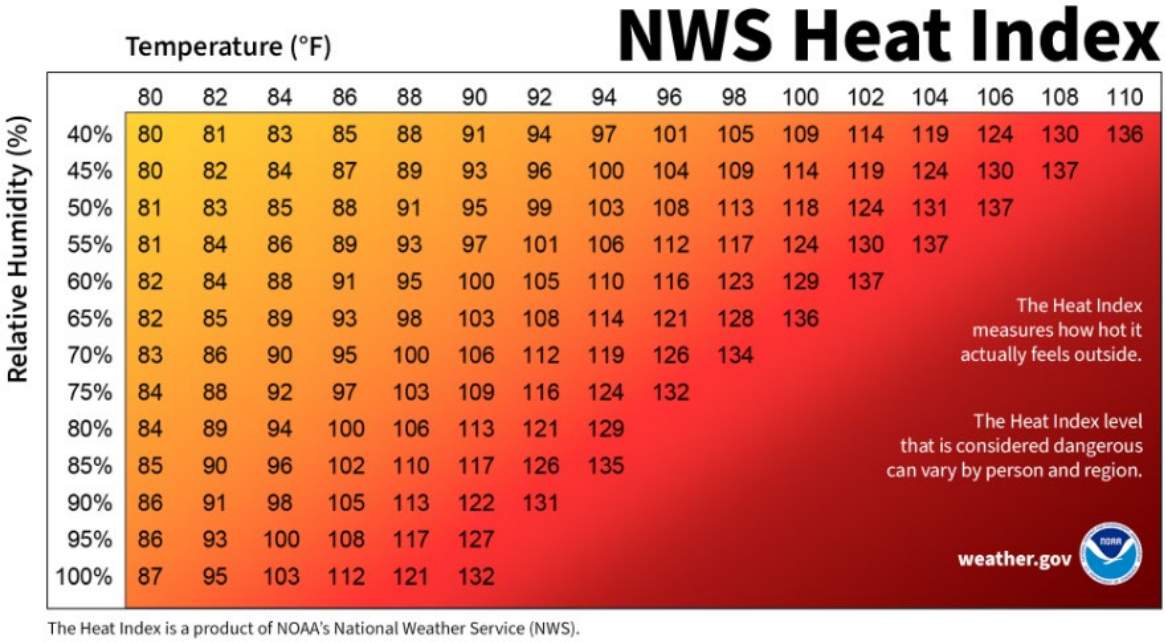


4.3.3.1. Location and Extent

Extreme temperature events include both extreme heat and extreme cold. Although often overlooked when compared against more dramatic hazard events, these events have a significant impact on the health, safety, and well-being of a community. In general, extreme temperature events are larger-scale and regional; as a result, any extreme temperature event impacting Berkeley and Morgan counties would also impact nearby counties. Areas most susceptible to extreme heat include urban environments, as buildings and pavements absorb and retain heat. This is referred to as the Urban Heat Island Effect. Berkeley County has the City of Martinsburg, which can be considered an urban area. Higher elevations are a more susceptible to extreme cold events. Different populations and industries may experience extreme temperatures differently. Demographics must also be considered, as large populations of elderly or poor represent those most vulnerable to temperature extremes. The effects can be wide-ranging.

West Virginia, like the rest of the United States, has been increasingly vulnerable to heat waves or periods of extreme heat that are both longer and hotter than normal. Extreme levels of humidity or dryness can also accompany heat waves, influencing the heat index or the body's perception of air temperature. Areas with high humidity also maintain a higher heat index. For instance, a temperature of 100° F and a relative humidity of 40 percent produces a heat index of 109 (NOAA, 2026a). Figure 4.3.3-1 below shows NOAA's National Weather Service Heat Index chart.

Figure 4.3.3-1: NOAA NWS Heat Index (NOAA, 2026a).

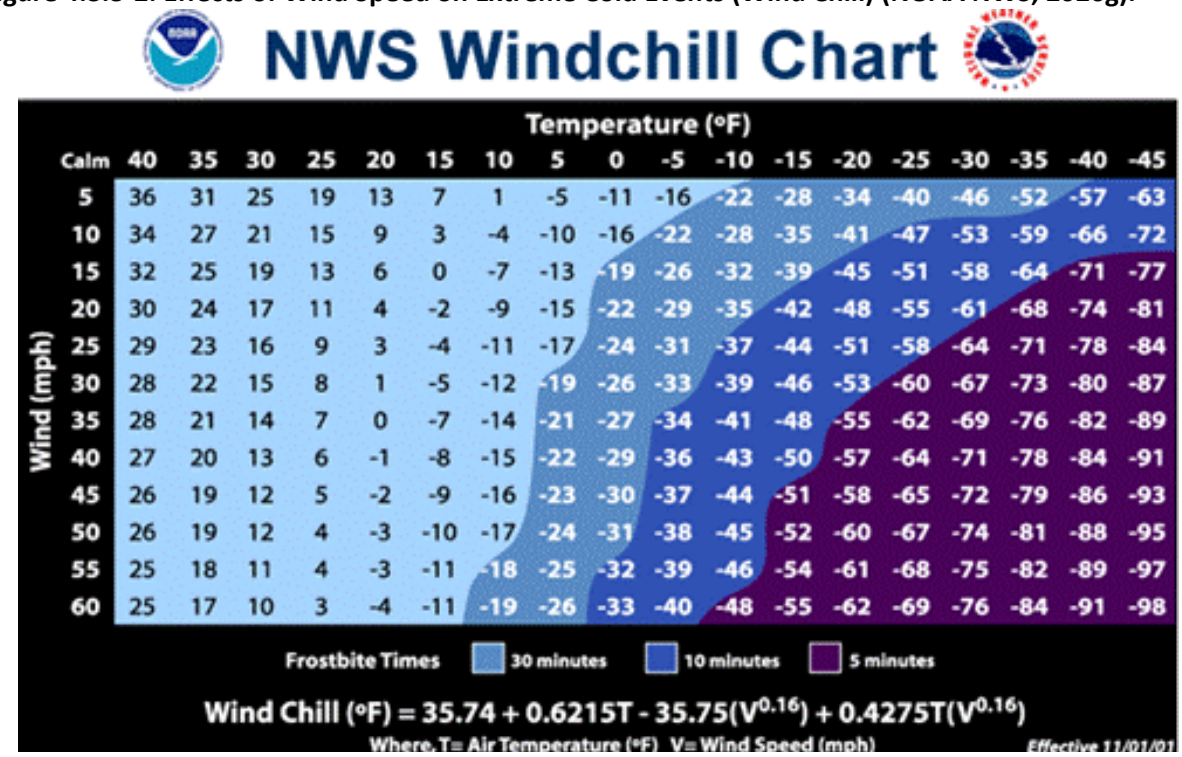


The Heat Index is a product of NOAA's National Weather Service (NWS).

Extreme cold is as equally threatening to human safety and wellbeing as extreme heat. The definition of extreme cold will vary depending upon the region of the country. In areas that do not usually experience winter weather, even near freezing temperatures can constitute extreme cold. As with the other end of the spectrum, extreme cold can result in a cold wave or cold snap.

According to the U.S. Climate Resilience Toolkit, a cold wave is defined as "a rapid fall in temperature within 24 hours and extreme low temperatures for an extended period". The location and local NWS weather forecast office then defines what temperatures are considered a cold wave (U.S. Climate Resilience Toolkit, 2026). The wind chill index is equivalent to the heat index, but for extreme cold. Wind chill temperature influences people's perception of how cold it is outside and is based on the rate of heat loss, caused by a combination of wind and cold. Increased wind rates draw heat from the body more quickly, leading to a drop in internal body temperature (NOAA NWS, 2026g). Figure 4.3.3-2 demonstrates the windchill chart from NOAA NWS.

Figure 4.3.3-2: Effects of Wind Speed on Extreme Cold Events (Wind Chill) (NOAA NWS, 2026g).



Figures 4.3.3-3 and 4.3.3-4 show the average minimum and maximum temperatures in Berkeley and Morgan Counties. Average minimum and maximum temperatures vary across the Counties. The minimum annual average temperatures can vary anywhere from 42 to >43.5°F for Berkeley County and 41.5-43°F for Morgan County. The average annual maximum temperature ranges from 64 to >64.5°F and 63.5-64.25°F for Morgan County.

Figure 4.3.3-3: The Average Annual Minimum Temperature in Berkeley and Morgan Counties from 1991-2020.

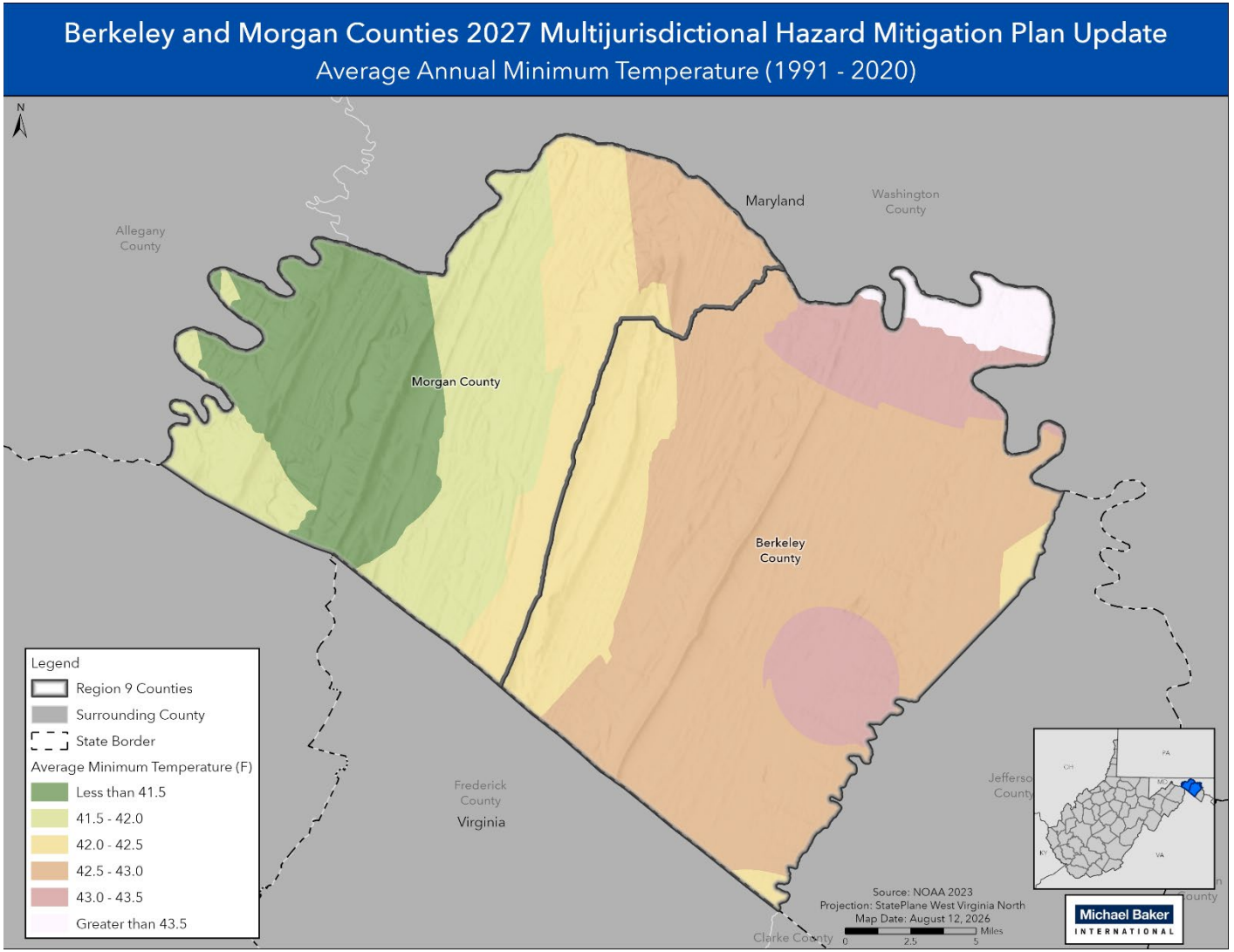
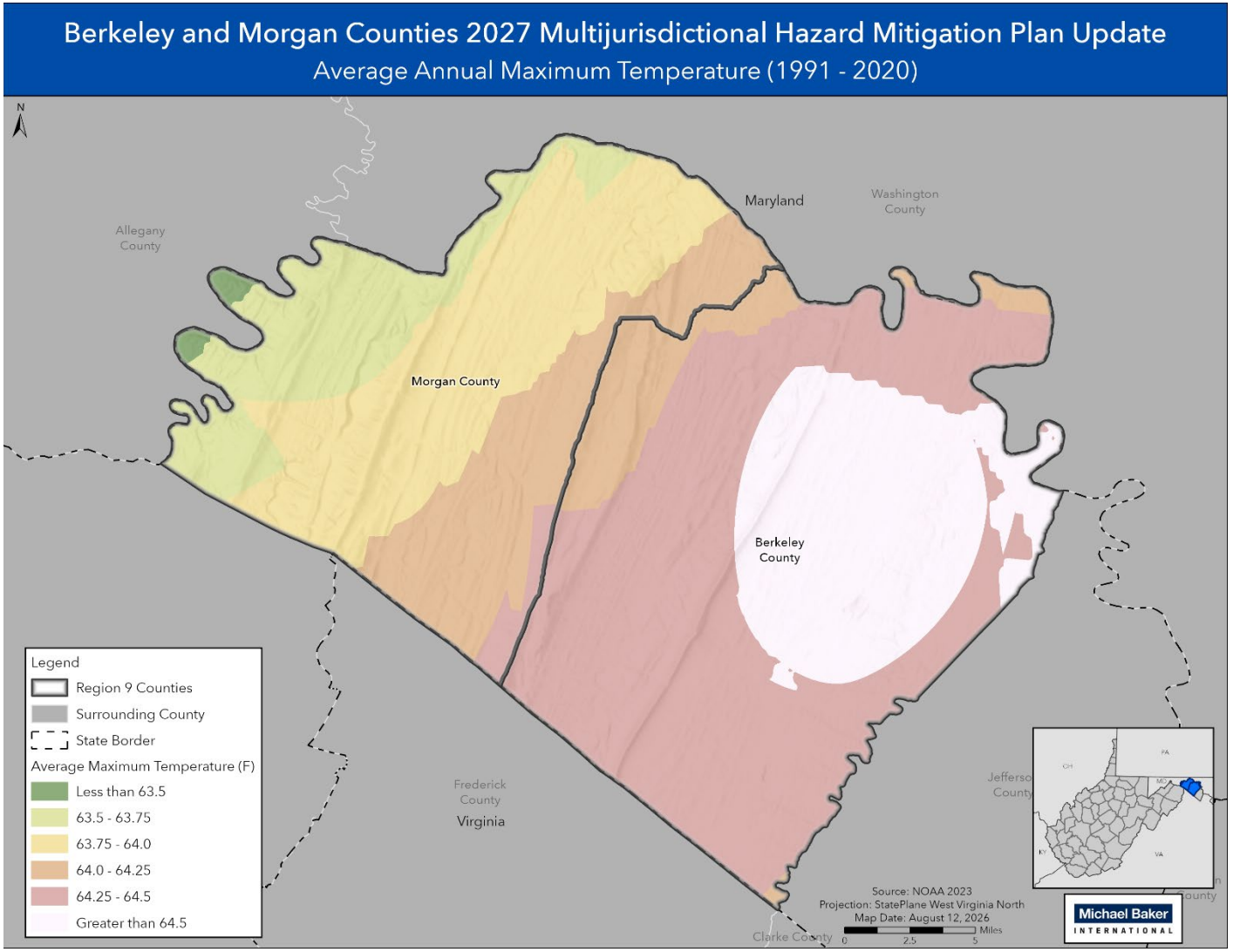


Figure 4.3.3-4: The Average Annual Maximum Temperature in Berkeley and Morgan Counties from 1991-2020.



4.3.3.2. Range of Magnitude

As the summer season progresses, more heat waves are likely to occur. Heat stress can show itself through several heat-related illnesses, including heat syncope (fainting), heat rash, heat cramps, heat exhaustion, rhabdomyolysis, and heat stroke. Heat stroke requires immediate medical attention and can result in death. When the body can no longer regulate its temperature or when the body loses too much fluid and/or salt via dehydration and sweating, heat stress is imminent (CDC, 2026b). The CDC lists several risk factors for heat-related illnesses for workers, however, this list can apply to anyone who spends extended periods of time outside during extreme heat events; high temperature and humidity, direct sun exposure, indoor radiant heat sources, limited air movement, lack of acclimatization, dehydration, physical exertion, personal protective equipment (PPE) and clothing, physical condition and health problems, certain medications, advanced age, pregnancy, and previous heat-related illness (CDC, 2026c).

People with chronic medical conditions are especially vulnerable to extreme heat. The National Integrated Heat Health Information System (NIHHIS) cites risk factors for heat-related illness as heart disease, mental illness, poor blood circulation, and obesity. Medications may worsen the effects or increase the sensitivity to extreme heat, while people with chronic health conditions may be unable to sense and/or respond to changes in temperature. Further, overweight and obese individuals retain more body heat and may be more sensitive to heat (NIHHIS, 2026).

Vulnerability to injury and death also significantly increases during periods of extreme cold. The most common direct causes of cold-related injury or death include hypothermia, frostbite, influenza, and pneumonia.

The CDC defines hypothermia as abnormally cold temperatures which cause your body to lose heat faster than it can be produced. Body temperature that is too low also affects cognitive processing, meaning that someone experiencing hypothermia may become confused and unable to process the danger they are in. Hypothermia can occur at relatively warm temperatures, such as 40° F, if a person is chilled from sweat or rain or has been submersed in cold water. Certain demographic and health characteristics increase susceptibility to hypothermia. Victims of hypothermia more frequently include (CDC, 2024f):

- Elderly people with inadequate food, clothing, or heating;
- Babies sleeping in cold bedrooms;
- Children left unattended;
- Adults under the influence of alcohol or illicit drugs;
- Persons with cognitive disabilities; and
- People who remain outdoors for long periods—the homeless, hikers, hunters, etc.

Frostbite is an additional severe cold weather concern and is caused by parts of the body freezing. It

more often affects extremities (such as the nose, ears, cheeks, chin, fingers, and toes) and can cause permanent damage, in extreme cases, amputation. Frostbite causes feeling and color in the affected area. People with reduced blood circulation and those not dressed properly for the weather are at increased risk of frostbite (CDC, 2024e).

Indirect causes of injury or death from cold can include death and injuries from falls and accidents due to icy conditions, or carbon monoxide poisoning and house fires due to home heating methods.

Extreme temperatures have an impact on more than just human health. They can also affect economic costs in transportation, agriculture, production, energy, and infrastructure. Transportation can be influenced by temperature in several ways. Most applicable to the county would be that highways and roads are damaged through excessive heat, which causes asphalt roads to soften. Concrete roads can explode, lifting large chunks of concrete off the ground. Excessive heat also places stress on automobile cooling systems, diesel trucks, and locomotives, causing an increase in mechanical failures, and airplanes lose lift at high temperatures. Extreme cold also impacts transportation, as it stresses diesel engines, vehicle batteries, and gels fuel. Metal bridge structures can also be negatively impacted by severe cold.

In Berkeley and Morgan counties, a potential worst-case extreme temperature scenario would involve the Counties experiencing 90°F or higher temperatures (or 0°F or lower) for an extended number of days. The heat/cold would overwhelm the power grid, causing widespread blackouts and damaging property.

The potential impacts of extreme temperatures on community lifelines are as follows:

Table 4.3.3-3: Most Likely Lifelines Impacted by Extreme Temperatures.

Lifelines	Notes
	Government operations and facilities, including police and fire, will be needed for response and recovery. Landlords and utility companies will need to respond to infrastructure issues for residents. Safety for residents will be impacted with extreme heat and cold events potentially causing medical issues.
	Medical care will be needed in extreme events, and the facilities themselves will need effective heating and cooling infrastructure.
	Extreme temperatures will lead to a larger strain on the power grid due to an increased usage of heating and cooling utilities in response. As a result, people and critical facilities may lose access to electricity if the demand is too overwhelming, causing blackouts.

4.3.3.3. Past Occurrence

The region has often encountered severe and dangerous temperatures in the past. Previous temperature extremes impacting Berkeley and Morgan Counties can be seen in Table 4.3.3-2 and Table 4.3.3-3. In general, Berkeley County seems to face the highest temperatures out of the two counties, while Morgan County experiences the lowest temperatures.

Table 4.3.3-2: Previous Temperature Extremes Impacting Berkeley County Since 1950 (NOAA NCEI, 2026b).

Event Type	Number Of Events	Injuries	Deaths	Property Damages	Crop Damages
Cold/Wind Chill	12	0	0	$0	$0
Excessive Heat	9	0	0	$0	$0
Extreme Cold/Wind Chill	8	0	0	$0	$0
Frost/Freeze	37	0	0	$0	$4,000,000
Heat	32	3	0	$0	$0
Total	98	3	0	$0	$4,000,000

Table 4.3.3-3: Previous Temperature Extremes Impacting Morgan County Since 1950 (NOAA NCEI, 2026b).

Severe Storm Event Type	Number Of Events	Injuries	Deaths	Property Damages	Crop Damages
Cold/Wind Chill	11	0	0	$0	$0
Excessive Heat	4	0	0	$0	$0
Extreme Cold/Wind Chill	8	0	0	$0	$0
Frost/Freeze	28	0	0	$0	$200,000
Heat	33	0	0	$0	$0
Total	84	0	0	$0	$200,000

The frost/freeze event that resulted in $4,000,000 in crop damage for Berkeley County and $200,000 for Morgan County occurred on April 10, 1997. According to NOAA NCEI, warm temperatures in late March (along with a warmer winter) caused apple and peach blossoms to reach critical bloom stage about 1 week ahead of schedule. However, a cold arctic air mass overspread eastern West Virginia on the 9th and 10th, which decreased temperatures to the mid-teens and lower 20s. Consequently, the apple crop endured 50% damage, while peach crop mortality ranged from 60 to 90% with berries also sustaining large kills. Berkeley County was notably affected with 8,500 damaged acres (NOAA NCEI, 2026b).

The heat event that resulted in three injuries occurred on July 4th, 1999. Due to the holiday weekend,

people spent a lot of time outdoors. Three people needed to be treated at the Martinsburg City Hospital for heat exhaustion the following day. Further, Berkeley County also reported complaints from residents about heat related issues. Berkeley Springs recorded a high temperature of 101 degrees. Heat indices were between 105 to 115 (NOAA NCEI, 2026b).

4.3.3.4. Future Occurrence

Although the frequency of heat waves and cold waves cannot currently be definitively predicted with long-range forecasts, meteorologists can identify frequent trends and likely temperature ranges based on regional historical data and upcoming weather conditions. Certain extreme weather events and temperatures are expected to continue to become more frequent, and although there is much debate over the issue of climate change, many leading experts are concerned about a potential warming of the Earth. According to NASA, climate change is, "a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates,". Additionally, they report rises in temperature globally resulting in ice sheets melting, contributing to the evidence of climate change (NASA, 2024b).

It is increasingly difficult to predict the future occurrence of temperature frequency as the impacts of climate change are experienced. Broad evidence supports anthropogenic influence on global warming. The average annual temperature of West Virginia has warmed by 2.9°F since 1970, which reflects a trend of overall warming (Climate Central, 2026a).

The CMRA Tool also provides county-level assessment reports for extreme heat, but not extreme cold. Figures 4.3.3-5 and 4.3.3-6 below show the report for Berkeley and Morgan Counties. According to CMRA, the annual number of days above 90°F is expected to significantly increase in the future under all emission scenarios for both Counties. The annual highest maximum temperature is also expected to increase by a few degrees for both Counties.

Therefore, the probability of an extreme temperature event in the region is considered *likely* (between 50% & 90% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Figure 4.3.3-5: Berkeley County Extreme Heat Hazard Assessment Report (CMRA, 2026).



Future Climate Indicators

Indicator	Mid - 1900s (1951 - 1980) Min - Max	Early Century (2011 - 2040) Lower Emissions Min - Max	Early Century (2011 - 2040) Higher Emissions Min - Max	Mid Century (2041 - 2070) Lower Emissions Min - Max	Mid Century (2041 - 2070) Higher Emissions Min - Max	Late Century (2071 - 2100) Lower Emissions Min - Max	Late Century (2071 - 2100) Higher Emissions Min - Max
Temperature thresholds:							
Annual days with maximum temperature > 90°F	**0 days** 0 - 45	**36 days** 11 - 78	**37 days** 11 - 85	**52 days** 12 - 99	**64 days** 20 - 118	**63 days** 20 - 113	**96 days** 36 - 164
Annual days with maximum temperature > 95°F	**3 days** 0 - 15	**10 days** 0 - 46	**10 days** 0 - 43	**18 days** 0 - 62	**26 days** 1 - 84	**25 days** 0 - 76	**56 days** 7 - 137
Annual days with maximum temperature > 100°F	**0 days** 0 - 5	**1 days** 0 - 19	**1 days** 0 - 20	**4 days** 0 - 33	**6 days** 0 - 39	**6 days** 0 - 33	**23 days** 0 - 94
Annual days with maximum temperature > 105°F	**0 days** 0 - 0	**0 days** 0 - 3	**0 days** 0 - 5	**0 days** 0 - 6	**1 days** 0 - 13	**1 days** 0 - 17	**6 days** 0 - 52
Annual temperature:							
Annual single highest maximum temperature °F	**97 °F** 89 - 104	**100 °F** 93 - 112	**100 °F** 93 - 111	**102 °F** 94 - 113	**103 °F** 95 - 113	**103 °F** 94 - 116	**107 °F** 98 - 121
Annual highest maximum temperature averaged over a 5-day period °F	**93 °F** 92 - 93	**96 °F** 94 - 100	**97 °F** 94 - 101	**98 °F** 95 - 104	**99 °F** 95 - 107	**100 °F** 96 - 107	**104 °F** 96 - 115
Cooling degree days (CDD)	**834 degree-days** 505 - 1216	**1,244 degree-days** 767 - 1,932	**1,269 degree-days** 767 - 1,980	**1,509 degree-days** 1,040 - 2,174	**1,731 degree-days** 994 - 2,678	**1,696 degree-days** 1,136 - 2,442	**2,390 degree-days** 1,431 - 4,171

N/A = Data Not Available for the selected area

Figure 4.3.3-6: Morgan County Extreme Heat Hazard Assessment Report (CMRA, 2026).



Future Climate Indicators

Indicator	Mid - 1900s (1951 - 1980) Min - Max	Early Century (2011 - 2040) Lower Emissions Min - Max	Early Century (2011 - 2040) Higher Emissions Min - Max	Mid Century (2041 - 2070) Lower Emissions Min - Max	Mid Century (2041 - 2070) Higher Emissions Min - Max	Late Century (2071 - 2100) Lower Emissions Min - Max	Late Century (2071 - 2100) Higher Emissions Min - Max
Temperature thresholds:							
Annual days with maximum temperature > 90°F	**0 days** 0 - 37	**27 days** 4 - 71	**27 days** 4 - 71	**41 days** 6 - 90	**53 days** 14 - 108	**52 days** 7 - 105	**86 days** 26 - 160
Annual days with maximum temperature > 95°F	**2 days** 0 - 11	**6 days** 0 - 35	**6 days** 0 - 37	**12 days** 0 - 54	**18 days** 0 - 65	**17 days** 0 - 67	**45 days** 3 - 133
Annual days with maximum temperature > 100°F	**0 days** 0 - 3	**1 days** 0 - 15	**1 days** 0 - 15	**2 days** 0 - 20	**3 days** 0 - 29	**3 days** 0 - 20	**15 days** 0 - 82
Annual days with maximum temperature > 105°F	**0 days** 0 - 0	**0 days** 0 - 2	**0 days** 0 - 4	**0 days** 0 - 5	**0 days** 0 - 11	**0 days** 0 - 12	**4 days** 0 - 42
Annual temperature:							
Annual single highest maximum temperature °F	**96 °F** 88 - 104	**99 °F** 91 - 112	**99 °F** 91 - 111	**101 °F** 92 - 114	**102 °F** 93 - 114	**102 °F** 94 - 117	**106 °F** 97 - 122
Annual highest maximum temperature averaged over a 5-day period °F	**92 °F** 91 - 92	**95 °F** 93 - 99	**96 °F** 93 - 101	**97 °F** 94 - 103	**99 °F** 94 - 106	**99 °F** 94 - 106	**104 °F** 96 - 114
Cooling degree days (CDD)	**686 degree-days** 398 - 1022	**1,027 degree-days** 609 - 1,661	**1,048 degree-days** 609 - 1,687	**1,262 degree-days** 815 - 1,871	**1,466 degree-days** 793 - 2,322	**1,429 degree-days** 894 - 2,116	**2,068 degree-days** 1,209 - 3,813

N/A = Data Not Available for the selected area

4.3.3.5. Vulnerability Assessment

The potential for extreme heat and cold always exists in and around the summer and winter months. Meteorologists and weather forecasters can normally predict the temperature with excellent accuracy. Adhering to extreme temperature warnings can significantly reduce the risk of temperature related deaths. All areas of both Counties are vulnerable to the effects of extreme temperatures, but these vulnerabilities are individualized among the general population and will continue to be extremely difficult to address from a countywide or even local emergency response to such events. This vulnerability is directed to both health impacts of extreme heat and cold as well as secondary impacts on the economy, infrastructure, and energy expenditure.

Those hardest hit by both heat and cold waves are adults 65 years of age or older, many of whom are already physically vulnerable. Excessive heat exposure also affects people with certain pre-existing medical conditions, including cardiovascular disease, respiratory illnesses, and obesity. Elderly individuals in Berkeley and Morgan Counties (those who are 65 years of age and older) make up 15.3% and 25.2% of the total population, respectively. As shown in Table 4.3.3-4 below, these groups are more likely to be in Morgan County, where the population is aging; however, effects will be noticed in senior communities and neighborhoods in Berkeley County as well. For example, both Martinsburg and the Town of Bath have several senior living communities. Officials should also focus on mobile home parks, where populations also tend to be aging. Disabled individuals are also more vulnerable to the effects of extreme temperatures. The Town of Bath had the highest percentage of disabled individuals with 22.6% of its population. While the City of Martinsburg has the largest number of disabled individuals with 3,447 people.

Table 4.3.3-4: Vulnerable Populations in Berkeley and Morgan Counties (U.S. Census Bureau, 2024, ACS).

Jurisdiction	Disabled Population	Percent	Population Over 65	Percent
Berkeley County	18,320	14.3%	19,771	15.3%
Martinsburg	3,447	18.3%	3,096	16.4%
Hedgesville	48	12.7%	43	11.3%
Morgan County	3,044	17.6%	4,386	25.2%
Bath	220	22.6%	275	28.2%
Paw Paw	90	19.6%	57	12.4%

Table 4.3.3-5 below shows the expected annual losses to heat waves by census tract.

Table 4.3.3-5: Expected Annual Losses to Heat Waves by Census Tract (FEMA NRI, 2026e).

Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$61,861.62	Relatively Moderate

Table 4.3.3-5: Expected Annual Losses to Heat Waves by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses ($)**	**Expected Annual Loss Rating**
54003971402	Martinsburg City	$64,239.35	Relatively Moderate
54003971500	Martinsburg City	$40,142.28	Relatively Moderate
54003971600	Martinsburg City	$50,969.10	Relatively Moderate
54003971700	Martinsburg City	$57,978.60	Relatively Moderate
54003971901	Martinsburg City	$64,834.14	Relatively Moderate
54003971902	Martinsburg City	$49,223.66	Relatively Moderate
54003972002	Martinsburg City	$40,205.51	Relatively Moderate
54065970900	Paw Paw Town	$18,996.27	Relatively Low
54065970800	Bath (Berkeley Springs) Town	$27,898.87	Relatively Low
54003971205	Hedgesville Town	$47,641.92	Relatively Moderate

Table 4.3.3-6 below shows the expected annual losses to cold waves by census tract.

Table 4.3.3-6: Expected Annual Losses to Cold Waves by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses ($)**	**Expected Annual Loss Rating**
54003971301	Martinsburg City	$8,026.59	Relatively Low
54003971402	Martinsburg City	$5,002.79	Relatively Low
54003971500	Martinsburg City	$3,539.17	Relatively Low
54003971600	Martinsburg City	$4,777.60	Relatively Low
54003971700	Martinsburg City	$5,108.24	Relatively Low
54003971901	Martinsburg City	$8,587.46	Relatively Low
54003971902	Martinsburg City	$8,627.95	Relatively Low
54003972002	Martinsburg City	$3,589.12	Relatively Low
54065970900	Paw Paw Town	$10,788.10	Relatively Low
54065970800	Bath (Berkeley Springs) Town	$27,461.17	Relatively Low
54003971205	Hedgesville Town	$8,412.90	Relatively Low

4.3.3.6. Populations at Risk

Low-income households may be at greater risk during extreme weather risks, especially when energy bills are disproportionately expensive in proportion to the income in these households. Renters can be more vulnerable because they do not have control over heating and cooling systems. This can be more serious in terms of extreme heat since air condition is not usually a legal requirement in structures, but heat usually is. In the event of heating and cooling system malfunctions, renters may be unable to make key decisions. Elderly populations (those aged 65 and older) will need extra consideration as they are more susceptible to negative health effects related to extreme temperatures. As mentioned above, this means Morgan County may be particularly vulnerable.

Unhoused populations and those without steady access to shelter are perhaps the most vulnerable population because they are exposed to the elements for extended periods of time.

4.3.4. Flooding



4.3.4.1. Location and Extent

Flooding is one of the highest priority hazards in both Berkeley and Morgan Counties, as is the case in most of West Virginia. Flooding is an overflowing of water onto land that is normally dry (NOAA NSSL, 2026b). Flooding is normally the result of a larger event such as a thunderstorm, rapid snowmelt, and/or ice jam. Flooding can be as frequent as the occurrence of a spring rain or summer thunderstorm. The amount of precipitation produced by storm events determines the type of flooding.

Flash flood conditions can result from a large amount of rainfall over a short time span. Though, a small amount of rain can also result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impervious surfaces such as large parking lots, paved roadways, or other densely developed areas. Flash floods typically occur more frequently than general floods.

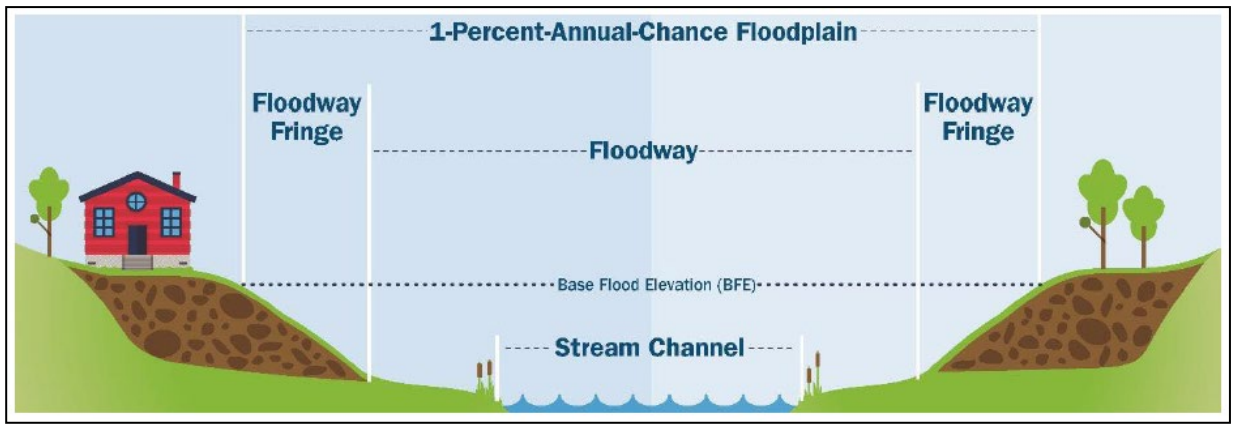
Flood sources within Berkeley and Morgan Counties include rivers and streams. For inland areas like the Eastern Panhandle, excess water from snowmelt or rainfall accumulates and overflows onto stream banks and adjacent floodplains. Berkeley and Morgan Counties lie within the drainage basin of the Potomac River, which drains directly into the Chesapeake Bay. Most of the region's population is in Potomac Direct Drains Watershed, but the western portion of Morgan County lies in the Cacapon Watershed.

The various tributary streams and creeks generally flow towards the northern region of Berkeley and Morgan Counties, towards the Potomac River. Large tributaries in the region include Opequon Creek, Back Creek, Sleepy Creek, and Cacapon River.

Floodplains are lowlands, adjacent to rivers, streams, and creeks that are subject to recurring floods. However, anywhere it can rain, it can flood. The National Flood Insurance Program (NFIP), for which the Flood Insurance Rate Map (FIRM) is published, maps the risk associated with the 1-percent-annual-chance flood. This 1-percent-annual chance flood event is used to delineate the Special Flood Hazard Area (SFHA) and to identify Base Flood Elevations (BFE), terms identified in Figure 4.3.4-1. The SFHA serves as the primary regulatory boundary used by FEMA and the State of West Virginia when determining risk associated with flooding. FEMA delineates floodplains on its maps by the recurrence interval of a given flood. Flood recurrence intervals are explained in more detail in Section 4.3.4.4. However, in assessing the spatial extent of flooding it is important to know that a floodplain associated with a 1-percent annual chance of occurring in a given year is smaller than the floodplain associated

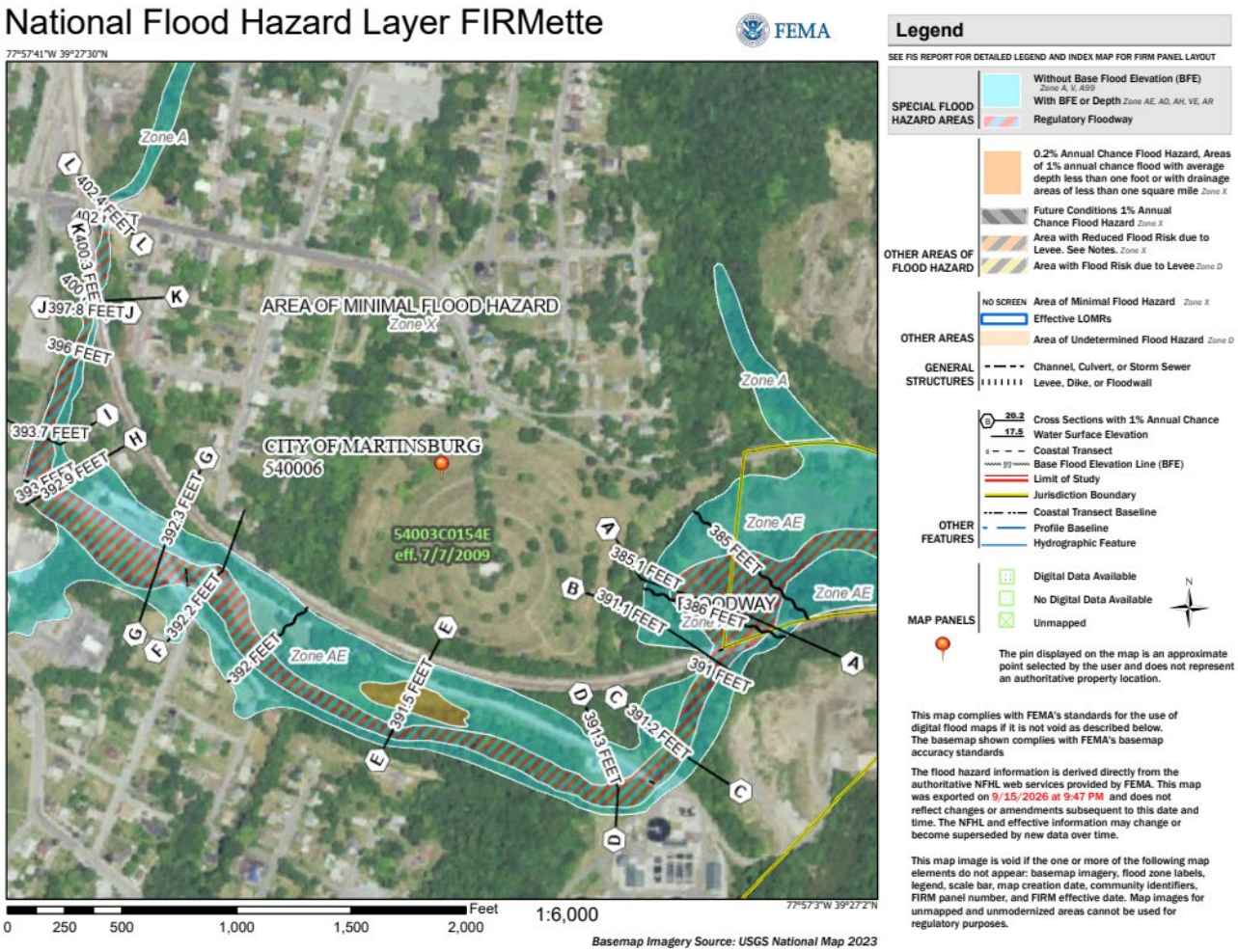
with a flood that has a 0.2-percent annual chance of occurring.

Figure 4.3.4-1: Diagram Identifying Special Flood Hazard Area and 100-Year Floodplain



The current countywide FIRM and Flood Insurance Study (FIS) report was published for Berkeley County on July 7, 2009, and Morgan County on September 25, 2009 (FEMA, 2026c). This best available flood hazard data, which was used to update this flood hazard profile, included current effective FIRM data and incorporated Letters of Map Revision (LOMRs). Figure 4.3.4-2 displays an example of a FIRM, found in Martinsburg City. The FIRM and FIS for both counties can be obtained from the FEMA Map Service Center (https://msc.fema.gov/portal/home) and can be used to identify the expected spatial extent and elevation of flooding from a 1-percent and 0.2-percent-annual chance event.

Table 4.3.4-2: FIRM Panel 54003C0154E showing Flood Hazard Areas in Martinsburg City (FEMA, 2026c).



According to Figure 4.3.4-3 and Figure 4.3.4-4, Berkeley and Morgan Counties both face flooding countywide. Berkeley County is most threatened by flooding resulting from Opequon Creek, Back Creek, and their tributaries. Morgan County's greatest flooding risk results from Sleepy Creek, Cacapon River, and their corresponding tributaries. Both counties also face some risk of flooding from the Potomac River.

Figure 4.3.4-3: Flood Zones in Berkeley County.

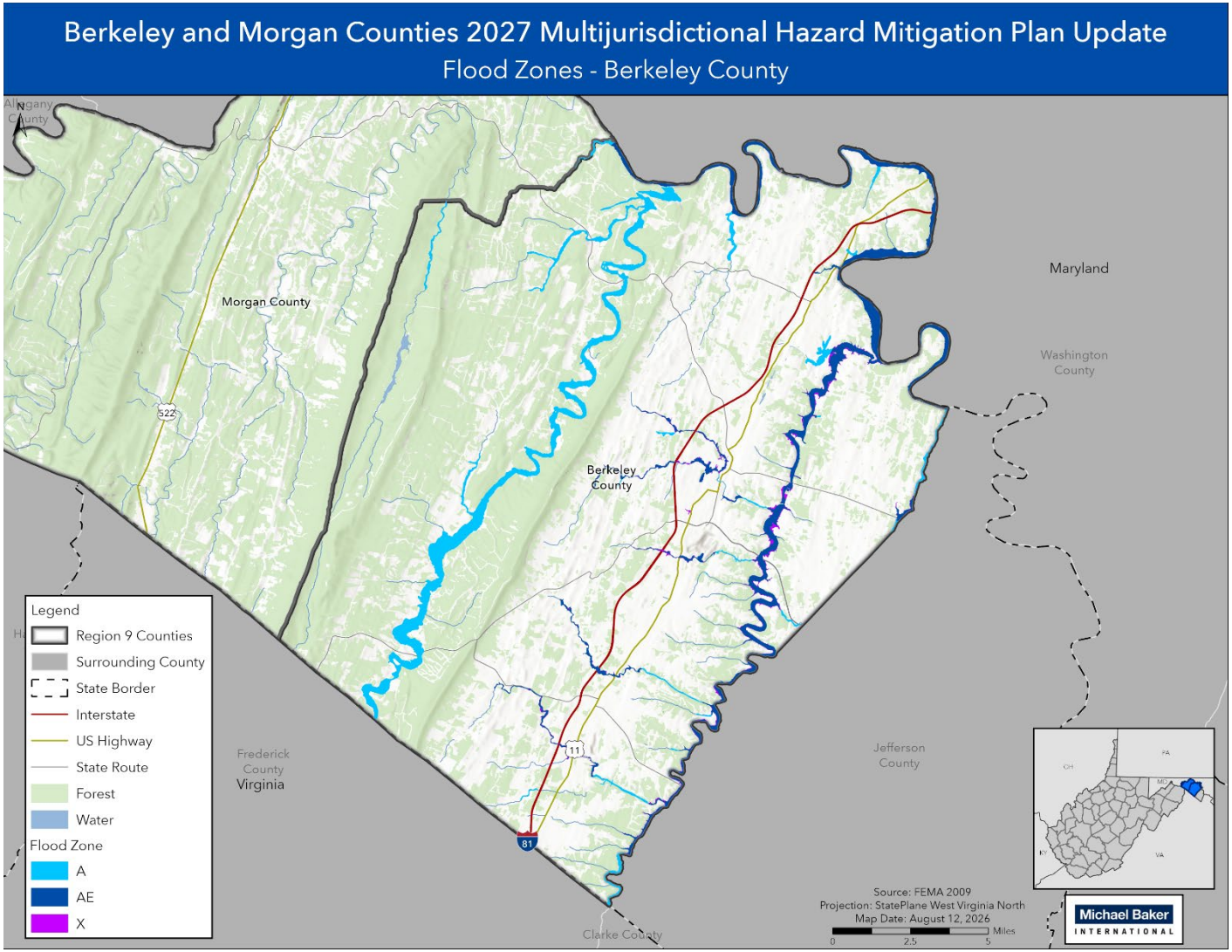
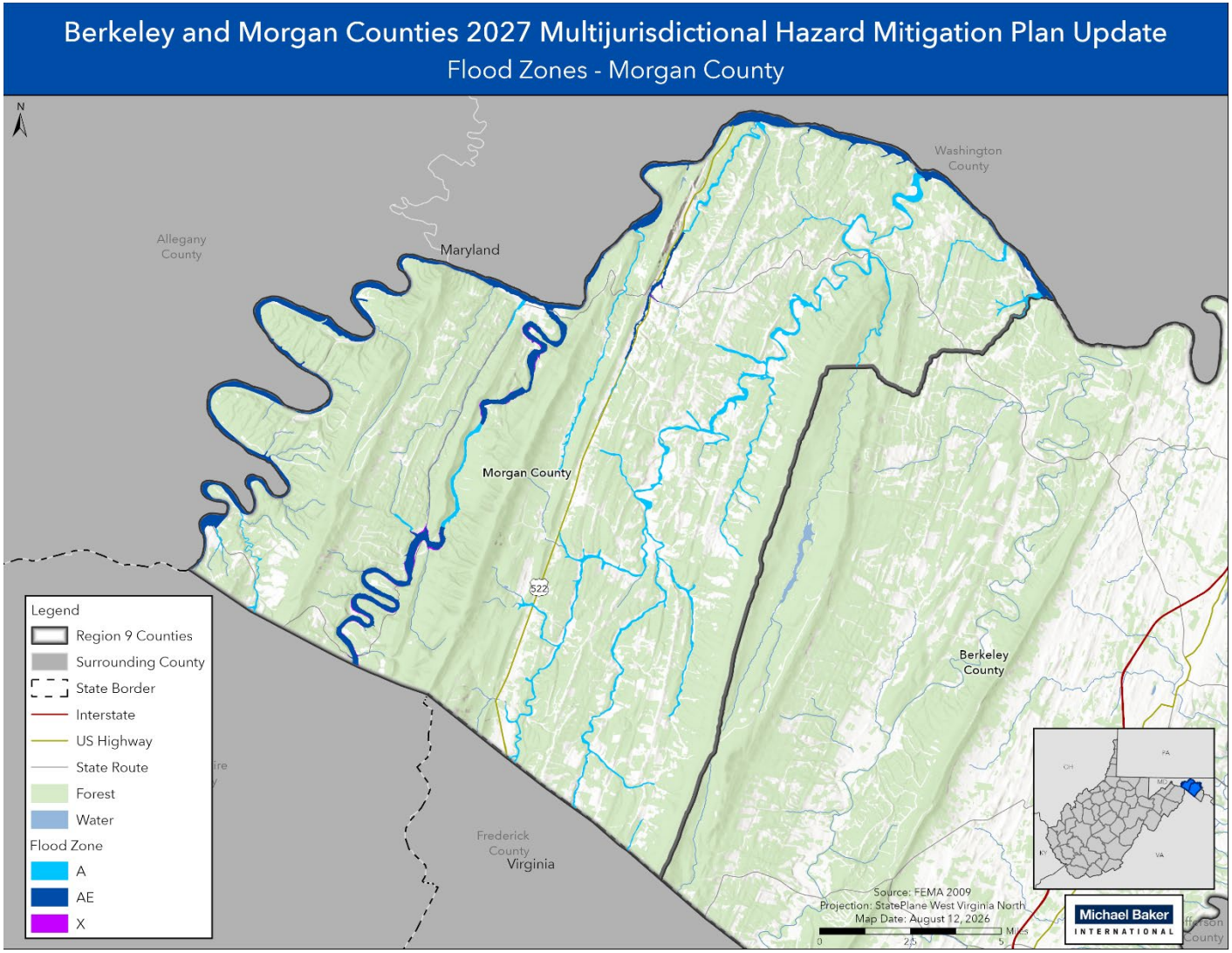


Figure 4.3.4-4: Flood Zones in Morgan County.



4.3.4.2. Range of Magnitude

Both localized and widespread floods are considered hazards when people and property are affected. Injuries and deaths can occur when people are swept away by flood currents or bacteria and disease are spread by moving or stagnant floodwaters (Doocy et al., 2013). Most property damage results from inundation by sediment-filled water. Generally, flash floods cause greater loss of life while riverine floods cause greater loss of property (USGS, 2026b). The American Meteorological Society classifies rainfall intensity into three categories (2026):

- Light rain – when precipitation rate is .01 to .10 inches/hour
- Moderate rain – when precipitation rate is .11 to .30 inches/hour
- Heavy rain – when precipitation rate is > .30 inches/hour

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover and rate of snowmelt. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover. Berkeley and Morgan Counties have significant amounts of sloping and mountainous terrain, which can contribute to more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. Also, urbanization typically results in the replacement of vegetative ground cover with asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems. If mismanaged, this runoff can accumulate quickly and create hazardous conditions. Stormwater runoff may contain and transport harmful pollutants such as trash, chemicals, and dirt/sediment (EPA, 2026e). These contaminants may infiltrate drinking water supply or swimming areas. When excess nitrogen and phosphorus enter a waterway, algal blooms can occur. Excess algae degrade water quality, food resources and habitats, and can significantly reduce or eliminate oxygen in the water. Lack of oxygen in water results in fish illnesses or deaths, which tends to be in large numbers (EPA, 2026b).

In much of the northeastern United States, including Berkeley and Morgan Counties, there are seasonal differences in how floods are caused. In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on dense snowpack throughout contributing watersheds, although the snowpack is generally moderate during most winters. Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time that can result in flash flood events. In addition, as detailed in Section 4.3.6, Berkeley and Morgan Counties occasionally experience intense rainfall associated with tropical storms or hurricanes in late summer and early fall.

While significant flood events are typically associated with heavy rain, rainfall events of lesser intensity may also cause flooding given sufficient duration. Flood effects can be volume- or force-related, although both play a factor in all flooding events. Flood events that occur along larger streams with wide floodplains tend to result in large-scale inundations, causing widespread damage through

soaking and silt deposits in homes, businesses, and industrial plants. The impacts of these events are typically a function of how much water was involved instead of the force of that moving water. On the other hand, flash floods resulting from bursts of heavy rainfall happen suddenly and powerfully as they sweep vehicles away, uproot trees, damage buildings and structures, and more (The Weather Channel, 2015). Flash floods are often unpredictable and, particularly if they occur at night, can cause major panic and loss of life due to low visibility (Špitalar et al., 2014). These events are common in hilly regions where runoff paths are steep, allowing water to reach higher velocity as it flows over the ground. Frozen or very dry surfaces can increase normal runoff velocities as well, particularly in small drainage areas, as water is not able to infiltrate the soil easily (Chen et al., 2017). In addition to slopes and frozen ground, ice and debris jams in channels and culverts can lead to quick-rising floods if they significantly obstruct the flow of water (NOAA NWS, 2026b).

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems. Such benefits include groundwater recharge and the introduction of nutrient rich sediment improving soil fertility (American Rivers, 2026). However, the destruction of riparian buffers through development, changes to land use and land cover throughout a watershed, and the introduction of chemical or biological contaminants which often accompany human presence cause environmental harm when floods occur. Hazardous material facilities are potential sources of contamination during flood events. Other negative environmental impacts of flooding include water-borne diseases, heavy siltation, damage or loss of crops, and drowning of both humans and animals.

According to Figure 4.3.4-5, Berkeley and Morgan Counties have several potential sources that could cause flood damage to be in the thousands. The biggest risk for Berkeley County comes from Potomac River with a dollar exposure amount of $20,027. Morgan County has the highest potential risk with Warm Spring Run, which flows through the Town of Bath and contains a dollar exposure of $69,068 (WVGISTC, 2024). It is important to note that no matter how slight the potential for loss, communities that face a possibility of flooding must be prepared.

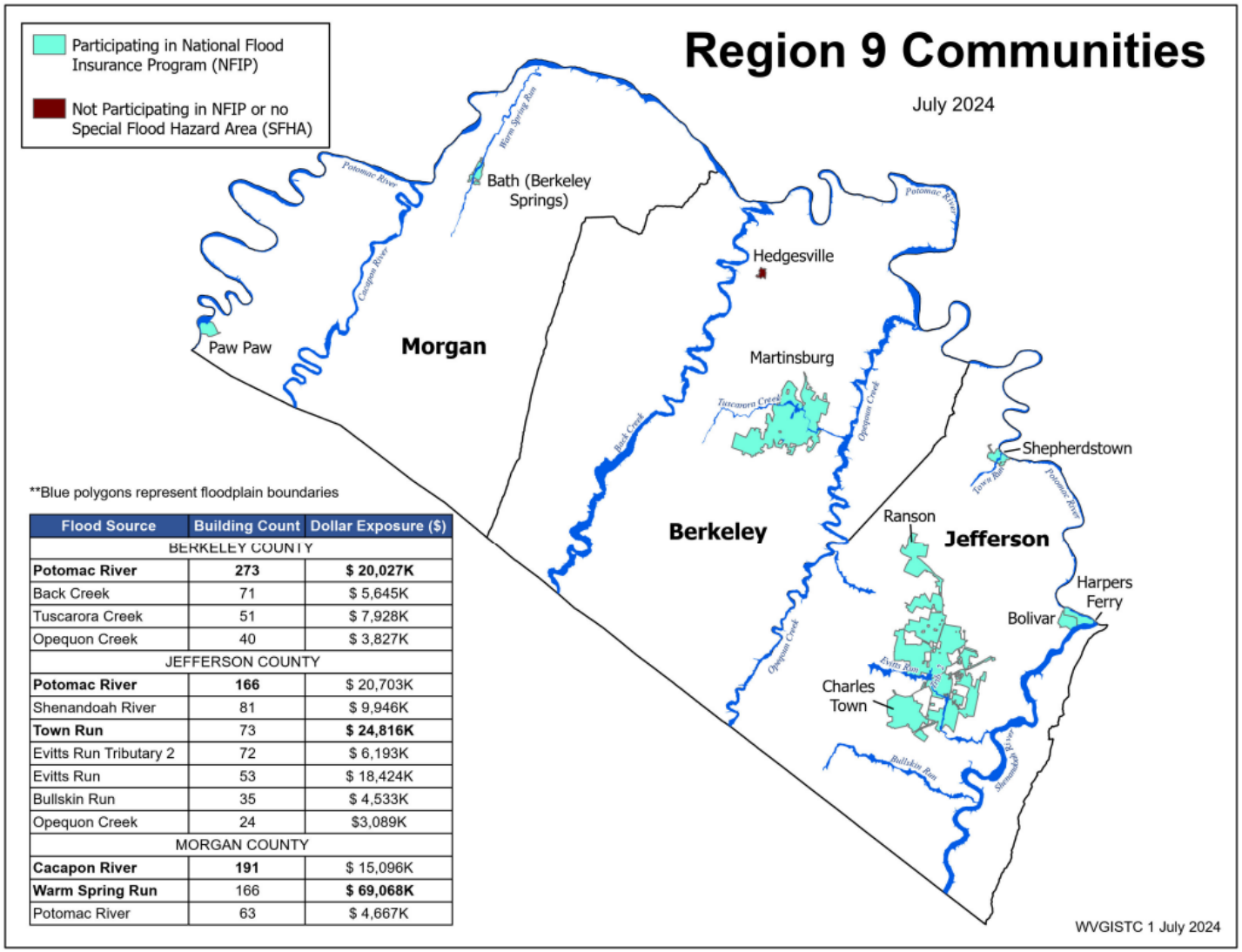
The following community lifelines are affected by flooding:

Table 4.3.4-1: Lifelines Most Likely Impacted by Flood, Flash Food.

Lifelines	Notes
	Government operations and facilities, including police, fire, and search and rescue are needed for response and recovery. People and animals safety are directly threatened with intense flooding potentially causing injury, deaths, and illness. Health and medical facilities may be damaged, causing them to be non-operational.
	Buildings, including homes and critical facilities, can become damaged due to flooding. The supply of food and water may be impacted by water and food facilities becoming damaged, disruptions to the food supply chain (flooded roads not allowing for travel), and the damage or destruction of crops. Agricultural operations will be impacted by flooded fields and damaged equipment. People might be forced to flee their homes for safety

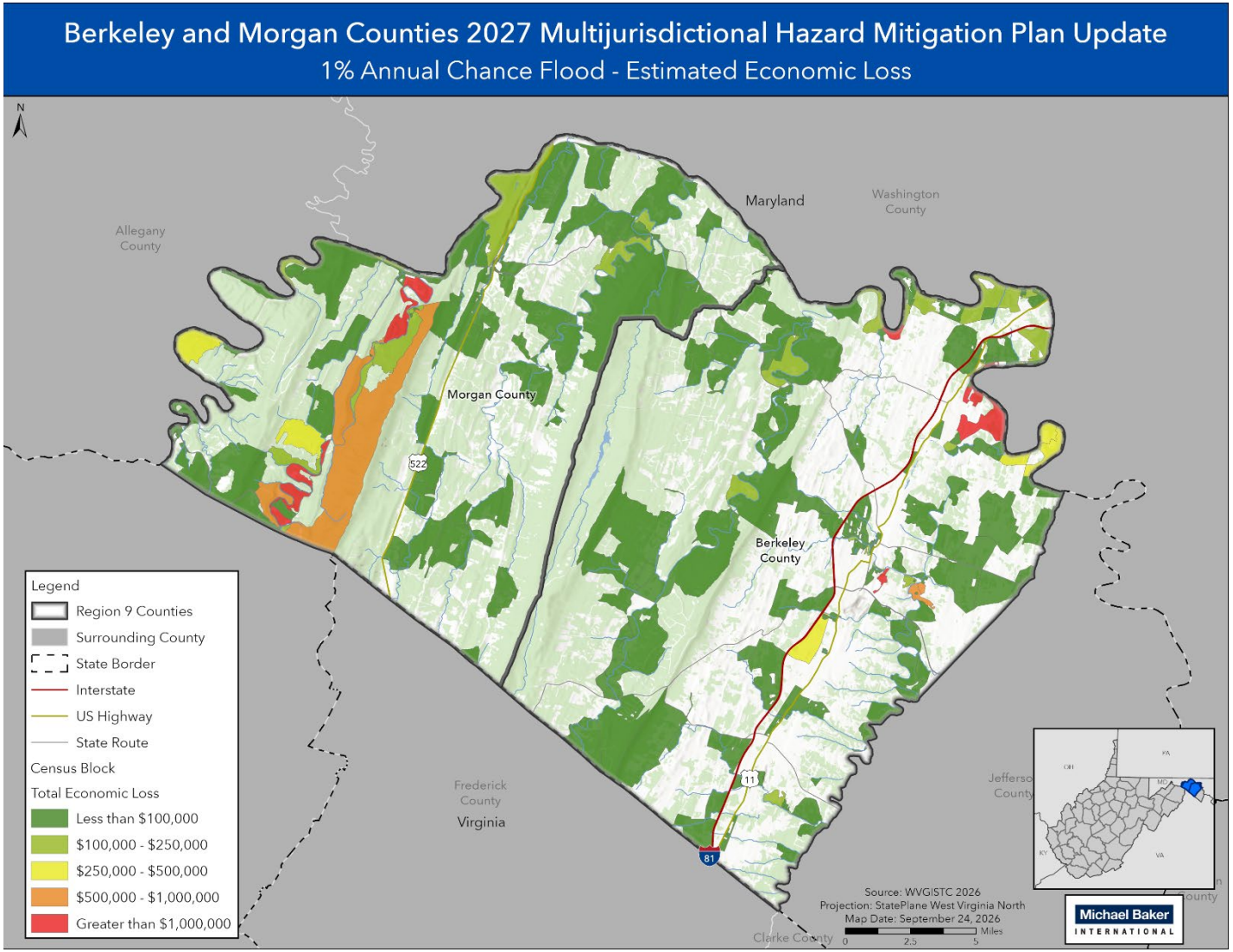
Table 4.3.4-1: Lifelines Most Likely Impacted by Flood, Flash Food.	
Lifelines	**Notes**
	Transportation routes will be affected due to direct damage from flooding and potential compounding hazards like landslides. People and essential services (fire, police, EMS, etc.) will be unable to travel by vehicle. Certain areas may become blocked off from flooding, making evacuation difficult if needed.
	Floods may affect hazardous materials storage due to damage to facilities. This could result in hazardous materials release, damaging further infrastructure and endangering people and animals.

Figure 4.3.4-5: Berkeley and Morgan Counties Building Risk and Dollar Exposure (WVGISTC, 2024).



Flood Source	Building Count	Dollar Exposure ($)
BERKELEY COUNTY		
Potomac River	**273**	**$ 20,027K**
Back Creek	71	$ 5,645K
Tuscarora Creek	51	$ 7,928K
Opequon Creek	40	$ 3,827K
JEFFERSON COUNTY		
Potomac River	**166**	$ 20,703K
Shenandoah River	81	$ 9,946K
Town Run	73	**$ 24,816K**
Evitts Run Tributary 2	72	$ 6,193K
Evitts Run	53	$ 18,424K
Bullskin Run	35	$ 4,533K
Opequon Creek	24	$3,089K
MORGAN COUNTY		
Cacapon River	**191**	$ 15,096K
Warm Spring Run	166	**$ 69,068K**
Potomac River	63	$ 4,667K

Figure 4.3.4-6: Berkeley and Morgan Counties Estimated Economic Losses.



4.3.4.3. Past Occurrence

Berkeley and Morgan Counties have a long history of flooding events. Some small, localized flooding events occur annually with minimal property damage. However, occasionally larger floods can occur, seriously impacting communities and destroying property. Significant flooding events are listed in Table 4.3.4-2. These are the oldest floods for which data is available from the Storm Events Database. There have been a total of 196 flash flood and flood events for both Counties. From the table, the May 12, 2008 flood is highlighted as being fairly representative of the usual type of flooding that occurs within the region. A late spring storm hammered the tri-state region with heavy rain over a two-day period. Paw Paw received about 2.38 inches of rain, rainfall in Berkeley Springs measured 1.97 inches, and Martinsburg received 2.75 inches of rain. Water levels for rivers and creeks grew quickly, with Opequon Creek cresting at almost 3 feet above the 10-foot flood stage. Some roads and basements filled with water, but damage was not severe (Keels, 2008). Figure 4.3.4-6 displays flash flood events throughout Berkeley and Morgan Counties.

Table 4.3.4-2: Flood and Flash Flood Events Impacting Berkeley and Morgan Counties, 1996-2026 (NOAA NCEI, 2026b).

County	Starting Location	Date	Type	Property Damage ($)
Berkeley	Not Provided (NP)	1/19/1996	Flood	0
Berkeley	All	1/19/1996	Flash Flood	0
Morgan	NP	1/19/1996	Flood	0
Morgan	All	1/19/1996	Flash Flood	500,000
Berkeley	Martinsburg	7/30/1996	Flash Flood	20,000
Berkeley	Southern Portion	8/2/1996	Flash Flood	20,000
Berkeley	Countywide	9/6/1996	Flash Flood	150,000
Morgan	Countywide	9/6/1996	Flash Flood	250,000
Berkeley	Countywide	11/7/1997	Flash Flood	0
Morgan	Countywide	11/7/1997	Flash Flood	0
Berkeley	Countywide	2/4/1998	Flash Flood	5,000
Berkeley	Countywide	3/20/1998	Flash Flood	2,500
Morgan	Countywide	6/16/2000	Flash Flood	6,000
Berkeley	NP	3/22/2001	Flood	0
Berkeley	NP	1/2/2003	Flood	0
Berkeley	NP	2/22/2003	Flood	0
Morgan	NP	2/22/2003	Flood	0
Berkeley	NP	2/23/2003	Flood	0
Morgan	NP	3/20/2003	Flood	0
Berkeley	NP	3/21/2003	Flood	0
Berkeley	NP	5/16/2003	Flood	0
Berkeley	NP	5/16/2003	Flood	0

Table 4.3.4-2: Flood and Flash Flood Events Impacting Berkeley and Morgan Counties, 1996-2026 (NOAA NCEI, 2026b).				
County	**Starting Location**	**Date**	**Type**	**Property Damage ($)**
Morgan	Countywide	5/31/2003	Flash Flood	0
Berkeley	Countywide	6/13/2003	Flash Flood	0
Berkeley	NP	6/21/2003	Flood	0
Morgan	Countywide	8/22/2003	Flash Flood	0
Berkeley	Northern Portion	9/3/2003	Flash Flood	50,000
Berkeley	NP	9/18/2003	Flood	5,000
Morgan	NP	9/19/2003	Flood	100,000
Berkeley	NP	11/19/2003	Flood	0
Berkeley	NP	12/11/2003	Flood	0
Morgan	NP	12/11/2003	Flood	0
Berkeley	NP	2/6/2004	Flood	0
Morgan	NP	2/6/2004	Flood	0
Berkeley	Martinsburg	5/14/2004	Flash Flood	0
Morgan	Berkeley Springs	9/8/2004	Flash Flood	0
Berkeley	NP	9/17/2004	Flood	0
Berkeley	Martinsburg	9/17/2004	Flash Flood	0
Morgan	NP	9/17/2004	Flood	0
Morgan	Berkeley Springs	9/17/2004	Flash Flood	0
Berkeley	Inwood	9/28/2004	Flash Flood	0
Morgan	Berkeley Springs	9/28/2004	Flash Flood	0
Berkeley	Martinsburg	11/29/2005	Flash Flood	0
Morgan	NP	11/29/2005	Flood	50,000
Berkeley	Inwood	6/27/2006	Flash Flood	12,000
Morgan	Countywide	6/27/2006	Flash Flood	8,000
Morgan	Berkeley Springs	7/18/2006	Flash Flood	125,000
Morgan	Berkeley Springs	4/15/2007	Flood	0
Berkeley	Martinsburg	4/21/2008	Flood	0
Morgan	Berkeley Springs	4/21/2008	Flood	5,000
Berkeley	Arden	5/12/2008	Flood	0
Morgan	Johnsons Mill	5/12/2008	Flood	0
Berkeley	Martinsburg	7/23/2008	Flood	0
Morgan	Largent	9/27/2008	Flash Flood	0
Berkeley	Inwood	12/1/2010	Flash Flood	0
Berkeley	Eastern WV Regional Airport	4/16/2011	Flood	0
Berkeley	Union Corner	4/16/2011	Flood	0

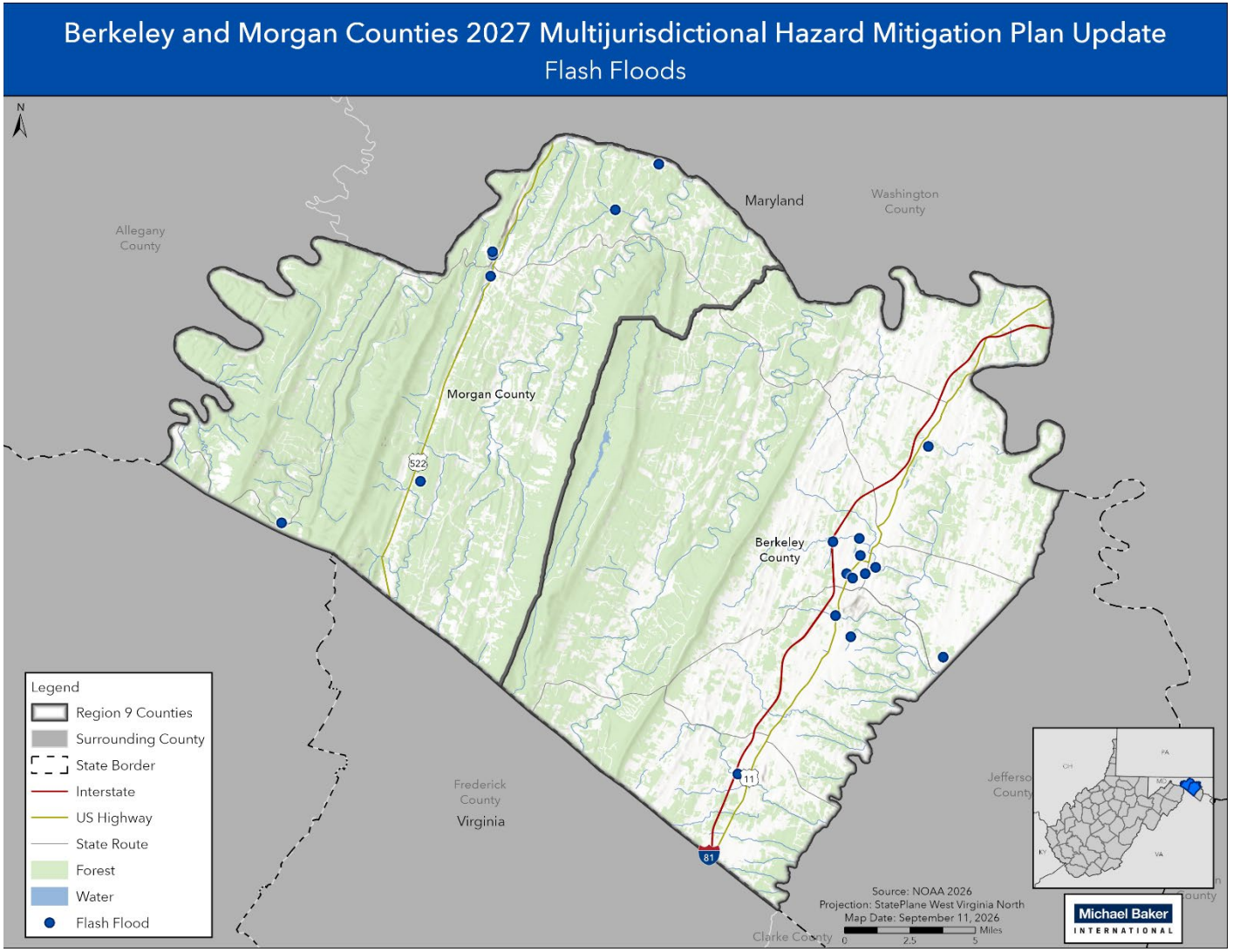
Table 4.3.4-2: Flood and Flash Flood Events Impacting Berkeley and Morgan Counties, 1996-2026 (NOAA NCEI, 2026b).				
County	**Starting Location**	**Date**	**Type**	**Property Damage ($)**
Morgan	Ridge	4/16/2011	Flood	0
Morgan	Berkeley Springs	4/28/2011	Flash Flood	0
Berkeley	Bedington	5/17/2011	Flood	0
Berkeley	Martinsburg	5/17/2011	Flash Flood	0
Berkeley	Martinsburg	8/13/2011	Flash Flood	0
Berkeley	Vanclevesville	5/29/2012	Flash Flood	0
Morgan	Omps	8/9/2012	Flash Flood	0
Morgan	Berkeley Springs	9/1/2012	Flash Flood	0
Berkeley	Martinsburg	10/29/2012	Flash Flood	0
Berkeley	Martinsburg	9/1/2013	Flash Flood	0
Berkeley	Bunker Hill	5/16/2014	Flood	0
Berkeley	Tomahawk	5/16/2014	Flood	0
Berkeley	Ganotown	5/16/2014	Flood	0
Morgan	Great Cacapon	2/2/2016	Flood	0
Berkeley	Vanclevesville	2/4/2016	Flood	0
Morgan	Great Cacapon	2/4/2016	Flood	0
Morgan	Johnsons Mill	7/28/2016	Flood	0
Berkeley	Vanclevesville	9/29/2016	Flood	0
Berkeley	Eastern WV Regional Airport	1/24/2017	Flood	0
Berkeley	Tomahawk	1/24/2017	Flood	0
Berkeley	Bunker Hill	5/5/2017	Flood	0
Berkeley	Bunker Hill	5/5/2017	Flood	0
Berkeley	Eastern WV Regional Airport	5/5/2017	Flood	0
Berkeley	Tomahawk	5/5/2017	Flood	0
Morgan	Great Cacapon	5/5/2017	Flood	0
Morgan	Paw Paw	6/16/2017	Flood	0
Berkeley	Martinsburg	7/28/2017	Flash Flood	0
Berkeley	Bunker Hill	7/29/2017	Flood	0
Berkeley	Blairton	7/29/2017	Flood	0
Berkeley	Eastern WV Regional Airport	4/16/2018	Flood	0
Morgan	Doe Gully	4/17/2018	Flood	0
Berkeley	Ridgeway	5/17/2018	Flood	0
Morgan	Largent	5/17/2018	Flood	0
Berkeley	Ridgeway	5/19/2018	Flood	0

Table 4.3.4-2: Flood and Flash Flood Events Impacting Berkeley and Morgan Counties, 1996-2026 (NOAA NCEI, 2026b).				
County	**Starting Location**	**Date**	**Type**	**Property Damage ($)**
Berkeley	Tomahawk	5/19/2018	Flood	0
Berkeley	Martinsburg	5/31/2018	Flood	0
Berkeley	Martinsburg	6/1/2018	Flood	0
Berkeley	Bedington	6/1/2018	Flood	0
Berkeley	Berkeley	6/1/2018	Flood	0
Morgan	Paw Paw	6/1/2018	Flood	0
Morgan	Omps	6/1/2018	Flood	0
Berkeley	Hainesville	6/1/2018	Flood	0
Berkeley	Tomahawk	6/2/2018	Flood	0
Morgan	Stotlers Xds	6/2/2018	Flood	0
Morgan	Largent	6/2/2018	Flood	0
Berkeley	Johnstown	6/2/2018	Flood	0
Berkeley	Johnstown	6/2/2018	Flood	0
Morgan	Paw Paw	6/3/2018	Flood	0
Morgan	Paw Paw	6/3/2018	Flood	0
Morgan	Berkeley Springs	6/3/2018	Flood	0
Morgan	Great Cacapon	6/3/2018	Flood	0
Berkeley	Ridgeway	6/3/2018	Flood	0
Morgan	Woodmont	6/3/2018	Flood	0
Morgan	Paw Paw	6/3/2018	Flood	0
Berkeley	Glengary	6/3/2018	Flood	0
Morgan	Great Cacapon	6/22/2018	Flood	0
Berkeley	Vanclevesville	6/23/2018	Flood	0
Berkeley	Blairton	8/4/2018	Flood	0
Morgan	Berkeley Springs	8/21/2018	Flash Flood	0
Morgan	Greenwood	8/21/2018	Flood	0
Morgan	Berkeley Springs	8/21/2018	Flood	0
Morgan	Berkeley Springs	8/21/2018	Flood	0
Berkeley	Martinsburg	8/21/2018	Flash Flood	0
Berkeley	Martinsburg	8/21/2018	Flood	0
Berkeley	Martinsburg	8/21/2018	Flood	0
Berkeley	Martinsburg	8/21/2018	Flood	0
Berkeley	Inwood	8/21/2018	Flood	0
Berkeley	Vanclevesville	8/22/2018	Flood	0
Berkeley	Blairton	8/22/2018	Flood	0
Berkeley	Berkeley	8/31/2018	Flood	0

Table 4.3.4-2: Flood and Flash Flood Events Impacting Berkeley and Morgan Counties, 1996-2026 (NOAA NCEI, 2026b).				
County	**Starting Location**	**Date**	**Type**	**Property Damage ($)**
Berkeley	Martinsburg	8/31/2018	Flood	0
Morgan	Oakland	9/9/2018	Flood	0
Morgan	Holton	9/9/2018	Flood	0
Berkeley	Martinsburg	9/9/2018	Flood	0
Morgan	Berkeley Springs	9/9/2018	Flood	0
Berkeley	Ridgeway	9/9/2018	Flood	0
Morgan	Patterson Creek	9/9/2018	Flood	0
Morgan	Rock gap	9/10/2018	Flood	0
Berkeley	Ridgeway	9/10/2018	Flood	0
Berkeley	Johnstown	9/10/2018	Flood	0
Berkeley	Spring Mills	9/10/2018	Flood	0
Berkeley	Bedington	9/10/2018	Flood	0
Berkeley	Berkeley	9/10/2018	Flood	0
Berkeley	Martinsburg	9/10/2018	Flood	0
Berkeley	Vanclevesville	9/10/2018	Flood	0
Berkeley	Inwood	9/10/2018	Flood	0
Berkeley	Blairton	9/28/2018	Flood	0
Berkeley	Berkeley	9/28/2018	Flood	0
Morgan	Rock gap	9/28/2018	Flood	0
Morgan	Holton	9/28/2018	Flood	0
Berkeley	Vanclevesville	11/25/2018	Flood	0
Berkeley	Inwood	12/15/2018	Flood	0
Berkeley	Martinsburg	12/15/2018	Flood	0
Morgan	Largent	12/15/2018	Flood	0
Berkeley	Tomahawk	12/16/2018	Flood	0
Berkeley	Inwood	12/16/2018	Flood	0
Berkeley	Bedington	12/16/2018	Flood	0
Morgan	Great cacapon	12/22/2018	Flood	0
Berkeley	Blairton	1/20/2019	Flood	0
Berkeley	Vanclevesville	2/13/2019	Flood	0
Berkeley	Blairton	3/22/2019	Flood	0
Berkeley	Inwood	4/20/2019	Flood	0
Berkeley	Eastern WV Regional Airport	4/20/2019	Flood	0
Berkeley	Inwood	5/5/2019	Flood	0
Berkeley	Inwood	5/5/2019	Flood	0

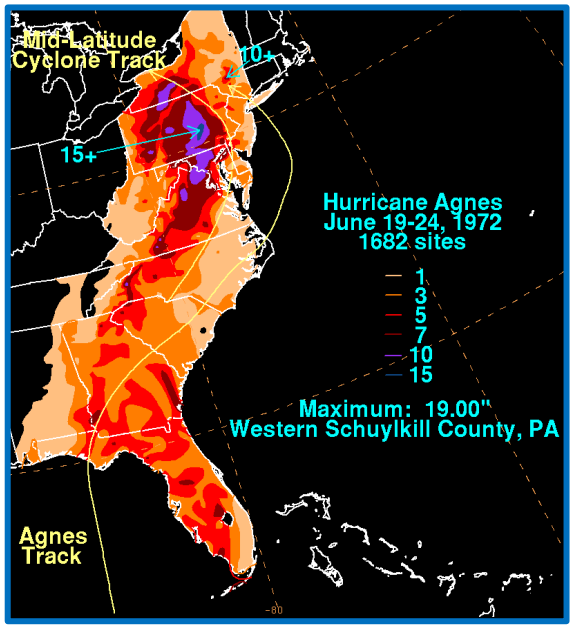
Table 4.3.4-2: Flood and Flash Flood Events Impacting Berkeley and Morgan Counties, 1996-2026 (NOAA NCEI, 2026b).				
County	**Starting Location**	**Date**	**Type**	**Property Damage ($)**
Berkeley	Blairton	5/5/2019	Flood	0
Berkeley	Blairton	5/5/2019	Flood	0
Berkeley	Eastern WV Regional Airport	5/5/2019	Flood	0
Berkeley	Tomahawk	5/5/2019	Flood	0
Morgan	Great Cacapon	5/1/2020	Flood	0
Morgan	Largent	3/1/2021	Flood	0
Morgan	Largent	3/1/2021	Flood	0
Morgan	Stohrs Xrds	8/16/2021	Flash Flood	0
Morgan	Sleepy Creek	8/16/2021	Flash Flood	0
Berkeley	Tarico Hgts	8/28/2021	Flood	0
Berkeley	Blairton	9/23/2021	Flood	0
Morgan	Doe Gully	5/7/2022	Flood	0
Berkeley	Tomahawk	5/7/2022	Flood	0
Berkeley	Vanclevesville	5/7/2022	Flood	0
Berkeley	Vanclevesville	12/23/2022	Flood	0
Berkeley	Martinsburg	8/7/2023	Flash Flood	0
Berkeley	Martinsburg	8/7/2023	Flood	0
Morgan	Johnsons Mill	1/10/2024	Flood	0
Morgan	Great Cacapon	1/10/2024	Flood	0
Morgan	Great Cacapon	1/10/2024	Flood	0
Berkeley	Vanclevesville	1/10/2024	Flood	0
Berkeley	Tomahawk	1/10/2024	Flood	0
Berkeley	Vanclevesville	1/28/2024	Flood	0
Morgan.	Great Cacapon	1/28/2024	Flood	0
Berkeley	(Mrb)Shepherd Fld Mr	8/8/2024	Flash Flood	0
Berkeley	Martinsburg	8/9/2024	Flood	0
Berkeley	Vanclevesville	8/9/2024	Flood	0
Morgan	Berkeley Spgs	8/9/2024	Flood	0
Morgan	Paw Paw	5/14/2025	Flood	0
Morgan	Woodmont	5/14/2025	Flood	0
Berkeley	Martinsburg	5/14/2025	Flood	0
Berkeley	Hainesville	7/14/2025	Flash Flood	0

Figure 4.3.4-6: Flash Floods in Berkeley and Morgan Counties.



2018 was a particularly heavy year for flooding in the region. West Virginia Governor Jim Justice declared a State of Emergency in eight counties for flooding from heavy rain, including Berkeley and Morgan Counties in June 2018. According to the National Weather Service (NWS) the Cacapon River near Great Cacapon, Opequon Creek near Martinsburg and the Shenandoah River at Millville all reached moderate flood stage (Floodlist, 2018). Morgan and Hampshire County were hit the hardest, seeing six to eight inches of rain. More than 30 roads were closed in Morgan County, and several sections of road were damaged or washed out. Approximately 10 roads were closed in Berkeley County due to high water (Associated Press, 2018).

Figure 4.3.4-7: Hurricane Agnes Rainfall in Inches (NOAA WPC, n.d.).



A few events representative of the most severe flooding events Berkeley and Morgan Counties could face involve June 1972 flooding due to Hurricane Agnes and January 1996 flooding because of heavy rain and snowmelt. Hurricane Agnes was one of the largest June hurricanes on record, but quickly weakened before landfall in Florida. However, a second low pressure developed west of Agnes, moving in tandem with the storm system and dramatically increasing rainfall across the east coast. Rainfall amounts on the east coast can be seen in Figure 4.3.4-7. Note that Berkeley and Morgan Counties lie within the five and seven inches of rainfall categories (NOAA WPC, n.d.). This intense rain caused waterbodies to flood over their banks, completely flooding low lying communities and carrying away bridges. The Cacapon River crested at 22 feet near Great Cacapon, 13 feet above its flood stage (NOAA, n.d.). Flooding destroyed over 100 homes and damaged more than 1,500 others in West Virginia. Losses in West Virginia related to Hurricane Agnes totaled more than $7,750,000 in 1972 dollars, equivalent to more than $50,000,000 today (NOAA NHC, 2009).

The January 19, 1996 flooding resulted from an unprecedented combination of unseasonably warm air, rainfall totals between 3 to 5 inches, and an existing dense snowpack between 12 to 18 inches that melted within a 12-hour period. This influx of rain and snowmelt produced catastrophic flooding across the region, damaging homes and businesses, and triggering mudslides. A 51-year-old woman was killed in Morgan County after she exited her stalled vehicle and was swept up in flood currents. Property damage in Morgan County was estimated at roughly $500,000 (NOAA NCEI, 2026b).

More recently on August 27, 2026, between 2 to 5 inches of rain was dropped across central Berkeley County by a slow-moving thunderstorm system. Severe flash flooding ensued resulting in submerged

major thoroughfares and three school's closing due to storm-related water and drainage issues (WVNews, 2026b). Figures 4.3.4-8 through 4.3.4-10 display some flooding pictures gathered from this event during the HMP update process.

Figure 4.3.4-8: Flooding on Burke Street in Martinsburg City, Berkeley County (August 2026).



Figure 4.3.4-9: Flooding on Berry Street in Martinsburg City, Berkeley County (August 2026).

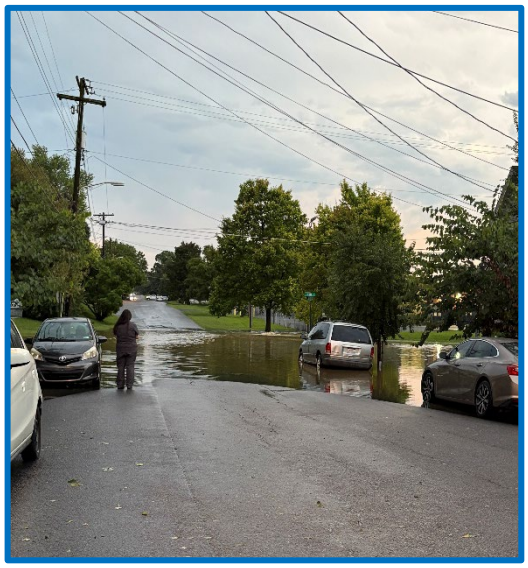


Figure 4.3.4-10: Flooding on N. Queen Street under bridge (August 2026).



In addition to the past flood events, the NFIP identifies properties that experience frequent flooding and can be used to determine areas of higher risk. These properties are identified through the NFIP when they receive more than one payment for flood damages. The NFIP defines a **Repetitive Loss (RL)**

property as "any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period, since 1978." The RL data provided in Table 4.3.4-7 represents the NFIP's definition of RL.

Under FEMA's Hazard Mitigation Assistance (HMA), in regard to mitigation grant funding, RL is defined as a structure that:

- Is covered by a contract for flood insurance made available under the NFIP; and
- Has incurred flood-related damage on two occasions, in which the cost of the repair, on the 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 (ICC). (Note: Homes are eligible for ICC coverage after the first loss, however the cost for ICC is part of all policies.).

A **Severe Repetitive Loss (SRL)** property is a structure that:

- Is covered under a contract for flood insurance made available under the NFIP; and
- Has incurred flood related damage (i) For which four or more separate claims payments have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or (ii) For which at least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Using data provided by the WVEMD NFIP Coordinator in September 2026, Tables 4.3.4-3 and 4.3.4-4 displays RL and SRL properties by jurisdiction and type in Berkeley and Morgan Counties. Berkeley County has 57 repetitive loss properties, and Morgan County has 40 repetitive loss properties. Of the 57 and 40 repetitive loss structures in Berkeley County and Morgan County, the most are single family homes, 54 and 39 respectively.

Table 4.3.4-3: Summary of the Number and Type of Repetitive Loss properties by Municipality (WVEMD, 2026).

Jurisdiction	Type			Sum of RL Properties
	Other Residential	Other Non-Residential	Single Family	
Berkeley County	0	3	54	57
Martinsburg	2	2	2	6
Hedgesville	0	0	0	0
Morgan County	0	1	39	40

Table 4.3.4-3: Summary of the Number and Type of Repetitive Loss properties by Municipality (WVEMD, 2026).

Jurisdiction	Type			Sum of RL Properties
	Other Residential	Other Non-Residential	Single Family	
Bath	0	2	0	2
Paw Paw	0	0	0	0
Berkeley and Morgan Counties Total	**2**	**8**	**95**	**105**

Table 4.3.4-4: Summary of the Number and Type of Severe Repetitive Loss properties by Municipality (WVEMD, 2026).

Jurisdiction	Type			Sum of SRL Properties
	Other Residential	Other Non-Residential	Single Family	
Berkeley County	0	1	14	15
Martinsburg	0	0	1	1
Hedgesville	0	0	0	0
Morgan County	0	0	2	2
Bath	0	0	0	0
Paw Paw	0	0	0	0
Berkeley and Morgan Counties Total	**0**	**1**	**17**	**18**

Floods are the most common and costly natural catastrophe in the United States. In terms of economic disruption, property damage, and loss of life, floods are “nature’s number-one disaster” (FEMA, 2019). For that reason, flood insurance is a critical way for citizens to protect their property against flood loss. Home and business owners can purchase flood insurance through private insurers or through the National Flood Insurance Program.

Congress established the NFIP in 1968 to help control the growing cost of federal disaster relief (FEMA, 2019). The NFIP, administrated through FEMA, offers federally backed flood insurance at discounted rates when communities adopt and enforce effective floodplain management ordinances to reduce future flood losses based on flood maps. The NFIP is based on voluntary participation of communities but is required for communities to receive federal disaster relief funding.

The minimum floodplain management requirements to be a community in good standing in the NFIP include:

- Review and permit all development in the Special Flood Hazard Area (SFHA);
- Elevate new and substantially improved residential structures above the Base Flood Elevation;
- Elevate or dry floodproof new and substantially improved non-residential structures;
- Limit development in floodways;
- Locate or construct all public utilities and facilities to minimize or eliminate flood damage; and
- Anchor foundation or structure to resist floatation, collapse, or lateral movement.

Table 4.3.4-5 displays Berkeley and Morgan Counties participation in the NFIP.

Table 4.3.4-5: Berkeley and Morgan Counties Participation in the NFIP (FEMA, 2026a).

Community	Participation Status	CID	Current Effective Map Date
Berkeley County	Participating	540282#	07/07/09
Martinsburg	Participating	540006#	07/07/09
Hedgesville	Not Participating		
Morgan County	Participating	540144#	09/25/09
Bath	Participating	540005#	09/25/09
Paw Paw	Participating	540252#	09/25/09

4.3.4.4. Future Occurrence

The NFIP recognizes the 1 percent-annual-chance flood, also known as the base flood, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1 percent-annual-chance flood is a flood which has a 1 percent chance of occurring over a given year. The FIRMs published in 2009 can be used to identify areas subject to the 1 percent- and 0.2 percent-annual-chance flooding. Areas subject to 2 percent- and 10 percent-annual-chance events are not shown on maps; however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report. In this plan, the term “Special Flood Hazard Area” is used rather than floodplain to clarify that the area under consideration is identified on the FIRM as having at least a 1 percent chance of flooding in any given year. Historically, the area with a 1-percent chance of flooding in any given year has been called the “100-year floodplain” or the “base flood” and the area with a 0.2 percent chance of flooding in any given year has been called the “500-year floodplain.” As these terms can be misleading by suggesting that there will be a flood only every 100 or 500 years respectively, they are not used in this plan.

Table 4.3.4-6 shows a range of flood recurrence intervals and associated probabilities of occurrence.

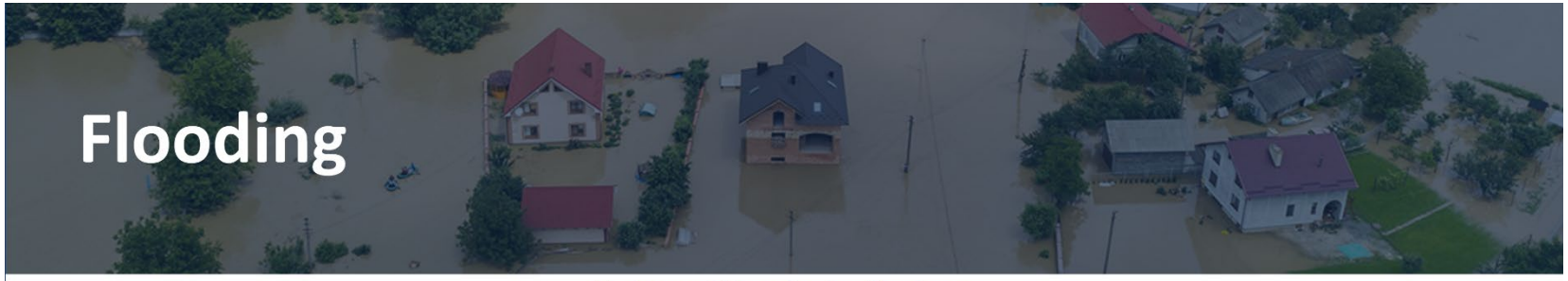
Table 4.3.4-6: Recurrence Intervals and Associated Probabilities of Occurrence (USGS, 2026a).	
Recurrence Interval	**Chance Of Occurrence**
10 year	10
50 year	2
100 year	1
500 year	0.2

In Berkeley and Morgan Counties, flooding occurs commonly and can take place during any season of the year. However, the possibility of flooding is greatly reduced during the winter months. Although most severe floods are attributable to rainfall alone, the spring floods can be compounded by snowmelt and moving ice. The major floods in the late summer and fall are often associated with tropical storms moving up the Atlantic coastline. According to the 2023 State of WV HMP, there is a 98.61% chance of occurrence in any given year for excessive localized rainfall (heavy rain) in WV and a 100% chance for flash floods and riverine and stormwater floods. Overall, the probability of future flooding in Berkeley and Morgan Counties can be considered likely (between 50% & 90% annual probability) according to the Risk Factor Methodology (see Table 4.4.1-1).

It is important to note that FEMA's flood maps do not project future flooding based on changing climate patterns. They are based on historical data, so they are not a future projection of flood risk. However, changing weather patterns have made many types of disasters more frequent and extreme. As the probability of frequent and intense rainfall increases, West Virginia is seeing more severe flooding across the State. In general, hazardous precipitation events are increasing in this region. This can also lead to higher instances of flash flooding and river overflow. According to the Fifth National Climate Assessment, the Northeast region has had the largest increase in the number of extreme precipitation days (defined as the top 1% of heaviest precipitation events) with an increase of around 60% between 1958 to 2021. Along with this, the Northeast region (including WV) has also experienced the greatest increase in five-year maximum daily precipitation (+18%) and in the annual maximum daily precipitation (+14%) compared to the rest of the nation (Marvel et. al, 2023).

The Climate Mapping for Resilience and Adaptation (CMRA) Tool provides a county-level assessment report for flooding, shown in Figures 4.3.4-11 and 4.3.4-12 below. According to CMRA, the average annual precipitation and the number of days per year with precipitation is expected to increase for both Counties. The annual days that exceed the 99th percentile precipitation is projected to slightly increase as well for Berkeley County, but remain the same for Morgan County. These projections (more precipitation on more days and more precipitation overall annually) combine to show that future precipitation may be more intense. Lastly, the number of days with a maximum temperature below 32 degrees Fahrenheit is projected to decrease for both Counties, meaning precipitation in the winter months will be less likely to turn into snow. This could push more flooding into the winter months.

Figure 4.3.4-11: Berkeley County Flooding Hazard Assessment Report (CMRA, 2026).



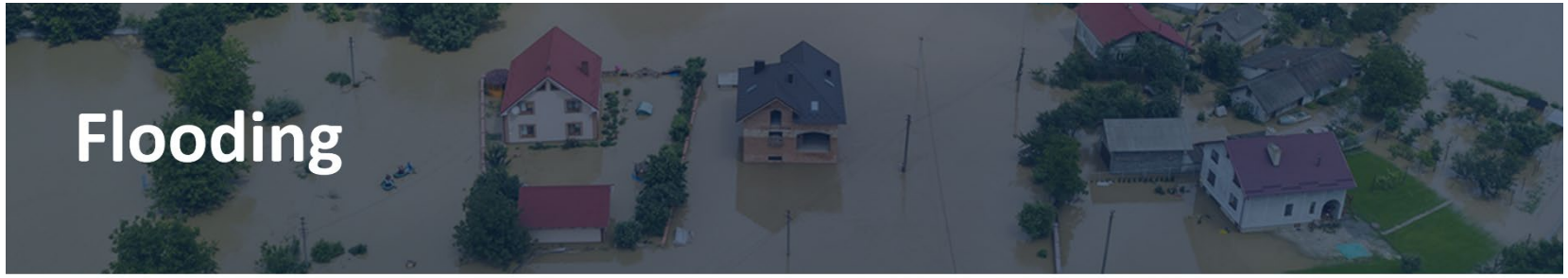
Future Climate Indicators

Indicator	Mid - 1900s (1951 - 1980)	Early Century (2011 - 2040)		Mid Century (2041 - 2070)		Late Century (2071 - 2100)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Precipitation:							
Annual average total precipitation	**38"** 24 - 58	**40"** 24 - 66	**40"** 23 - 60	**41"** 19 - 63	**42"** 24 - 68	**41"** 26 - 65	**43"** 25 - 67
Days per year with precipitation (wet days)	**88 days** 61 - 117	**89 days** 61 - 123	**90 days** 59 - 119	**91 days** 52 - 125	**91 days** 59 - 130	**90 days** 61 - 120	**90 days** 59 - 122
Maximum period of consecutive wet days	**5 days** 3 - 12	**6 days** 3 - 14	**6 days** 3 - 11	**6 days** 3 - 13	**6 days** 3 - 11	**6 days** 3 - 15	**6 days** 3 - 13
Daily precipitation > 99th percentile	**2"** 0 - 10	**3"** 0 - 16	**3"** 0 - 14	**3"** 0 - 14	**3"** 0 - 14	**3"** 0 - 17	**4"** 0 - 18
Annual days with:							
Annual days with total precipitation > 1 inch	**5 days** 1 - 13	**6 days** 1 - 16	**6 days** 1 - 15	**7 days** 1 - 15	**7 days** 1 - 17	**7 days** 2 - 15	**7 days** 1 - 18
Annual days with total precipitation > 2 inches	**1 days** 0 - 3	**1 days** 0 - 5	**1 days** 0 - 4	**1 days** 0 - 4	**1 days** 0 - 4	**1 days** 0 - 5	**1 days** 0 - 5
Annual days with total precipitation > 3 inches	**0 days** 0 - 1	**0 days** 0 - 3	**0 days** 0 - 2	**0 days** 0 - 2	**0 days** 0 - 3	**0 days** 0 - 3	**0 days** 0 - 3
Annual days with precipitation > 99th percentile	**1 days** 0 - 4	**1 days** 0 - 6	**1 days** 0 - 5	**1 days** 0 - 5	**1 days** 0 - 5	**1 days** 0 - 7	**2 days** 0 - 6
Days with maximum temperature below 32 °F	**16 days** 1 - 39	**8 days** 0 - 30	**8 days** 0 - 51	**5 days** 0 - 24	**3 days** 0 - 20	**3 days** 0 - 16	**1 days** 0 - 11

The daily precipitation 99th percentile is 1"

N/A = Data Not Available for the selected area

Figure 4.3.4-12: Morgan County Flooding Hazard Assessment Report (CMRA, 2026).



Future Climate Indicators

Indicator	Mid - 1900s (1951 - 1980) Min - Max	Early Century (2011 - 2040) Lower Emissions Min - Max	Early Century (2011 - 2040) Higher Emissions Min - Max	Mid Century (2041 - 2070) Lower Emissions Min - Max	Mid Century (2041 - 2070) Higher Emissions Min - Max	Late Century (2071 - 2100) Lower Emissions Min - Max	Late Century (2071 - 2100) Higher Emissions Min - Max
Precipitation:							
Annual average total precipitation	**38"** 23 - 57	**40"** 21 - 63	**40"** 24 - 59	**41"** 20 - 67	**41"** 22 - 70	**41"** 23 - 64	**42"** 23 - 68
Days per year with precipitation (wet days)	**81 days** 56 - 105	**82 days** 50 - 116	**83 days** 54 - 110	**84 days** 52 - 119	**84 days** 52 - 122	**83 days** 53 - 114	**83 days** 55 - 114
Maximum period of consecutive wet days	**5 days** 3 - 11	**5 days** 3 - 10	**5 days** 3 - 11	**5 days** 3 - 13	**5 days** 3 - 9	**5 days** 3 - 13	**5 days** 3 - 14
Daily precipitation > 99th percentile	**2"** 0 - 12	**3"** 0 - 16	**3"** 0 - 16	**3"** 0 - 15	**3"** 0 - 19	**3"** 0 - 17	**4"** 0 - 20
Annual days with:							
Annual days with total precipitation > 1 inch	**6 days** 1 - 14	**7 days** 1 - 17	**8 days** 2 - 16	**8 days** 2 - 19	**8 days** 1 - 20	**8 days** 1 - 18	**9 days** 2 - 21
Annual days with total precipitation > 2 inches	**1 days** 0 - 4	**1 days** 0 - 4	**1 days** 0 - 4	**1 days** 0 - 5	**1 days** 0 - 5	**1 days** 0 - 5	**1 days** 0 - 5
Annual days with total precipitation > 3 inches	**0 days** 0 - 3	**0 days** 0 - 3	**0 days** 0 - 2	**0 days** 0 - 2	**0 days** 0 - 4	**0 days** 0 - 3	**0 days** 0 - 3
Annual days with precipitation > 99th percentile	**1 days** 0 - 4	**1 days** 0 - 5	**1 days** 0 - 4	**1 days** 0 - 5	**1 days** 0 - 6	**1 days** 0 - 6	**1 days** 0 - 5
Days with maximum temperature below 32 °F	**20 days** 2 - 47	**12 days** 0 - 41	**12 days** 0 - 61	**9 days** 0 - 31	**7 days** 0 - 25	**6 days** 0 - 23	**3 days** 0 - 20

The daily precipitation 99th percentile is 1"

N/A = Data Not Available for the selected area

4.3.4.5. Vulnerability Assessment

Flooding can lead to property loss as well as to loss of life. Flooding damages structures, including homes and businesses, vehicles, and infrastructure, including roadways. People who are surrounded by flood waters may at some point require evacuation, placing their lives and the lives of rescuers in danger. Flooding can disrupt the operation of businesses and schools. Recovery from flood damages can be time consuming and costly.

Flood vulnerability is described in terms of what community assets, structures, and infrastructure are situated in locations where flooding is anticipated. For purposes of assessing vulnerability, this plan focuses on those that are located within the SFHA. Please note that while other floods are possible, information about the extent and depths for the flood frequencies likely to be seen in this floodplain are available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each county, showing the SFHA, critical facilities, and transportation routes within it, are included in **Appendix D**. These maps were created using FEMA countywide data from each county's current effective FIRM.

The best way for communities to strengthen floodplain management is by reviewing current codes and ordinances and by strongly enforcing their floodplain codes on new development to avoid aggravating further flooding. Significant residential growth in the outlying rural townships can increase opportunities for flash flooding if floodplain development and stormwater management are not properly regulated. Numerous times since the January 1996 floods, localized rainstorms that went undetected by the National Weather Service created surface flooding, which forced evacuations in several floodplain communities.

Table 4.3.4-7 displays the number of addressable structures and critical facilities intersecting the SFHA in each county. The table incorporates analysis complete by the state of West Virginia and supplements missing areas with data gathered by the planning team. The planning team attempts to incorporate all of the results from the state, but will supplement where needed. For example, the state analysis gives a total count of essential facilities within a floodplain, but it does not give the base counts of essential facilities, so the planning team will gather data in the same categories analyzed to provide this number.

The number of vulnerable structures and critical facilities were calculated by overlaying the building footprints with the SFHA as shown in the FIRM data. Overall, 0.8 percent of the building footprints in Berkeley County and 3.8 percent of building footprints in Morgan County are within the SFHA. None of the 56 critical facilities within Berkeley County are within the SFHA. Of the 18 critical facilities located within Morgan County, 4 are within the SFHA.

Table 4.3.4-7: Community Flood Vulnerability for Berkeley and Morgan Counties.									
Jurisdiction	Total Structures	Total Structures in SFHA	Percent of Structures in SFHA	Total Population	Population in SFHA	Percent of Population	Total Critical Facilities	Critical Facilities in SFHA	Percent of Critical Facilities in SFHA
Bath	504	87	17.3%	753	139	18.5%	3	0	0.0%
Berkeley Unincorporated	104,115	2,802	2.7%	102,999	750	0.7%	52	0	0.0%
Hedgesville	276	0	0.0%	300	0	0.0%	0	0	0.0%
Martinsburg	10,342	111	1.1%	18,777	571	3.0%	16	0	0.0%
Morgan Unincorporated	22,977	1,201	5.2%	15,900	110	0.7%	11	1	9.1%
Paw Paw	481	71	14.8%	410	40	9.8%	4	0	0.0%
Total	138,695	4,272	3.1%	139,139	1,610	1.2%	86	1	1.2%

The WV GIS Technical Center has also performed in depth analysis of critical infrastructure, flood depth, building-level risk, and much more on the WV Flood Tool with results posted on the West Virginia Risk Explorer.

FEMA and the WVEMD have partnered to identify buyouts of repetitive flood properties during the past two decades, since the inception of the FEMA Hazard Mitigation Assistance grant programs. Some landowners have taken flood mitigation into their own hands, without the use of state or federal mitigation funding. For example, in 2006, the historic Morgan County Courthouse in Berkeley Springs was destroyed by a fire. This prompted the county to not just rebuild the courthouse, but also to move the courthouse out of a designated floodway. This type of community hazard mitigation action and awareness is important for long term progress in reducing the impacts of flooding.

Additional information on flood vulnerability and losses in the region, including the 1 percent-annual-chance flood event results from Hazus, FEMA's loss estimation software, is provided in Section 4.4.3: Potential Loss Estimates.

Table 4.3.4-8 below shows the expected annual losses to flooding by census tract.

Table 4.3.4-8: Expected Annual Losses to Flooding by Census Tract (FEMA NRI, 2026e).			
Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$916,945.22	Relatively Moderate
54003971402	Martinsburg City	$532,081.96	Relatively Low
54003971500	Martinsburg City	$689,135.31	Relatively Moderate

Table 4.3.4-8: Expected Annual Losses to Flooding by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses ($)**	**Expected Annual Loss Rating**
54003971600	Martinsburg City	$1,006,844.15	Relatively Moderate
54003971700	Martinsburg City	$824,499.90	Relatively Moderate
54003971901	Martinsburg City	$1,058,162.00	Relatively High
54003971902	Martinsburg City	$1,041,577.88	Relatively High
54003972002	Martinsburg City	$462,245.94	Relatively Low
54065970900	Paw Paw Town	$1,492,901.81	Relatively High
54065970800	Bath (Berkeley Springs) Town	$1,617,695.02	Relatively High
54003971205	Hedgesville Town	$2,020,931.77	Relatively High

4.3.4.6. Populations at Risk

In terms of equity, residents living within mobile homes or other manufactured homes will experience risks associated with floods, flash floods, and ice jams at a disproportionate rate, especially if they are unanchored or improperly installed. These structures also tend to be sited on less desirable, more flood-prone land to begin with. People currently experiencing homelessness are highly susceptible to flooding as they lack secure shelter. Equitable policies must ensure access to emergency shelters, temporary housing, and long-term housing solutions for people displaced by flooding. In terms of evacuation, households without vehicles or with people who have disabilities will need assistance. According to the American Community Survey, the highest proportions of zero-car households is in the Town of Bath, where 30.6% of households do not have access to a vehicle (ACS 2024 5-year estimates).

4.3.5. Hailstorm

4.3.5.1. Location and Extent



Hailstorm events can occur in all areas of both counties. Neither the duration of the storm nor the extent of the area affected by such an occurrence can be predicted. Hail is a form of precipitation consisting of solid ice that forms inside thunderstorm updrafts. Hailstones are formed when raindrops are carried upward by thunderstorm updrafts into extremely cold areas of the atmosphere and freeze. Hailstones then grow by colliding with liquid water drops that freeze onto the hailstone's surface. The hail falls in the form of balls or irregularly shaped masses of ice when the thunderstorm's updraft can no longer support the weight of the hailstone, which can occur if the stone becomes large enough or the updraft weakens (NOAA NSSL, 2026e).

4.3.5.2. Range of Magnitude

Hail is described qualitatively and quantitatively by its size and can range from 0.2 inches to 4.5 inches. Table 4.3.5-1 demonstrates the range of reported hail sizes, with severe hail identified as being 1 inch or greater in diameter (NOAA NSSL, 2026e). The most severe hail experienced by Berkeley and Morgan Counties is between 1.75-2.5 inches in diameter.

4.3.5-1: Hailstone Size and Relationship to Updraft Speed (NOAA, 2024).

Hailstone Size	Measurement (Inches)	Updraft Speed (Mph)
BB	<0.25	<39
Pea	0.25	24
Marble	0.50	35
Dime	0.70	38
Penny	0.75	40
Nickel	0.88	46
Quarter	1.00	49
Half Dollar	1.25	54
Walnut	1.50	60
Golf Ball	1.75	64
Hen Egg	2.00	69
Tennis Ball	2.50	77
Baseball	2.75	81
Teacup	3.00	84
Grapefruit	4.00	98
Softball	4.50	103

Hailstorms can cause significant damage to crops, livestock and property, depending on the size, duration, and intensity of hail precipitation. Automobiles and aircraft are particularly susceptible to damage. Also, people and animals are at risk for serious injury if they do not seek immediate shelter. Wind-driven hail can tear up siding on houses, break windows and blow into houses, break side windows on cars, and cause severe injury and/or death to people and animals (NOAA NSSL, 2026e). Since hail precipitation ususally occurs during thunderstorm events, the impacts of other hazards associated with thunderstorms (i.e. strong winds, intense precipitation, etc.) often occur simultaneously.

A potential worst-case scenario of a hailstorm would be if a storm carrying hail of over two inches were to occur over a prolonged period in a predominantly agricultural area. Because hail can cause significant crop damage, a storm of this magnitude would potentially destroy agricultural yields and result in significant lost revenue, as well as property damage and injuries to both people and livestock.

The potential impacts of hailstorms on community lifelines are as follows:

Table 4.3.5-2: Lifelines Most Likely Impacted by Hailstorm.	
Lifelines	**Notes**
	Government operations and facilities, including police, may be needed for response and recovery. People and animals may be injured from hail depending on the size.
	Hailstorms can cause severe crop damage even during minor events. This may impact the availability and cost of food and may cause adverse economic impacts for farmers. Hail can also cause damage to property.
	Hailstorms can cause severe damage to vehicles and airplanes and may render roadways temporarily impassable. This may impact emergency responders' ability to safely transport patients during hailstorm events. As well as impact the ability of police and fire to respond to events. Critical facilities might be blocked off or difficult to travel to.

4.3.5.3. Past Occurrence

There have been several hazardous hailstorms reported in the region. According to NOAA NCEI, 94 hail events of 0.5 inches or greater have been reported in Berkeley County, and 30 events have been reported in Morgan County since 1950. The largest reported hail in the area occurred during a hailstorm in Morgan County on July 18, 2006. It produced hail the size of a tennis ball, 2.5 inches in diameter (NOAA NCEI, 2026b). Hail events from 1950 to present for both counties can be viewed in Table 4.3.5-2. Damages from these events totaled $771,000.00.

Table 4.3.5-2: Berkeley and Morgan Counties Hail Events 1950-2026 (NOAA NCEI, 2026b).

Location	Date	Size (in)	Property And Crop Losses ($)
Morgan County	4/28/1957	1.75	$0
Berkeley County	6/3/1968	1.75	$0
Berkeley County	7/2/1968	1.5	$0
Berkeley County	6/8/1969	1	$0
Berkeley County	5/16/1988	1.75	$0
Berkeley County	9/18/1991	0.75	$0
Berkeley County	9/18/1991	1.75	$0
Berkeley County	9/18/1991	1	$0
Morgan County	4/16/1993	0.75	$0
Berkeley Springs	9/2/1993	1	$500
Berkeley County	9/21/1993	1.75	$500
Martinsburg	6/29/1994	0.5	$0

Table 4.3.5-2: Berkeley and Morgan Counties Hail Events 1950-2026 (NOAA NCEI, 2026b).			
Location	**Date**	**Size (in)**	**Property And Crop Losses ($)**
Berkeley County	5/25/1995	0.75	$2,000
Martinsburg	6/11/1995	0.75	$0
Morgan County	7/6/1995	0.75	$0
Martinsburg	7/10/1995	0.75	$0
Morgan County	7/10/1995	1	$5,000
Hedgesville	3/29/1997	0.88	$0
Bunker Hill	7/30/1998	1.75	$3,000
Martinsburg	5/12/1999	1	$0
Martinsburg	7/24/1999	0.88	$0
Falling Waters	7/24/1999	0.75	$0
Falling Waters	7/25/1999	0.75	$0
Berkeley	11/2/1999	1	$0
Martinsburg	11/2/1999	1	$0
Falling Waters	5/10/2000	0.75	$0
Martinsburg Arpt	5/10/2000	0.75	$0
Inwood	5/10/2000	0.88	$0
Hedgesville	7/14/2000	1	$0
Hedgesville	7/28/2000	1	$0
Berkeley Spgs	6/12/2001	0.75	$0
Martinsburg	5/26/2002	1.75	$0
Bunker Hill	5/26/2002	0.88	$0
Berkeley Spgs	5/26/2002	1.75	$0
Berkeley Spgs	5/26/2002	1	$0
Arden	6/4/2002	0.75	$0
Inwood	8/16/2003	1	$0
Martinsburg	5/14/2004	0.88	$5,000
Martinsburg	5/25/2004	0.88	$0
Martinsburg Arpt	6/22/2005	0.88	$0
Martinsburg	7/9/2006	0.88	$0
Berkeley Spgs	7/18/2006	1	$750,000
Berkeley Spgs	7/18/2006	2.5	$0
Berkeley Spgs	7/18/2006	1	$0
Omps	6/19/2007	1.75	$0
Martinsburg	9/26/2007	0.88	$0
Gerrardstown	6/16/2008	0.75	$0
(Mrb)Shepherd Fld Mr	6/16/2008	0.75	$0
Hedgesville	8/14/2008	0.75	$0

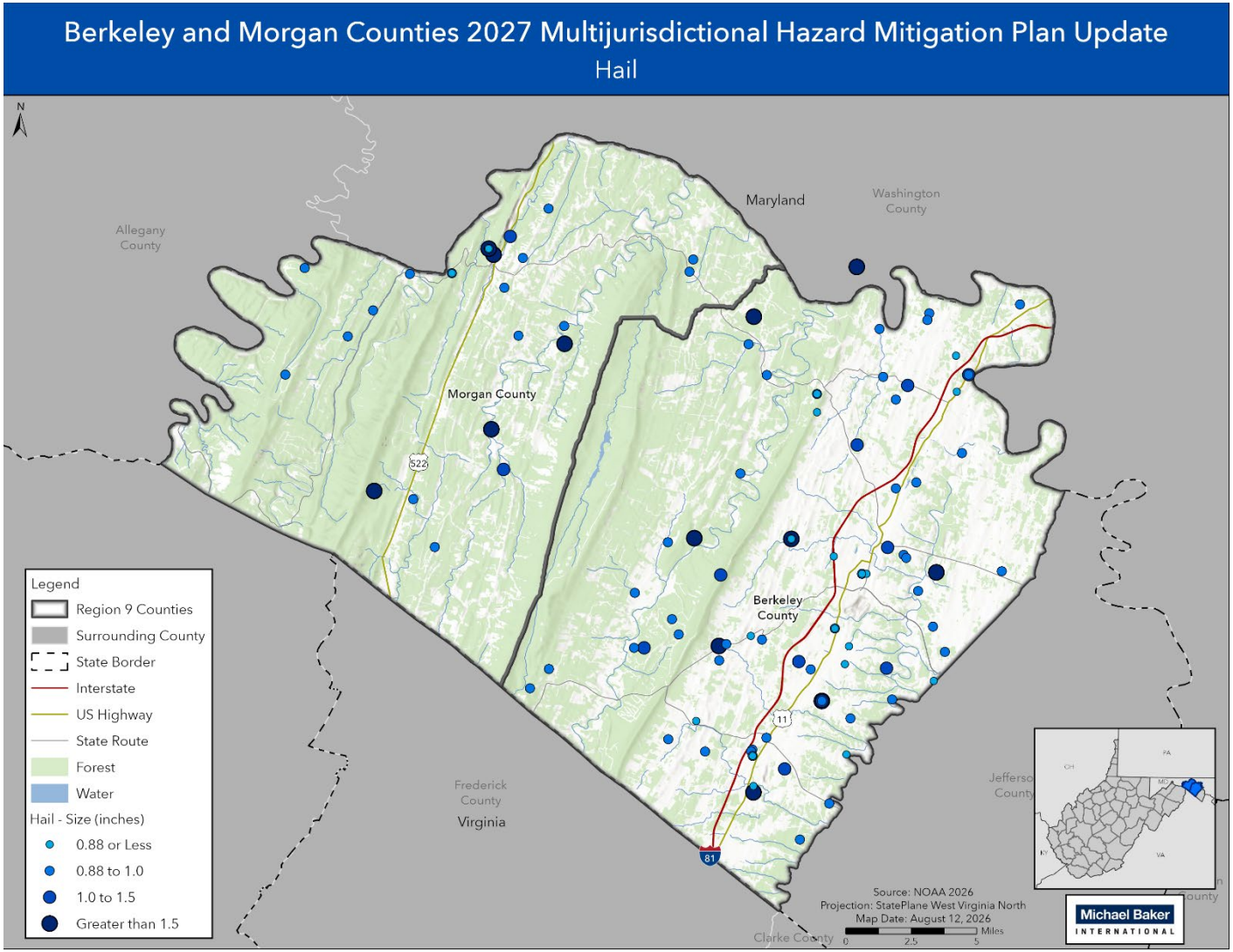
Table 4.3.5-2: Berkeley and Morgan Counties Hail Events 1950-2026 (NOAA NCEI, 2026b).			
Location	**Date**	**Size (in)**	**Property And Crop Losses ($)**
(Mrb)Shepherd Fld Mr	6/9/2009	1	$0
Great Cacapon	6/9/2009	0.75	$0
Marlowe	7/11/2009	1	$0
Tarico Hgts	4/25/2010	1	$0
Tarico Hgts	4/25/2010	1	$0
Tablers	5/26/2011	1	$0
Tablers	5/26/2011	1.25	$0
Spring Mills	6/21/2011	1.25	$0
Blairton	6/21/2011	1	$0
Marlowe	8/18/2011	1	$0
Marlowe	8/18/2011	1	$0
Jones Spgs	9/14/2011	1.75	$0
Arden	9/14/2011	1	$0
Johnstown	9/14/2011	1.75	$5,000
Johnstown	9/14/2011	1	$0
Ganotown	9/14/2011	1	$0
Shanghai	9/14/2011	1.5	$0
Shanghai	9/14/2011	1	$0
Union Corner	9/14/2011	1	$0
Gerrardstown	9/14/2011	1	$0
Union Corner	5/3/2012	1	$0
Union Corner	5/3/2012	1.75	$0
Union Corner	5/3/2012	1	$0
North Mtn	5/3/2012	1	$0
North Mtn	5/3/2012	1	$0
Vanclevesville	5/29/2012	1	$0
Glengary	8/1/2012	1	$0
Stotlers Xrds	8/9/2012	1.25	$0
Hansrote	8/14/2012	1	$0
New Hope	9/1/2012	1	$0
Berkeley Spgs	5/22/2013	1	$0
Fair View	5/22/2013	1	$0
Gerrardstown	5/13/2014	1	$0
Berkeley	6/11/2014	1	$0
Spring Mills	6/11/2014	1	$0
Glengary	6/18/2014	1	$0
Great Cacapon	4/20/2015	1	$0

Table 4.3.5-2: Berkeley and Morgan Counties Hail Events 1950-2026 (NOAA NCEI, 2026b).			
Location	**Date**	**Size (in)**	**Property And Crop Losses ($)**
Great Cacapon	4/20/2015	1	$0
Berkeley Spgs	6/16/2016	1.75	$0
Nollville	6/21/2016	1	$0
Blairton	6/21/2016	1	$0
Oakland	8/15/2016	1	$0
Johnstown	8/12/2017	1	$0
Berkeley Spgs	8/12/2017	1	$0
Omps	9/5/2017	1	$0
Holton	5/13/2018	1	$0
Martinsburg	5/14/2018	1.5	$0
Inwood	5/14/2018	1	$0
Darkesville	5/3/2019	1	$0
(Mrb)Shepherd Fld Mr	5/3/2019	1	$0
(Mrb)Shepherd Fld Mr	5/3/2019	1	$0
Vanclevesville	5/3/2019	0.75	$0
Martinsburg	6/2/2019	0.75	$0
Blairton	6/2/2019	1	$0
(Mrb)Shepherd Fld Mr	6/2/2019	0.75	$0
Inwood	6/23/2020	1	$0
Blairton	6/22/2022	1	$0
Inwood	7/28/2023	1.25	$0
Johnstown	8/7/2023	1	$0
Falling Waters	8/7/2023	1.25	$0
Johnsons Mill	8/7/2023	1	$0
Shanghai	9/7/2023	1	$0
Jones Spgs	9/7/2023	1	$0
Arden	9/7/2023	1.5	$0
Tomahawk	9/7/2023	1	$0
Bedington	9/7/2023	1	$0
Spring Mills	9/7/2023	1.25	$0
Doe Gully	9/7/2023	1	$0
Falling Waters	5/27/2024	1	$0
Spring Mills	5/27/2024	1	$0
Orleans Xrds	5/27/2024	1	$0
Sir Johns Run	5/27/2024	1.25	$0
Holton	5/27/2024	1	$0
(Mrb)Shepherd Fld Mr	5/3/2025	1.25	$0

Table 4.3.5-2: Berkeley and Morgan Counties Hail Events 1950-2026 (NOAA NCEI, 2026b).			
Location	**Date**	**Size (in)**	**Property And Crop Losses ($)**
Ridgeway	7/18/2025	1	$0

The most recent occurrence of sizeable hail was reported in Ridgeway on July 18, 2025, with hail up to 1.0 inches in diameter. No damages were claimed. None of the hail events since the 2022 update resulted in property damage. Figure 4.3.5-1 displays the hail events with the hail sizes throughout Berkeley and Morgan counties.

Figure 4.3.5-1 Hail Events Throughout Berkeley and Morgan Counties.



4.3.5.4. Future Occurrence

It is not possible to predict the formation of a hailstorm with more than a few days' lead time. The future occurrence of hailstorm activity in Berkeley and Morgan Counties is expected, and the susceptibility to damage from hail will remain unchanged. The past occurrences in the region indicate that this event is one that can happen several times in any given year, most likely during the late spring and summer months. However, the probability of hailstorm events resulting in multiple casualties and extensive structural damage can be considered *unlikely,* while the probability of nondamaging hail can be considered *possible* (between 1% & 49.9% annual probability), according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.5.4. Vulnerability Assessment

All of Berkeley and Morgan counties, including all critical infrastructure, is vulnerable to the effects of hail, as the storm cells that produce this hazard are spread over a large (multi-county) area. The area of damage due to these storms is relatively small, in that a single storm does not cause widespread devastation but may cause damage in a focused area of the storm.

Structures identified as potentially at risk of damage due to a hailstorm are mostly older structures. The number of occupied housing units built before 1960 (over 65 years old) in Berkeley and Morgan Counties is 13,058 (U.S. Census Bureau, 2024, ACS). The Town of Bath and City of Martinsburg face the highest vulnerability with 49% and 42.4% of all structures built before 1960.

Table 4.3.5-3: Occupied Housing Units Built Before 1960 (U.S. Census Bureau, 2024, ACS).

Jurisdiction	Units	Percent
Berkeley County	7,385	13.7%
Martinsburg	3,597	42.4%
Hedgesville	48	32.2%
Morgan County	1,676	18.2%
Bath	267	49%
Paw Paw	85	38.2%

As a hazard, damage to crops and vehicles are typically the most significant impacts of hailstorms. Damage to trees, shrubs, and other vegetation may occur during hailstorm events through defoliation. Unless there are compounding stresses, natural vegetation can typically recover over time following the event. However, crops such as corn and soybeans can be damaged to the point of total loss, particularly if an event occurs later in the growing season. Livestock may also be injured during these events.

Potential losses from a hailstorm event can be derived from agricultural sales information as reported

in the Drought hazard profile, Section 4.3.1. According to the 2022 USDA Census of Agriculture, there are 849 farms located in Berkeley County. Berkeley County businesses sold approximately $32,253,000 in agricultural products in 2022 with 78% coming from crop sales. The remaining 22% of sales are the result of livestock, poultry, and products with a total of $6,956,000 sales in 2022 (USDA, 2024a). Morgan County has less agricultural land with only 294 farms reported and $4,679,000 agricultural products sold in 2022. Like Berkeley County, most sales (76%) come from crops with only 24% from livestock, poultry, and products (USDA, 2024b). Both Counties main livestock is cattle and calves with 3,021,000 sales for Berkeley County and 547,000 sales for Morgan County (USDA, 2024a; USDA 2024b). Economic costs could result from a massive hail event if livestock are injured, which often tend to graze in pastures during the hail seasons.

Table 4.3.5-4 below shows the expected annual losses to hail for each census tract in the county According to FEMA's National Risk Index.

Table 4.3.5-4: Expected Annual Losses to Hail by Census Tract (FEMA NRI, 2026e).

Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$42,094.44	Relatively Moderate
54003971402	Martinsburg City	$19,557.46	Relatively Low
54003971500	Martinsburg City	$18,538.32	Relatively Low
54003971600	Martinsburg City	$27,677.20	Relatively Moderate
54003971700	Martinsburg City	$27,145.32	Relatively Moderate
54003971901	Martinsburg City	$33,531.44	Relatively Moderate
f54003971902	Martinsburg City	$29,290.36	Relatively Moderate
54003972002	Martinsburg City	$13,910.38	Relatively Low
54065970900	Paw Paw Town	$8,827.59	Relatively Low
54065970800	Bath (Berkeley Springs) Town	$15,371.02	Relatively Low
54003971205	Hedgesville Town	$20,735.59	Relatively Low

4.3.5.5. Populations at Risk

In terms of equity, unhoused populations may be most at risk of adverse impacts of hailstorms. Low-income groups who may live in older or less well-maintained dwellings may also be at heightened risk of adverse impacts. Rural areas of the counties, which is the majority for both, may be disproportionately impacted by hailstorms due to crops and livestock impacts.

4.3.6. Hurricane and Tropical Storm

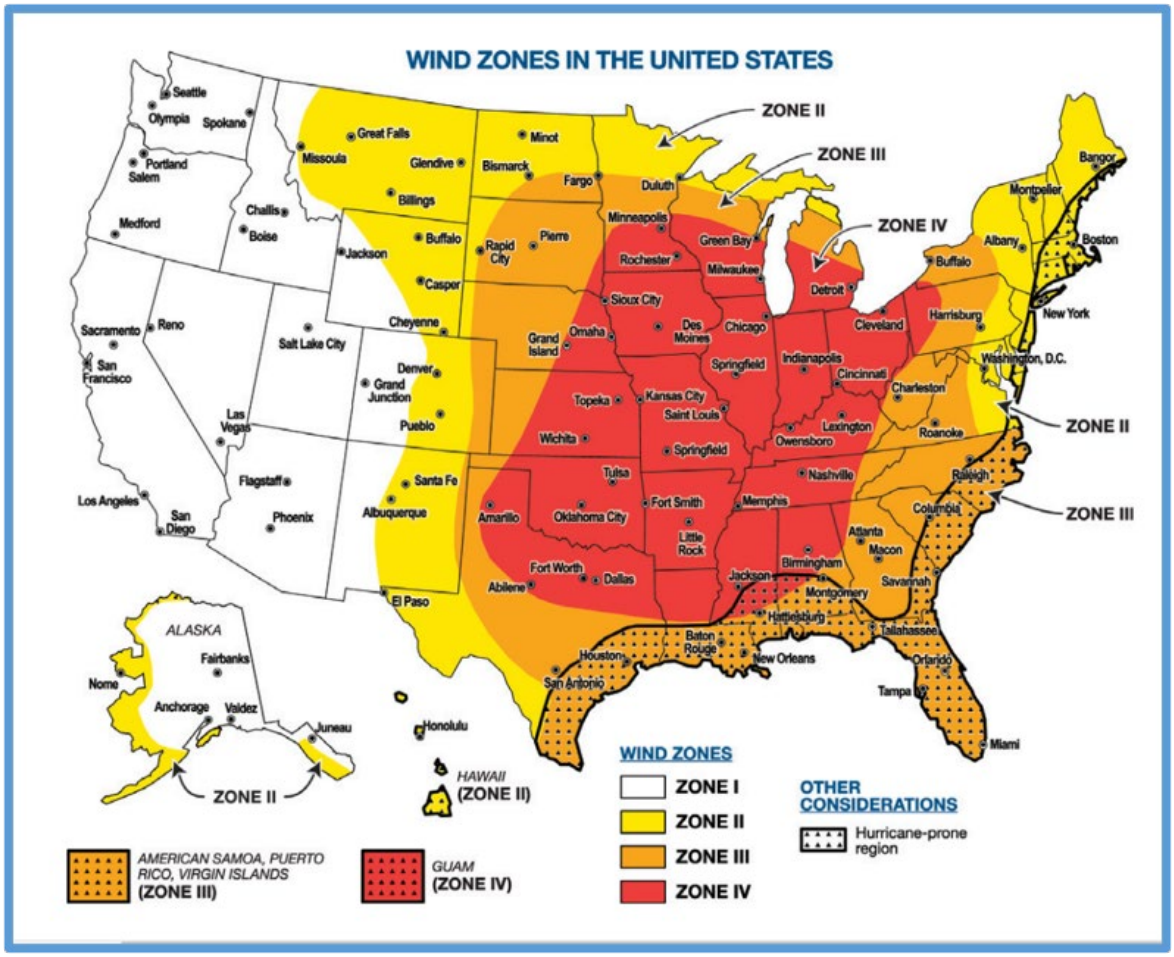
4.3.6.1. Location and Extent



Tropical storms systems (i.e. hurricanes, tropical storms, tropical depressions) impacting Berkeley and Morgan Counties develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea (NOAA NOS, 2025). Cyclones with maximum sustained winds of less than 39 miles per hour (mph) are called tropical depressions. A tropical storm is a cyclone with maximum sustained winds between 39-74 mph. These storms sometimes develop into hurricanes with wind speeds in excess of 74 mph (NOAA NOS, 2025). While the region is located over 100 miles from the Atlantic Coast, tropical storms can track inland causing heavy rainfall and winds. Therefore, all communities within both counties are equally subject to the impacts of hurricanes and tropical storms. Areas subject to flooding, wind, and winter storm damage are particularly vulnerable.

Figure 4.3.6.1 shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. Berkeley and Morgan counties fall within Zone III, meaning shelters and critical facilities should be able to withstand a 3-second gust of up to 200 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. More detail on tornados and windstorms is discussed in Section 4.3.13.

Figure 4.3.6-1: Wind Zones of the United States (IBEC, 2019).



4.3.6.2. *Range of Magnitude*

The impacts associated with hurricanes and tropical storms are primarily wind damage and flooding. It is not uncommon for tornadoes to develop during these events. Historical tropical storm and hurricane events have brought intense rainfall, sometimes leading to damaging floods, northeast winds, which, combined with waterlogged soils, caused trees and utility poles to fall.

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (characteristic of tropical storms and hurricanes, but not a threat to Berkeley and Morgan Counties), which are combined to estimate potential damage. Table 4.3.6-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as “major” hurricanes.

Table 4.3.6-1: Saffir-Simpson Scale Categories with Associated Wind Speeds and Damages (NOAA NHC, 2026).

Storm Category	Wind Speed (mph)	Description
1	74-95	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	>156	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

The likelihood of these damages occurring in Berkeley and Morgan Counties is assessed in Section 4.3.6.4. It is important to recognize the potential for the cascading effects of flooding during these storm events; the risk assessment for flood-related damages is discussed in Section 4.3.4. Environmental impacts associated with hurricanes and tropical storms are consistent with the impacts described for flooding in Section 4.3.4.2 and tornadoes and windstorms in Section 4.3.13.2.

The potential impacts of hurricanes, tropical storms, or a Nor'easter on community lifelines are as

follows:

Table 4.3.6-2: Most Likely Lifelines Impacted by Hurricanes or Tropical Storms.	
Lifelines	**Notes**
	Government operations and facilities, including police, fire, and search and rescue are needed for response and recovery.
	Severe storms present a significant risk to buildings and infrastructure and can create issues for food and water access.
	The power grid and issues of fuel availability either due to direct damage or increased usage may occur.
	Transportation corridors may be affected due to direct damage from storm conditions, and potential impacts of other compounding hazards such as flooding and transportation incidents.
	Damage to facilities and other storage areas from storm or flooding damage may affect hazardous materials.

4.3.6.3. Past Occurrence

NOAA's Coastal Services Center maintains records of all coastal storms occurring in the United States since the 1850s. Tables 4.3.6-3 and 4.3.6-4 lists all coastal storms having centers of circulation to pass through or within 30 nautical miles of Berkeley and Morgan Counties since the 1850s. Typically, when these storms reach these Counties, they have lost their hurricane speed winds, so structural damage is usually not as bad as coastal communities may experience. According to the Historic Hurricane Tracks by NOAA, no new tropical storms, extratropical storms, or hurricanes have circulated through or within 30 nautical miles of Berkeley County since Hurricane Ida in 2021 and since Hurricane Debby in 2024 for Morgan County.

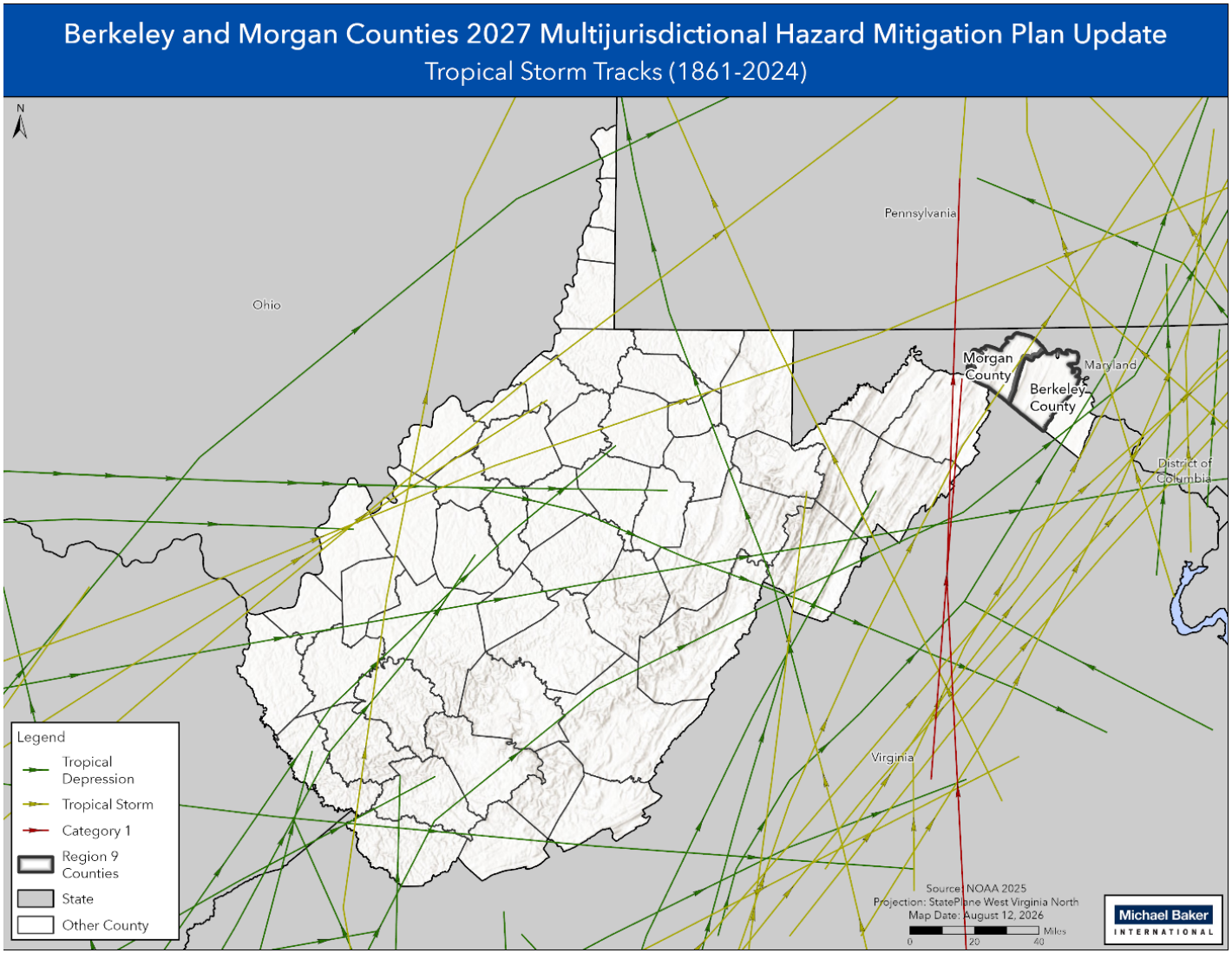
Figure 4.3.6-2 shows historic coastal storms which have passed through Berkeley and Morgan Counties and throughout the State of West Virginia.

Table 4.3.6-3: Previous Tropical Storm Events with Centers of Circulation Within 30 Nautical Miles of Berkeley County (NOAA, 2026b).		
Year	**Event**	**Type**
1876	Unnamed	Hurricane
1883	Unnamed	Hurricane
1885	Unnamed	Tropical Storm
1893	Unnamed	Hurricane
1893	Unnamed	Hurricane
1893	Unnamed	Tropical Storm
1896	Unnamed	Hurricane
1928	Unnamed	Hurricane
1934	Unnamed	Hurricane
1939	Unnamed	Hurricane
1949	Unnamed	Hurricane
1952	Able	Hurricane
1954	Hazel	Hurricane
1955	Diane	Hurricane
1979	David	Hurricane
1988	Chris	Tropical Storm
1994	Beryl	Tropical Storm
1999	Dennis	Hurricane
2012	Sandy	Hurricane
2021	Ida	Hurricane

Table 4.3.6-4: Previous Tropical Storm Events with Centers of Circulation Within 30 Nautical Miles of Morgan County (NOAA, 2026b).		
Year	**Event**	**Type**
1876	Unnamed	Hurricane
1885	Unnamed	Tropical Storm
1888	Unnamed	Hurricane
1893	Unnamed	Hurricane
1893	Unnamed	Tropical Storm
1896	Unnamed	Hurricane
1928	Unnamed	Hurricane
1934	Unnamed	Hurricane
1939	Unnamed	Hurricane
1949	Unnamed	Hurricane
1979	David	Hurricane

Table 4.3.6-4: Previous Tropical Storm Events with Centers of Circulation Within 30 Nautical Miles of Morgan County (NOAA, 2026b).		
Year	**Event**	**Type**
1988	Chris	Tropical Storm
1994	Beryl	Tropical Storm
1999	Dennis	Hurricane
2012	Sandy	Hurricane
2021	Ida	Hurricane
2024	Debby	Hurricane

Figure 4.3.6-2: Historical Tropical Storms in Berkeley and Morgan Counties.



One of the worst events in the most recent years was the remnants of Hurricane Ida in 2021, which resulted in large swaths of rain and power outages throughout the two counties. There were reported 587 customers in Berkeley County and 41 customers in Morgan County without power. Schools closed early so staff and students were able to return home safely. Henshaw Road (CR 51/5) was closed from high water. The NWS issued a flood warning for Berkeley and Morgan Counties with the potential for 3 to 8 inches of rain, damaging winds, and life-threatening flash, urban, and river flooding to communities (Keefer, 2021). Figure 4.3.6-3 below displays some of the flooding to occur in Morgan County due to Hurricane Ida.

Table 4.3.6-3: Flooding at Berkeley Springs State Park from Warm Springs Run due to Hurricane Ida (Photograph courtesy of Tricia Strader / *The Journal,* 2021).



4.3.6.4. Future Occurrence

Although hurricanes and tropical storms can cause flood events consistent with 100- and 500- year levels, their probability of occurrence is measured relative to wind speed. There has been an increase in North Atlantic hurricane activity since the 1970s with locations of peak intensity tropical cyclones migrating poleward coinciding with tropics expansion (Kossin et al. 2020). However, activity does vary year to year, due to factors such as natural variability in ocean circulation, volcanic eruptions, and Saharan dust. In addition, changing climatic conditions have led to more favorable conditions for large storms. The relationship between climate change and hurricanes is complex due to the variety of

potential factors that impact their development. For example, dust from the Sahara Desert that is lifted high in the atmosphere during a particularly hot and dry summer can inhibit the development of some hurricane formation. Consensus does seem to be that future storms will produce more precipitation. This is because warming sea and air temperatures allow for more moisture in the air, providing more fuel for potential storms. The warming of the Atlantic, which is partially due to human activity like the production of greenhouse gases, has already been associated with an increase in extreme precipitation events in the northeast United States since 1996 (Huang et al., 2018). Global storm intensity is also expected to increase as a larger proportion of storms will reach Category 4 and 5 levels, but regional projections are more uncertain due to the complexity of factors. There is also a tentative connection with a general slowdown of atmospheric circulation due to warming in the Arctic, which may lead to these stronger storms lingering longer in each place.

Furthermore, the Fifth National Climate Assessment noted that precipitation in the Northeast has increased throughout all seasons with extreme precipitation events (events with the top 1% of daily precipitation accumulation) have increased by roughly 60%. The Assessment noted that a possible reason may be the increase in tropical systems during the Atlantic hurricane season in September and October, especially for interior locations as far inland as West Virginia (Fifth National Climate Assessment, 2023). Similarly, West Virginia's annual precipitation has increased by 2 inches since 1970 (Climate Central, 2026a).

The larger rainfall totals, stronger winds, potentially lingering storm paths, and higher storm surges will greatly increase the destructive potential of storms. The effect of having more intense Category 4 and 5 storms may increase potential damage in the Atlantic 30% by 2100 (see NOAA GFDL's site for more details here https://www.gfdl.noaa.gov/global-warming-and-hurricanes/). As storms get stronger, building codes should follow suit. In addition to those impacts, storm activity has been occurring before the official start of hurricane season (June 1st) more frequently, potentially signaling an extended season each year (Truchelut, et al. 2022).

These changes may lead to greater threats to human safety and infrastructure in Berkeley and Morgan Counties. Figure 4.3.6-1 shows International Building Code wind zones for the Counties and West Virginia. These zones specify the minimum windspeed a building must be capable of withstanding to meet the requirements of shelter design. All of both Counties fall in Zone III (200 mph), this is considered the zone with the second strongest and most frequent wind activity. The probability of future hurricane or tropical storm events is *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.6.5. Vulnerability Assessment

A vulnerability assessment for hurricanes and tropical storms focuses on the impacts of flooding and severe wind. Berkeley and Morgan Counties are vulnerable to the impact of flooding and severe wind caused by hurricanes and tropical storms. Historic data indicates that while storm tracks do not

typically track over this region, impacts from associated rain can be felt in low-lying communities that face similar vulnerability from flooding events. A detailed assessment of Berkeley and Morgan Counties flood-related vulnerability is addressed in Section 4.3.4, while its vulnerability to wind damage is addressed in Section 4.3.13.

Table 4.3.6-5 below shows the expected annual losses to hurricanes by census tract.

Table 4.3.6-5: Expected Annual Losses to Hurricanes by Census Tract (FEMA NRI, 2026e).

Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$205,100.91	Relatively Moderate
54003971402	Martinsburg City	$82,656.85	Relatively Low
54003971500	Martinsburg City	$85,331.02	Relatively Low
54003971600	Martinsburg City	$130,379.43	Relatively Moderate
54003971700	Martinsburg City	$124,771.92	Relatively Moderate
54003971901	Martinsburg City	$159,276.15	Relatively Moderate
54003971902	Martinsburg City	$142,989.83	Relatively Moderate
54003972002	Martinsburg City	$60,942.30	Relatively Low
54065970900	Paw Paw Town	$29,109.88	Relatively Low
54065970800	Bath (Berkeley Springs) Town	$52,270.43	Relatively Low
54003971205	Hedgesville Town	$98,292.20	Relatively Low

4.3.6.6. Populations at Risk

Residents living within mobile homes or other manufactured homes will experience risks associated with severe storms at a disproportionate rate compared to other housing types due to their susceptibility to high winds and floods. Table 4.3.6-6 below displays the number of manufactured housing units per jurisdiction. The City of Martinsburg has the most mobile homes (75), while the Town of Paw Paw has the highest percentage of mobile homes with 14.3%. Out of the counties, Berkeley County contains more mobile homes than Morgan County.

Table 4.3.6-6: Mobile Homes per Jurisdiction (U.S. Census Bureau, ACS, 2024).

County	Total Housing Units	Number Mobile Homes	Percent Mobile Homes
Berkeley County	53,819	5,540	10.3%
Martinsburg City	8,455	75	0.9%
Hedgesville Town	149	0	0%
Morgan County	9,250	1,172	12.7%
Bath (Berkeley Springs) Town	587	4	0.7%

Paw Paw Town	223	32	14.3%

Households with no vehicles, lack of internet access, and/or no access to telephone services may have extra hurdles if evacuation is needed in the face of this hazard. Table 4.3.6-7 displays these vulnerable populations throughout the two counties. Overall, Berkeley County had the most people without a vehicle (2,615), no internet subscription (3,915), and no telephone service available (597). However, the Town of Bath had the highest percentage of people without a vehicle (30.6%), while Morgan County had the highest percentage of households with no internet subscription (14.6%). These areas may be especially vulnerable to the impacts of hurricanes and tropical storms. Populations of people experiencing homelessness will require extra help finding locations for sheltering in place.

Table 4.3.6-7: Vulnerable Populations in Berkeley and Morgan Counties (U.S. Census Bureau, 2024, ACS).

Jurisdiction	No Vehicles	Percent	No Internet Subscription	Percent	No Telephone Service Available	Percent
Berkeley County	2,615	5.1%	3,915	7.7%	597	1.2%
Martinsburg	776	9.7%	695	8.7%	96	1.2%
Hedgesville	8	5.8%	10	7.2%	2	1.4%
Morgan County	375	5.1%	1,071	14.6%	89	1.2%
Bath	156	30.6%	74	14.5%	0	0.0%
Paw Paw	0	0.0%	10	5.7%	0	0.0%

4.3.7. Invasive Species



4.3.7.1. Location and Extent

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.

The effects of an infestation to this region could be quite damaging due to the thousands of acres of agriculture and forested land in the region. Both Berkeley and Morgan Counties have similar native forests, agricultural species, and climate. Therefore, they both have essentially the same risk of infestation. Infestations often spread regionally, as invasive species are often adept at gaining footholds and outcompeting native species in entire biomes.

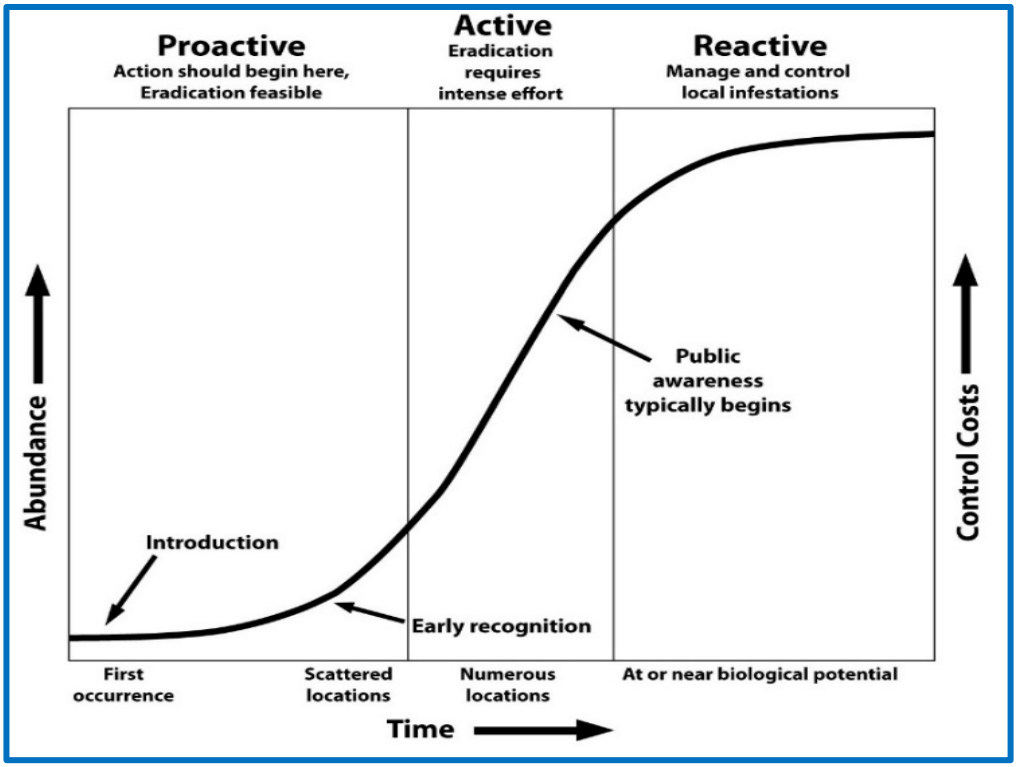
Figure 2.5-1 in the community profile displays the land use throughout Berkeley and Morgan Counties, while Table 4.3.7-2 shows a breakdown of agricultural and forested land throughout the counties.

Berkeley County contains a higher concentration of farms with 29% of its land use considered agricultural. Most agricultural land is concentrated within the southeastern portion of Berkeley County, while the northwestern half of the county consists largely of forested land. Conversely, the majority of Morgan County (78.7% of it), is considered forested with a few striations of agricultural land throughout the eastern half.

4.3.7.2. *Range of Magnitude*

Invasive species can have severe impacts on agriculture, wipe out tree species, and out compete native organisms. The magnitude of an infestation varies as widely as the species that can cause them. Infestations can be caused by plants, animals, insects, or pathogens. There are over 1,000 invasive species in West Virginia. The complete scope of magnitude of these organisms is outside the scope of this document. However, as seen in Figure 4.3.7-1, infestations do not often occur overnight, and invasive populations grow along a logistic curve. The earlier along this curve control and eradication actions are taken against an infestation, the more effective they will be. Once populations reach their peak level, they are very difficult to eradicate, and communities are forced to rely on careful management and control of invasive populations (WV DNR, 2026). Education and public awareness become extremely important as invasive species spread.

Figure 4.3.7-1: Phases of Invasive Species Infestation and Control (WV DNR, 2014)



The potential impact of invasive species on community lifelines are as follows:

Table 4.3.7-1: Lifelines Most likely Impacted by Invasive Species.

Lifelines	Notes
Food, Hydration, Shelter	Infestation of certain species can severely cripple crop production and the availability of valued domestic products. For individuals who grow a significant amount of their food, invasive species can have a large impact. Some invasive species may also cause mass food contamination if targeting agricultural operations.
Health and Medical	Invasive species can bring along with them various diseases that can infect local populations which may result in an increase in medical interventions or hospitalizations. This could also put a strain on health and medical facilities depending on severity. If the disease becomes widespread, it can lead to staff shortages.
Water Systems	Aquatic invasive species can alter the water chemistry and reduce water flow leading to a degradation in water quality. Other AIS can harm the infrastructure itself by clogging water intakes therefore disrupting the water supply.

4.3.7.3. Past Occurrence

Species that impact trees have been of specific concern to Berkeley and Morgan Counties in recent years. The most impactful species have been the emerald ash borer, gypsy moth, hemlock woolly adelgid, and spotted lanternfly. The emerald ash borer eats the cambium (cellular plant tissue) of ash trees, killing the tree within 2 or 3 years of infestation. The emerald ash borer was first sighted in 2009 in Morgan County and in 2010 in Berkeley County, and ash trees are now extremely scarce in the Eastern Panhandle (WV DNR, 2014; USDA, 2016).

Figure 4.3.7-2: A WVDA employee conducts a Gypsy Moth Survey (WV Division of Forestry, 2020).



Gypsy moths have been a widespread issue in West Virginia after they first arrived in the state in the early 1970s. According to The West Virginia Division of Forestry, the gypsy moth is considered the most serious insect pest ever to invade West Virginia (WV Division of Forestry, 2026). The moths eat the leaves of many hardwoods, which can kill trees and damage the health and appearance of forests. Exposure to the caterpillars of these moths can also cause minor health problems, such as irritation to the eyes or respiratory tract and rashes. Bans on the transport of certain trees and tree products, mobile homes, and outdoor household articles have been put in place in 44 West Virginia counties, including Berkeley County, to try to stop the spread of gypsy moths (WV DNR, 2014; USDA, 2016). The West Virginia Department of Agriculture also proposed approximately 17,328 acres for the purpose of reducing significant impacts to forested lands within West Virginia caused by the gypsy moth.

Figure 4.3.7-3: Spotted Lanternfly tree infestation (WV Division of Forestry, 2020)



The hemlock woolly adelgid feeds off the sap of and is deadly to hemlock trees. It was reported in Morgan County in 1993 and in Berkeley County in 1997, and it has continued to spread across the state. The loss of hemlock trees contributes to dramatic changes in the composition of forests, habitat loss for birds, and the reduction of shade and increased sedimentation for cold water trout streams (WV DNR, 2026).The spotted lanternfly has the potential to infest over 70 species of trees and vines. Its primarily known to infest the exotic and equally invasive tree-of-heaven (scientific name Ailanthus altissima) but has been detected on many of West Virginia's native tree hosts where it has the potential to cause severe economic and ecological damage. As of 2026, Berkeley and Morgan Counties have large populations of spotted lanternfly (West Virginia Department of Agriculture, 2026).

Other infestations include a European fungus that causes white-nose syndrome and the death of bats, chestnut blight which eradicated chestnuts trees across their entire habitable entire range by 1940, and the brown marmorated stink bug which feeds on over 170 kinds of plants and crops (WV DNR, 2026). Feral cats are listed by the Global Invasive Species Database as one of the top 100 worst invasive species globally because of their impact on bird species and competition with other native species such as raccoons, foxes, and skunks. Over 270 invasive plants have been well documented in West Virginia, and more than a third of these are classified as posing moderate to high threats. These non-native species infest areas and out compete native plants and include Japanese knotweed, tree-of-heaven, and purple loosestrife (WV DNR, 2026).

4.3.7.4. Future Occurrence

It is impossible to predict what infestations may emerge as a hazard, as new species can be introduced to the area without warning and existing pathogens can evolve to become a greater threat. However invasive species that already exist in West Virginia and may be of some concern for Berkeley and Morgan Counties in the future include beech scale, yellow poplar weevil, and the *Matsucoccus* scale/*Caliciopsis* canker complex. These all threaten specific tree species and could fundamentally change the composition of forests in the Eastern Panhandle. Beech scale is a disease that exposes beech bark to attack by fungi, killing the tree, and is spreading north from the east central portion of West Virginia. It has already reached Hardy and Mineral County. Yellow poplar weevils attack and eat the leaves of yellow poplar trees and have already begun to infest Berkeley County. It may spread to Morgan County in the coming years. *Matsucoccus* scale is a bug that attacks cankers caused by *Caliciopsis pinea*, which is thought to be a fungus. The combination of these two conditions can kill white pines, but it has not spread to the Eastern Panhandle. It has been creeping further north (USDA,

2026).

As seen in Pennsylvania over the past several years, where the spotted lanternfly population exceeds that of West Virginia, spotted lanternflies can spread rapidly when introduced to new areas, especially if major highways, railways, or rivers are in proximity to the introduction site. The key to controlling the spread of this invasive pest throughout West Virginia will be early detection and prompt eradication efforts. Within the Eastern Panhandle, there is a profitable orchard industry which could be affected by an increased spotted lanternfly population. The West Virginia Department of Agriculture is diligently working to prevent the continued spread of spotted lanternfly with joint efforts including the USDA APHIS and other professional agricultural agencies (West Virginia Department of Agriculture, 2026). The probability of future invasive species impacting the region can be considered *possible* (between 1% & 49.9% annual probability) according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.7.5. Vulnerability Assessment

With similar ecosystems and environment, Berkeley and Morgan Counties are likely to be threatened by the same pests. However, with a greater population and economy, Berkeley County may be more threatened by invasive species that can be transported by people or goods. For example, the emerald ash borer and gypsy moth can be transported through firewood or other tree products. Spotted lanternflies can be spread long distances by people who move infested materials or items containing eggs. Farmers or individuals involved in timber sales may be more vulnerable to the impacts of infestation due to the potential for pests to damage crops or trees; farmers in both counties have millions of dollars in crops that could be affected.

Table 4.3.1-5 below breaks down the agricultural and forested acres by jurisdiction for the counties. The unincorporated areas of Berkeley and Morgan Counties contain the highest vulnerability to drought due to containing a large acreage of agricultural and forested land. The unincorporated areas of Berkeley County have the most agricultural land with 58,348.7 acres (29%), while the unincorporated areas of Morgan County contain the most forested land with 115,225.4 acres (78.7%). Berkeley County also has 97,866.6 acres (48.6%) of forested land. These agricultural and forested areas of the counties are the most vulnerable to invasive species.

Table 4.3.7-2: Agricultural and Forested Land in Berkeley and Morgan Counties.

Jurisdiction	Total Acres	Total Agriculture Acres	Percent Agriculture	Total Forest Acres	Percent Forest
Bath	215	0.0	0.0%	21.7	10.1%
Berkeley Unincorporated	201,446	58,348.7	29.0%	97,866.6	48.6%

Hedgesville	84	2.4	2.8%	8.5	10.1%
Martinsburg	4,254	241.4	5.7%	497.9	11.7%
Morgan Unincorporated	146,413	16,017.3	10.9%	115,225.4	78.7%
Paw Paw	339	15.7	4.6%	120.8	35.6%

Based on historical documentation, and increased incidences of infestation throughout West Virginia, it is estimated that Berkeley and Morgan Counties will continue to experience infestation that may induce secondary hazards and health threats to the region's population, if infestations are not prevented, controlled, or eradicated efficiently.

4.3.7.6. Populations at Risk

According to the US Department of Agriculture National Invasive Species Information Center, invasive species introduce a variety of social and economic equity concerns. Direct impacts, such as effects on property values, agricultural productivity, tourism, outdoor recreation, and public utility operations may be of particular concern to low-income communities and those who work in the agriculture and utility sectors (USDA, 2026). Underserved communities are also particularly vulnerable to potential pathogens related to invasive species, as many underserved communities lack the resources to map and report sightings (DOI, 2025).



4.3.8. Landslides and Land Subsidence

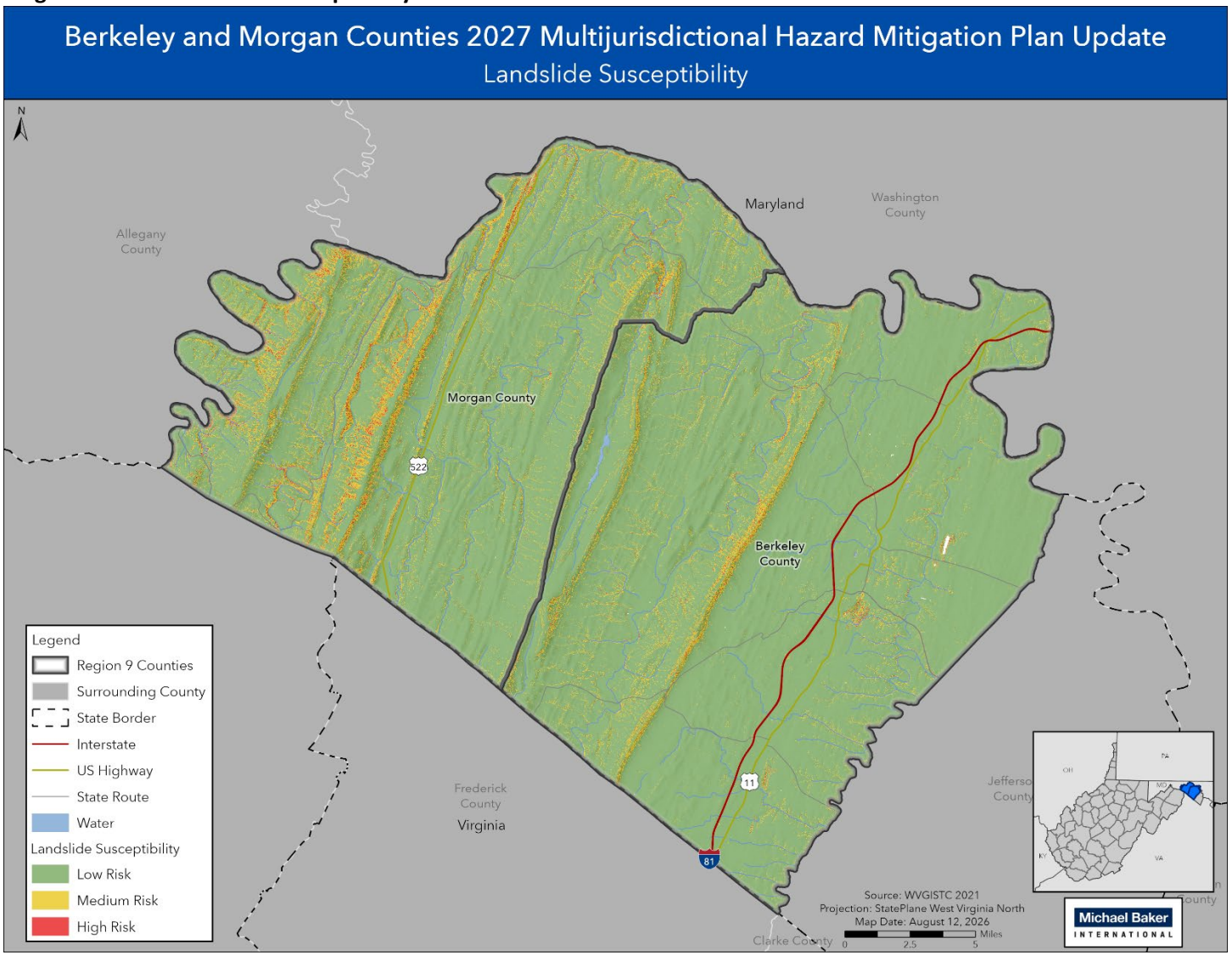
4.3.8.1. Location and Extent

In West Virginia, the most common geological hazards are landslides and subsidence. A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening slopes due to construction, erosion, earthquakes, and changes in groundwater levels. Landslides occur primarily in colluvial (loose) soil and old landslide debris on steep slopes. Steep mountain slopes across the state have experienced debris avalanches associated with extreme rainfall or rain-on-snow events. Mudflows, mudslides, rockfalls, rockslides, and rock topples are all forms of a landslide.

The Eastern Panhandle faces some risk of minor landslides, in large part due to its mountainous terrain, including North Mountain and Cacapon Mountain. Berkeley and Morgan counties encompass a variety of susceptibility, but at the local level only minor landslides in the form of falling rock and/or mud slides have occurred to date. According to the West Virginia Risk Explorer (WVRE), the Northern Appalachian Ridges and Valley region of West Virginia, which both Berkley and Morgan County fall within, have the lowest landslide density of all regions within West Virginia at 0.5 landslides per square mile (WVRE, 2024).

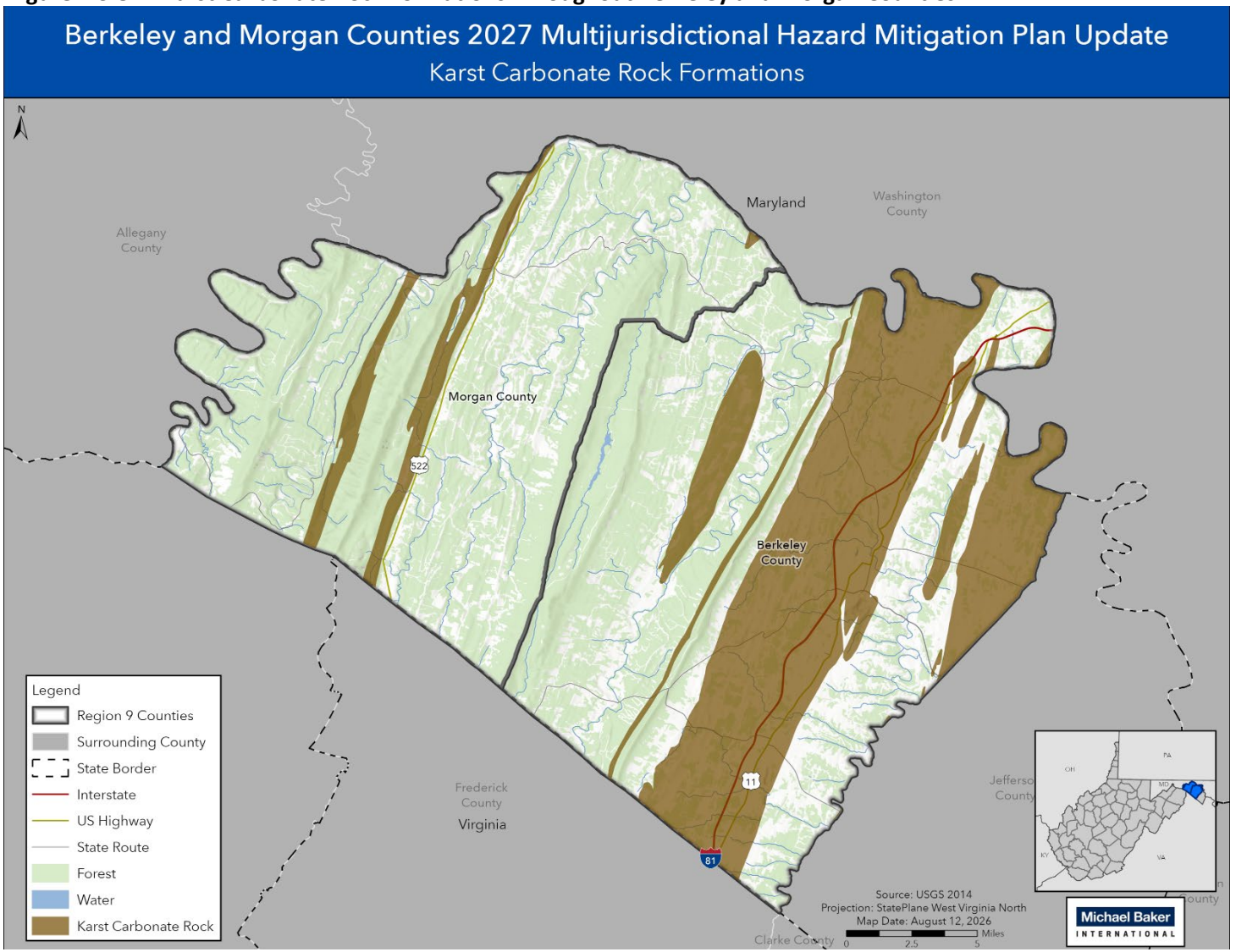
No serious injury, death or property damage attributed to landslides has been identified in the region. Most of these landslides occur along road and highway cuts through the mountains. Figure 4.3.8-1 shows general landslide susceptibility throughout the region. According to this figure, the majority of each county faces low risk (green) with a few striations of medium and high risk found throughout the western half of both counties.

Figure 4.3.8-1: Landslide Susceptibility.



Land subsidence occurs in areas of abandoned mines and karst area underlain by carbonate rock. These formations often contain several underground caves that could collapse, causing subsidence on top of the ground. Additionally, some portions of the region have also been undermined which could result in subsidence as well. As a result, the entire region appears susceptible to subsidence, but it should be noted that the type of subsidence could vary. The West Virginia Statewide Hazard Mitigation Plan (2023) discusses karst formations throughout West Virginia. According to that document, rapid subsidence can also occur in developed areas because of subsurface erosion caused by leaking water lines, or changes in groundwater flow caused by pumping associated with dewatering excavations, especially in karst areas. Slow subsidence is typically caused by consolidation in areas in which the soil stresses increase materially. Slow developing regional subsidence is often the result of excessive removal of groundwater, or petroleum that increases the effective stresses in subsurface soils. Slow developing, site-specific subsidence is often the result of construction structures or facilities over uncontrolled fills, including soils dumped loosely at convenient dumping locations, leveled deposits of mine spoil, highway construction spoil, head-of-hollow fills, covered sanitary landfills, etc. (State of West Virginia, 2023). Figure 4.3.8-2 depicts the karst carbonate rock formations throughout Berkeley and Morgan Counties.

Figure 4.3.8-2: Karst Carbonate Rock Formations Throughout Berkeley and Morgan Counties.



4.3.8.2. Range of Magnitude

Landslide velocity can vary from rapid to slow, and the amount of material moving in a landslide can range from a relatively small amount to a large amount. Landslides can include falling, sliding, or flowing of rocks and soil or a combination of these different types of motion.

The impact of landslides on the environment depends on the size and specific location of the event. In general, impacts include:

- Changes to topography
- Damage or destruction of vegetation
- Potential diversion or blockage of water in the vicinity of streams, rivers, etc.
- Increased sediment runoff both during and after event

Landslides can have potentially devastating consequences in localized areas. Landslides cause damage to transportation routes, utilities, and buildings and create travel delays and other side effects. Structures or infrastructure built on susceptible land will likely collapse as their footings slide downhill. Structures below the landslide can be crushed. Landslides next to roads and highways have the potential to fall on and damage vehicles or cause crashes. Most West Virginia landslides are moderate to slow moving and damage things rather than people. Property losses due to landslides and associated effects are more common than injuries and deaths. Most damages are less expensive, but significant. "Backyard" landslides are usually repaired incompletely or not at all. Cost estimates of several hundred thousand dollars for stabilization and repair of a landslide affecting two or three properties are typical. With repair estimates exceeding the value of the properties, abandonment is a frequent "solution".

No two subsidence areas or sinkholes are exactly alike. Variations in size and shape, rate they occur (i.e., gradually or abruptly), and their proximity to development ultimately determines the magnitude of damage incurred. Potential damage due to landslides or subsidence in the region is mostly limited to roadway closures and/or the possibility of highway accidents due to debris deposited on the roadway. The threat of landslides is greatest along high-volume traffic areas, especially where the road travels through a cut in the topography. Other problems related to subsidence include the disruption of utility services and damage to private and public property including buildings, and underground infrastructure. If long-term subsidence or sinkhole formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may result. If mitigation measures are not taken, the cost to fill in and stabilize sinkholes can be significant although sinkholes are limited in extent. A worst-case scenario event for planning purposes would likely involve a U.S. Route traversing a higher risk area. Crushed vehicles, stranded motorists, economic impacts due to disruptions in freight movement, as well as the cost to clear debris would result from this scenario.

The following community lifelines are affected by landslides and land subsidence:

Table 4.3.8-1: Lifelines Most Likely Impacted by Landslides and Land Subsidence.

Lifelines	Notes
	Government officials will be called into action in response. People's safety is threatened with landslides and land subsidence potentially causing injuries and deaths depending on the severity.
	Landslides and land subsidence can damage or destroy buildings and other structures. Crops and agricultural operations may be negatively impacted, leading to economic and food losses. Water disruptions may occur and groundwater could potentially be contaminated.
	Landslides and land subsidence can cause damage to transportation infrastructure and close roadways. People and essential services (fire, police, EMS, etc.) may not be able to travel or struggle to. Critical facilities, such as hospitals, might end up blocked off.

4.3.8.3. Past Occurrence

Fortunately, neither county in the region has reported significant numbers of historical landslides or land subsidence occurrences. NCEI is known to have spotty recordings of geological hazards (i.e., earthquake, landslide, karst), primarily because these events are not always seen. Beyond debris avalanches associated with significant rain and flooding activity, only minor landslides in the form of falling rock and/or mud slides have occurred in Berkeley and Morgan counties to date. One such landslide can be seen in Figure 4.3.8-4. A collapsed road caused by overflowing small streams and creeks in Morgan County can be seen in Figure 4.3.8-5.

Since landslides often occur during periods of heavy rain or snowmelt, it is possible to examine past occurrences of these events. At least 34 events of heavy rain or snow in Berkeley or Morgan County have been recorded by NCEI since 1990 (NOAA NCEI, 2021). No heavy snow events have occurred since 2007.

Figure 4.3.8-5: Collapsed Road in Paw Paw (The Morgan Messenger, 2018).



Figure 4.3.8-4: Mudslide in Morgan County Caused by Heavy Rain in January 2012.



Figure 4.3.8-6: Emergency Management crews respond to a collapsed portion of Bowers Lane in Morgan County (Morgan County EM).



4.3.8.4. Future Occurrence

Since the exact number of previous landslides over a definite time interval is not known, it is not possible to determine a quantitative probability of future occurrence for landslides in the region. Historical evidence indicates significant landslide and subsidence events are unlikely to occur in the region. However, mismanaged intense development in steeply sloped areas could increase their frequency of landslide occurrence. Building and road construction are contributing development factors to landslides as they can often undermine or steep otherwise stable soil. The West Virginia Statewide Hazard Mitigation Plan (2023) recommends that the WV Department of Transportation (WVDOT) be involved in determining areas where roads experience sinkholes to improve on incidence reporting. Additionally, as noted in Section 4.3.4, the region anticipates an increase in the frequency and magnitude of flood events as a result of increasing amounts and intensity of precipitation. Increased rainfall has also been shown to increase occurrences of landslide and land subsidence events. The probability of future landslide events can be considered *unlikely* (less than 1% annual probability) according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.8.5. Vulnerability Assessment

Landslides can result in the disruption of roads, water, sewer, gas, electric and phone lines, as well as serious damage to public and private property. The loss of life likely to happen in such an occurrence would be a major concern, particularly for those areas where multi-family construction has taken place. While most of the development in the Eastern Panhandle is not particularly vulnerable to landslides, any landslide events that do occur in the region would take place in steeply sloped areas. In addition, conditions that may exacerbate or mitigate the severity and effects of landslides include erosion, unstable slopes, earthquakes, increase of weight of slopes, hydrologic factors, and human activity. Human activities are responsible for initiating or intensifying certain conditions where otherwise there would have been little or no risk. Activities that increase vulnerability by triggering landslides include:

- Excavations and developments in unstable slope materials
- Haphazard construction or improper use of pipelines
- Disruption of surface or subsurface drainage (streams and springs) e.g. by filling
- Overuse of fill materials on slopes, particularly at the heads of existing slide masses
- Removal of materials at the bases of slopes
- Vibrations from heavy traffic, blasting, and driving piles near unstable slopes

Additionally, increased deforestation and soil disturbances caused by development on sloped areas may further increase these risks. As timbering and development of sloped land continue, the risk of significant landslides increases.

The WVU GIS Technical Center released a landslide risk assessment in 2021 for Region 9 profiling high

and medium risk road segments and structure/parcels. The landslide risk assessment is designed to be updated as characteristics of the area, roads and structures change, and updates and further mapping can be found on the WV Landslide Tool.

Table 4.3.8-2 shows the total miles of roads that are prone to high/medium slope failure risk, as well as the rank of landslide susceptibility within the state. Morgan County has about 21.5 miles of roads susceptible to landslides and Berkeley County has about 16.4 miles of roads susceptible to landslides.

Table 4.3.8-2: Road Length Susceptible to High/Medium Risk Landslide (WVGIST, 2021).

Community Name	County	Roads Total (miles)	Roads Total (miles) – High/Medium Risk	Rank
Morgan County	Morgan	423.9	21.1	49
Bath	Morgan	4.5	0	182
Paw Paw	Morgan	2.7	0.3	96
	Morgan	431.1	21.5	51
Berkeley County	Berkeley	701.6	15.9	53
Hedgesville	Berkeley	0.9	9	182
Martinsburg	Berkeley	30.6	0.3	96
	Berkeley	733.1	16.4	54

The study also examined land use risk analysis for structures/parcels in Region 9. Table 4.3.8-3 shows the total count of primary structures in high/medium landslide susceptibility areas. Morgan County has a total of 356 primary structures with a total appraisal value of $31,940,422 that are in high/medium susceptibility areas and Berkeley County has 516 primary structures with total appraisal value of $57,360,557 in high/medium susceptibility areas.

Table 4.3.8-3: Structures Susceptible to High/Medium Risk Landslide (WVGIST, 2021).

Community Name	County	Total Count	Total Value	Ranking (Count)	Ranking (Value)
Morgan County	Morgan	337	$30,207,387	18	10
Bath	Morgan	19	$1,733,036	57	34
Paw Paw	Morgan	0	$0	187	183
	Morgan	356	$31,940,422	25	13
Berkeley County	Berkeley	496	$54,441,856	9	5
Hedgesville	Berkeley	18	$2,804,600	62	23
Martinsburg	Berkeley	2	$114,100	158	130
	Berkeley	516	$57,360,557	15	7

The study also provides a detailed risk of slope failure based on different occupancy classes. Findings indicate that:

Morgan County has a total of 298 structures in Residential occupancy class with replacement costs of $30,903,625 followed by 49 Other occupancy class structures and 9 Commercial structures with replacement costs of $712,158. The unincorporated areas of Morgan County have the highest structure count and corresponding replacement values, whereas Paw Paw has no structure or related replacement costs in high and medium-risk susceptibility areas.

Berkeley County has a total of 456 structures in the Residential occupancy class with replacement costs of $53,183,807 followed by 52 Other structures and finally 8 commercial structures with replacement costs of $2,575,300. The unincorporated areas of Berkeley County have the highest structure count and corresponding replacement values whereas Hedgesville has the lowest structure count and related replacement costs in high and medium risk susceptibility areas.

Table 4.3.8-4 below displays the two counties' landslide vulnerability. The Town of Paw Paw has no structures, people, or critical facilities within karst areas. The City of Martinsburg has the highest percentage of structures (87%), people (85.8%), and critical facilities (100%) within karst areas, indicating a high vulnerability. Similarly, the unincorporated areas of Berkeley County have the most structures (52,878), people (52,269), and critical facilities (33) in karst areas.

Table 4.3.8-4: Community Landslide Vulnerability for Berkeley and Morgan Counties.

Jurisdiction	Total Structures	Total Structures in Karst	Percent of Structures in Karst	Total Population	Population in Karst	Percent of Population Karst	Total Critical Facilities	Critical Facilities in Karst	Percent of Critical Facilities in Karst
Bath	504	11	2.2%	753	14	1.9%	3	0	0.0%
Berkeley Unincorporated	104,115	52,878	50.8%	102,999	52,269	50.7%	52	33	63.5%
Hedgesville	276	220	79.7%	300	177	59.0%	0	0	0.0%
Martinsburg	10,342	8,994	87.0%	18,777	16,117	85.8%	16	16	100.0%
Morgan Unincorporated	22,977	1,403	6.1%	15,900	1,064	6.7%	11	1	9.1%
Paw Paw	481	0	0.0%	410	0	0.0%	4	0	0.0%

Table 4.3.8-5 below shows the expected annual losses to landslides by census tract.

Table 4.3.8-5: Expected Annual Losses to Landslides by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses ($)**	**Expected Annual Loss Rating**
54003971301	Martinsburg City	$8.36	Very Low
54003971402	Martinsburg City	$43.23	Very Low
54003971500	Martinsburg City	$10.25	Very Low
54003971600	Martinsburg City	$2.25	Very Low
54003971700	Martinsburg City	$1.29	Very Low
54003971901	Martinsburg City	$47.41	Very Low
54003971902	Martinsburg City	$27.62	Very Low
54003972002	Martinsburg City	$54.27	Very Low
54065970900	Paw Paw Town	$6,238.92	Relatively Moderate
54065970800	Bath (Berkeley Springs) Town	$1,879.84	Relatively Low
54003971205	Hedgesville Town	$1,144.44	Relatively Low

Residents living within mobile homes or other manufactured homes will experience risks associated with severe storms at a disproportionate rate compared to other housing types due to their susceptibility to high winds and floods. Table 4.3.6-6 below displays the number of manufactured housing units per jurisdiction. The City of Martinsburg has the most mobile homes (75), while the Town of Paw Paw has the highest percentage of mobile homes with 14.3%. Out of the counties, Berkeley County contains more mobile homes than Morgan County.

Table 4.3.6-6: Mobile Homes per Jurisdiction (U.S. Census Bureau, ACS, 2024).			
County	**Total Housing Units**	**Number Mobile Homes**	**Percent Mobile Homes**
Berkeley County	53,819	5,540	10.3%
Martinsburg City	8,455	75	0.9%
Hedgesville Town	149	0	0%
Morgan County	9,250	1,172	12.7%
Bath (Berkeley Springs) Town	587	4	0.7%
Paw Paw Town	223	32	14.3%

4.3.8.6. Populations at Risk

Populations particularly at risk include those who live in manufactured homes as they are highly susceptible to any ground disturbances. The City of Martinsburg has the most mobile homes (75),

while the Town of Paw Paw has the highest percentage of mobile homes with 14.3%. Out of the counties, Berkeley County contains more mobile homes than Morgan County. These areas are particularly susceptible. Low-income communities may not have the capital to maintain roads and keep drainage systems adequate. This can exacerbate landslide risks. In terms of immediate safety risks, vulnerable populations, such as the elderly, people with disabilities, or those without access to emergency shelters, may face greater risks.

4.3.9. Pandemic and Infectious Disease

4.3.9.1. Location and Extent



Pandemics are defined as a disease affecting or attacking the population of an extensive region, including several countries, and/or continent(s). They are further described as extensive epidemics. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale. Infectious diseases are also highly virulent and can be spread person-to-person.

Pandemic and infectious disease events cover a wide geographical area and can affect large populations, potentially including the entire population of the Counties and beyond. 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 denser areas where there are large concentrations of people. The transmission rate of infectious disease depends 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 and contaminate water (Van Seventer & Hochberg, 2017).

One of the most concerning potential hazard events is a pandemic flu outbreak. Influenza, also known as “the flu,” is a contagious disease that is caused by the influenza virus and most commonly attacks the respiratory tract in humans. Influenza is considered to have pandemic potential if it is novel, meaning that people have no immunity to it; virulent, meaning that it causes deaths in normally healthy individuals; and easily transmittable from person-to-person (CDC, 2026d).

4.3.9.2. Range of Magnitude

The magnitude of a pandemic or infectious disease threat in the Counties will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. Pandemic influenza is easily transmitted from person to person, but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time. The magnitude of a pandemic may be exacerbated by the fact that an influenza pandemic will cause outbreaks across the United States, limiting the ability to transfer assistance from one jurisdiction to another. Additionally, effective preventative and therapeutic measures, including vaccines and other medications, will likely be in short supply or will not be available.

In terms of lives lost, the impact various pandemic influenza outbreaks have had globally over the last century has declined (see Table 4.3.9-2). The severity of illness from the 2009 H1N1 swine flu virus varied, with the gravest cases occurring mainly among those considered at high risk. High risk populations considered more vulnerable include children, older adults, pregnant people, and chronic disease patients with reduced immune system capacity. These populations are described in more

detail in Section 4.3.9.5. Most people infected with H1N1 swine flu in 2009 recovered without needing medical treatment (CDC, 2009). However, unlike a regular flu season, according to the Centers for Disease Control (CDC), of the people who died, as many as 77% were 18 to 64 years old. Additionally, up to 11% of the deaths were estimated to have occurred in those 17 years old and younger.

The 1918 Spanish flu pandemic was the worst-case pandemic event in the 20th century both in Pennsylvania and worldwide. County data is unavailable, and mortality figures were probably under-reported. It is recorded that over 71,000 West Virginians died from the flu or its complications in this pandemic (Kercheval, 2020). Infection rates were much worse in denser cities, which should be a higher priority for response actions in future flu events.

First reaching the county in 2020, COVID-19 is still impacting populations in Berkeley and Morgan counties. This virus quickly became a great concern in the early months of the pandemic due to its high rates of transmission and high incidence of mortality in addition to so little being known about it. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Most people infected with COVID-19 will experience mild to moderate respiratory illness and recover without requiring special treatment (WHO, 2025).

Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness (Dennison Himmelfarb & Baptiste, 2020). Some people who have been infected with COVID-19 can experience long-term effects from the infection, known as post-COVID conditions (PCC) or long COVID. PCCs can include a wide range of ongoing health problems that can last weeks, months, or years. Some general symptoms of PCCs can include ongoing fatigue, symptoms that get worse with physical or mental activity, fever, difficulty breathing, chest pain, heart palpitations, headache, dizziness, diarrhea, and joint or muscle pain (CDC, 2026e). These are more often found in people who had severe COVID-19 illness, but anyone who has been infected with COVID-19 can experience PCCs.

Those not vaccinated and who become infected may have a higher risk of developing PCCs, compared to people previously vaccinated. In some cases, a person with PCCs may not have tested positive for the virus or known they were infected (CDC, 2026e). Viruses like COVID-19 constantly change through mutation, which sometimes results in a new variant of the virus. Some changes and mutations may allow the virus to spread more easily or make it resistant to treatments and vaccines. It is essential to track and monitor the incidence of variants during a pandemic to effectively respond to changing trends in transmission and patient care. The World Health Organization (WHO) defines categories for variants as the following (WHO, 2023):

- **Variant Under Monitoring (VUM):** A term used to signal to public health authorities that a SARS-CoV-2 variant may require prioritized attention and monitoring. The main objective of this category is to investigate if this variant (and others closely related to it) may pose an additional threat to global public health as compared to other circulating

variants

- **Variant of Interest (VOI):** a term used to describe a SARS-CoV-2 variant with changes that are known to affect how the virus behaves or its potential impact on human health. This can include, for example, its ability to spread, its ability to cause serious disease, or how easily it may be detected or treated. A VOI may also be identified because it has an increased ability to spread when compared with other circulating variants, suggesting a potential emerging risk to global public health.
- **Variant of Concern (VOC):** a term that describes a SARS-CoV-2 variant that meets the definition of a VOI (see above), but also meets at least one of the following criteria when compared with other variants:
  - it can cause a detrimental change in disease severity
  - it can have a substantial impact on the ability of health systems to provide care to patients with COVID-19 or other illnesses and therefore require major public health interventions.
  - there is a significant decrease in the effectiveness of available vaccines in protecting against severe disease.

While COVID-19 or other pandemic events do not cause environmental harm themselves, capacity in the environmental sector was similarly reduced. Several studies have found that the global socio-economic disruptions from the COVID-19 pandemic have directly and indirectly impacted community's abilities to implement projects that can improve environmental conditions such as air and water quality, reduction of noise, and restoration of ecology (Rume & Didar-Ul Islam, 2020). At the same time, there were some indications of environmental improvements from people staying at home. Government services and administration will be significantly impacted by widespread disease. Response plans will need to be developed.

The potential impacts of pandemic and infectious diseases on lifelines include:

Table 4.3.9-1: Most Likely Lifelines Impacted by Pandemic and Infectious Diseases.

Lifelines	Notes
	Community safety is threatened due to disease, with the administration of government services being negatively impacted because of widespread illness.
	Widespread disease outbreaks and resulting staffing issues will cause issues at different points along the commercial food supply chain. Agricultural production may be affected as well.

Health and Medical	Direct impacts from the increase in patients, potential staffing issues, and supply chain disruptions that may also result as disease impacts become more widespread.

4.3.9.3. Past Occurrence

The United States Department of Health and Human Services estimates that influenza pandemics have occurred for at least 300 years at unpredictable intervals. There have been several pandemic influenza outbreaks over the past 100 years. A list of events and worldwide deaths are shown in Table 4.3.9-2. Different strands of influenza mutate over time and replace older stands of the virus and thus may have drastically different effects. The H1N1 virus, colloquially known as swine flu, is of particular concern. This virus was first detected in people in the United States in April 2009. On June 11, 2009, the World Health Organization signaled that a pandemic of 2009 H1N1 flu was underway (CDC, 2009).

Avian influenza, also known as "bird flu," typically infects birds. However, a recent strain, H5N1, has caused concern in the United States due to its ability to pass from wild birds to poultry then on to people (Mayo Clinic, 2024).

Table 4.3.9-2: List of previous significant outbreaks of influenza over the past century (Global Security, 2009; WHO, 2026).

Date	Pandemic	Worldwide Deaths (approximate)
1918-1920	Spanish Flu / H1N1	50 million
1957-1958	Asian Flu / H2N2	1.5-2 million
1968-1969	Hong Kong Flu / H3N2	1 million
2009 - 2010	Swine Flu / A/H1N1	12,000
2020-Continuing	COVID-19	7.1 million

The 2017-2018 flu season was a severe season according to the CDC. They do not track national deaths in adults, but the organization reported 148 pediatric deaths from influenza. The CDC also reported that the H3N2 flu, along with other strains including H1N1, led to more cases, doctors' visits, hospital visits, and deaths than previous flu seasons. They also noted that the flu became widespread in all states and jurisdictions at the same time. In January 2018, approximately halfway through the flu season, 37 pediatric deaths were reported. The CDC estimated that 34 million Americans were affected by the flu (CDC, 2018).

In late 2019 and early 2020, a novel coronavirus began to spread into a worldwide pandemic. Named COVID-19, this type of coronavirus is a new virus that causes respiratory illness and is extremely contagious even prior to exhibiting symptoms and may be transmitted between people even if the

infected person is asymptomatic. The virus is believed to have originated in the Wuhan province of China, quickly spreading to nearby countries in late 2019 and the whole world by March 2020 (CDC, 2024a). Flu-like in nature, symptoms of COVID-19 virus include fever, cough, shortness of breath, and diarrhea. In extreme COVID-19 cases that require hospitalization, patients may require ventilators to support breathing and may pass away from the virus or related reasons (CDC, 2025c). As of August 2026, around 7.1 million people have died from COVID-19 (WHO, 2026).

According to the West Virginia Department of Health, there have been 98 flu outbreaks and 121 COVID outbreaks across West Virginia from September 2025 to September 2026 (WV Department of Health, 2026a).

4.3.9.4. Future Occurrence

Future occurrences of pandemics and infectious diseases are unclear. The precise timing of pandemic influenza is uncertain, but occurrences are most likely when the Influenza Type A virus makes a dramatic change, or antigenic shift, that results in a new or "novel" virus to which the population has no immunity. This emergence of a novel virus is the first step toward a pandemic. Future pandemics may also emerge from other diseases, especially invasive pathogens that individuals do not have natural immunity to. While it is unlikely that pandemics and infectious diseases will affect the counties, this hazard occurred recently in Spring 2020. It is impossible to predict this type of hazard. The best form of county response is to expect that these events can occur at any time and to constantly evaluate resources and update emergency response plans.

Climate change is increasing the likelihood of future pandemics due to shifts in the behaviors of hosts, vectors, and pathogens, along with changing weather patterns, migration shifts, and changes in livestock and agriculture practices which may allow new transmission pathways to develop. Climate change may also increase the prevalence of waterborne and foodborne illnesses (Kaseya et al, 2024).

Climate change will also force animals into different migration patterns and into new habitats, which will create new interactions and opportunities for pathogens to infect new hosts; this is a concern as most pandemics are driven by diseases that are passed from animals to humans (Baker & Metcalf, 2022). Tick populations may increase because of climate changes, especially warmer winters that allow them to be active for longer periods of the year and expand the ranges they can survive in. Some health threats that the CDC believes climate change will increase the risk of are:

- Anaplasmosis.
- Lyme disease.
- Dengue.
- Fungal diseases.
- Hantavirus.
- Harmful algae blooms.
- Rabies.
- Salmonellosis.

- Vibriosis.
- West Nile virus.

It is important to note that even if these changes do not originate in West Virginia, the interconnectedness of global commerce and tourism increase the risks of diseases spreading across the world from their origin. Future pandemics and infectious disease outbreaks may emerge from a long list of diseases, and invasive pathogens for which individuals lack natural immunity present a significant danger.

Looking at the number of historical incidences of pandemic-potential diseases, the probability of future pandemic events can be considered possible (between 1% & 49.9% annual probability) according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.9.5. Vulnerability Assessment

Certain population groups are at higher risk of pandemic flu infection. This population group includes people 65 years and older, children younger than 5 years old, pregnant people, people of any age with certain chronic medical conditions (diabetes, heart disease, asthma, etc.), and people with certain disabilities. Disabilities that cause problems with muscle function, lung function, coughing, swallowing, or clearing fluids from airways are especially more vulnerable (CDC, 2024c).

Schools, colleges, convalescent centers, and other institutions serving those younger than 5 years old and older than 65 years old, are locations conducive to faster transmission of pandemic influenza since populations identified as being at high risk are concentrated at these facilities or because of many people living in close quarters.

In general, jurisdictions that are more densely populated are more vulnerable to disease threats when the disease is directly spread from human to human, but every jurisdiction in West Virginia has some vulnerability to pandemic and infectious disease threats. Table 4.3.9-4 below displays the populations most vulnerable to pandemic and infectious diseases by municipality.

Table 4.3.9-4: Vulnerable Populations in Berkeley and Morgan Counties (U.S. Census Bureau, 2024, ACS).

Jurisdiction	Population Under 5	Percent	Disabled Population	Percent	Population Over 65	Percent
Berkeley County	7,870	6.1%	18,320	14.3%	19,771	15.3%
Martinsburg	1,017	5.4%	3,447	18.3%	3,096	16.4%
Hedgesville	11	2.9%	48	12.7%	43	11.3%
Morgan County	689	4.0%	3,044	17.6%	4,386	25.2%
Bath	25	2.6%	220	22.6%	275	28.2%
Paw Paw	7	1.5%	90	19.6%	57	12.4%

There are some occupation-specific risks that may make some employees more vulnerable. For example, those working in direct patient care situations are more likely to be exposed to a pandemic disease.

There are no true environmental impacts of pandemics and infectious disease threats, but there will be significant economic and social costs beyond the possibility of disease-related deaths. Widespread illness may increase the likelihood of shortages of personnel to perform essential community services. In addition, high rates of illness and worker absenteeism occur within the business community, and these contribute to social and economic disruption. Social and economic disruptions could be temporary but may be amplified in today's closely interrelated and interdependent systems of trade and commerce. Social disruption may be greatest when rates of absenteeism impair essential services, such as power, transportation, and communications.

Jurisdictional losses in a pandemic or infectious disease outbreak stem from lost wages and productivity, not losses to buildings or land. Losses are difficult to estimate because the exact rates of absenteeism and cost of treating a widespread disease will depend on the virus or bacterium in question, the availability of vaccination or treatment, and the severity of symptoms. For historical context, though, the Asian and Hong Kong Flu pandemics killed over 1.5 million people worldwide and caused an estimated $32 billion loss due to lost productivity and medical expenses (Saunders-Hastings & Krewski, 2016).

4.3.9.6. Populations at Risk

Equity considerations during pandemics and infectious disease outbreaks are crucial as there are several populations at an increased risk. Those living with chronic medical conditions or disabilities, older adults, and young children may be particularly susceptible to the effects of pandemics and infectious disease outbreaks. Populations of people 65 and older are overall more susceptible to severe outcomes related to infectious disease, especially those currently residing within congregate care facilities. The Town of Bath has the greatest percentage of 65+ and disabled individuals with 28.2% and 22.6% respectively. The City of Martinsburg has the greatest population of 65+ and disabled individuals with 3,096 65+ and 3,447 disabled people, as shown in Table 4.3.9-4. As for children under 5, the City of Martinsburg has the most children with 1,017 individuals.

Additionally, low-income populations are more likely to lack access to quality healthcare and have pre-existing health conditions. Furthermore, these populations may be unable to follow quarantine measures as they may be essential workers or live in group quarters. Households with inadequate internet and telecom access may struggle to access both remote work and remote learning needed during a large-scale pandemic. This can cause further economic harm. Having measures and protections in place for these groups is essential to mitigate and reduce the extensivity of this hazard.

Households with no computers, lack of internet access, and/or no access to telephone services may

have extra hurdles if evacuation is needed in the face of this hazard. Table 4.3.9-5 displays these vulnerable populations throughout the two counties. Overall, Berkeley County had the most people without a computer (1,917), internet subscription (3,915), and telephone service (597). However, the Town of Bath had the highest percentage of people without a computer (20.8%), while Morgan County had the highest percentage of households with no internet subscription (14.6%). These areas may be especially vulnerable to the impacts of pandemics and infectious diseases.

Table 4.3.9-5: Vulnerable Populations in Berkeley and Morgan Counties (U.S. Census Bureau, 2024, ACS).

Jurisdiction	No Computer	Percent	No Internet Subscription	Percent	No Telephone Service Available	Percent
Berkeley County	1,917	3.8%	3,915	7.7%	597	1.2%
Martinsburg	331	4.2%	695	8.7%	96	1.2%
Hedgesville	2	1.4%	10	7.2%	2	1.4%
Morgan County	553	7.5%	1,071	14.6%	89	1.2%
Bath	106	20.8%	74	14.5%	0	0.0%
Paw Paw	10	5.7%	10	5.7%	0	0.0%

4.3.10. Radon Exposure

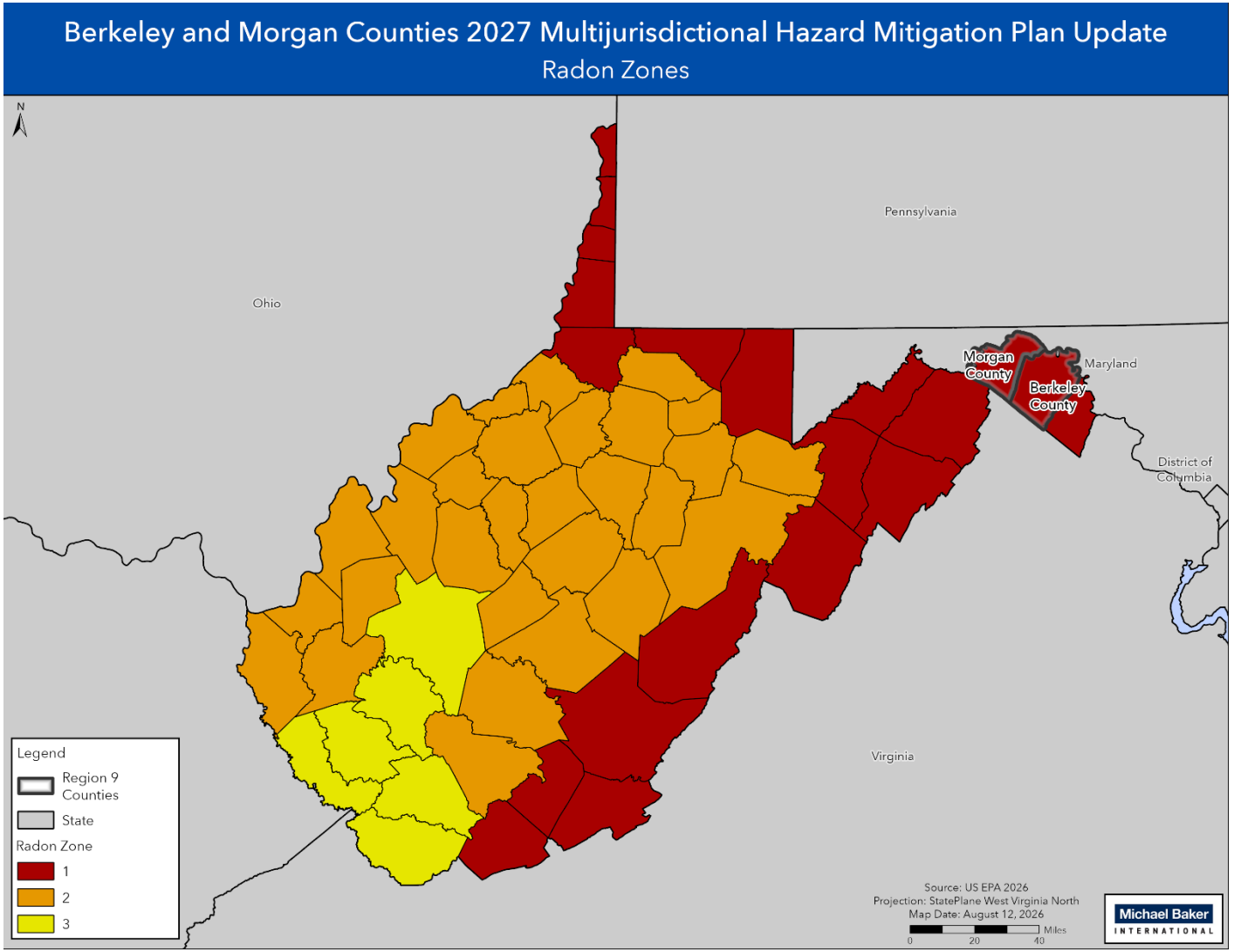


Radioactivity caused by airborne radon has been recognized for many years as an important component in the natural background radioactivity exposure of humans, but it was not until the 1980s that the wide geographic distribution of elevated values in houses and the possibility of extremely high radon values in houses was recognized. In 1984, routine monitoring of employees leaving the Limerick nuclear power plant near Reading, PA while it was still under construction and not yet functional, showed that readings on a construction worker at the plant frequently exceeded expected radiation levels. However, only natural, nonfission-product radioactivity was detected on him. Subsequent testing of the employee's home in the Reading Prong section of Pennsylvania showed extremely high radon levels around 2,500 pCi/L (pico Curies per Liter). To put this amount in perspective, the Environmental Protection Agency (EPA) guidelines state that actions should be taken if radon levels exceed 4 pCi/L in a home, and uranium miners have a maximum exposure of 67 pCi/L. As a result of this event, the Reading Prong became the focus of the first large-scale radon scare in the world. Studies have tied high radon levels to a few different geologic units, including the type of carbonate bedrock found in both Reading, PA and West Virginia's Eastern Panhandle Region (USGS, 2013).

Radon is a gas that cannot be seen or smelled. It is a noble gas that originates by the natural radioactive decay of uranium and thorium. Like other noble gases (e.g., helium, neon, and argon), radon forms essentially no chemical compounds and tends to exist as a gas or as a dissolved atomic constituent in groundwater. Two isotopes of radon are significant in nature, 222Rn and 220Rn, formed

in the radioactive decay series of 238U and 232Th, respectively. The isotope thoron (i.e. 220Rn) has a half-life (time for decay of half of a given group of atoms) of 55 seconds, barely long enough for it to migrate from its source to the air inside a house and pose a health risk. However, radon (i.e., 222Rn), which has a half-life of 3.8 days, is a widespread hazard.

Figure 4.3.10-1: West Virginia Radon Program Hazard Zones (EPA 2026).

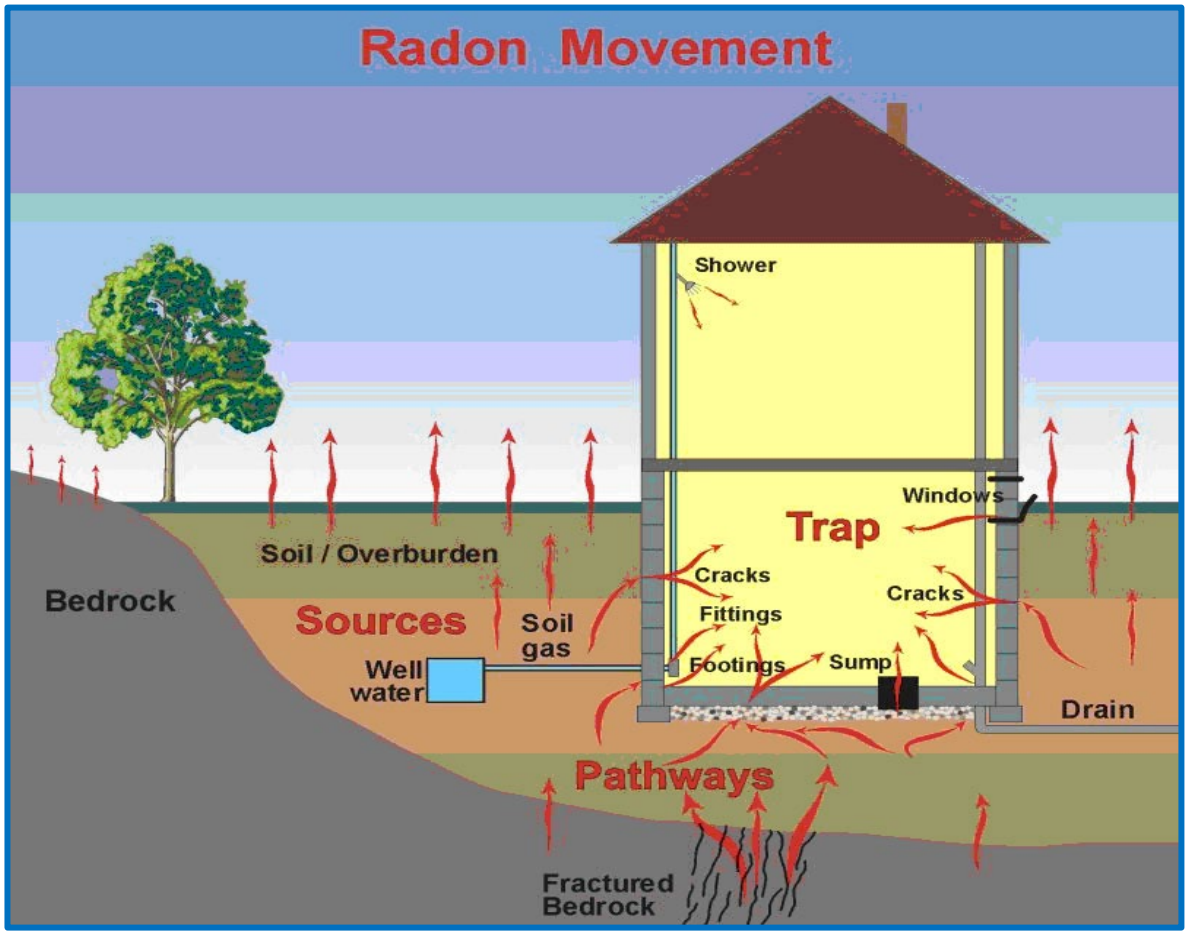


4.3.10.1. Location and Extent

Radon is frequently a hazard to West Virginia residents but can often go unnoticed. As seen in Figure 4.3.10-1, Berkeley and Morgan counties lie in the zone with the highest potential for radon. Homeowners and building managers need to be aware of the danger radon can cause. Three sources of radon in houses are now recognized (shown in Figure 4.3.10-2):

- 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 region; and
- Radon emanating from uranium-rich building materials (e.g. concrete blocks or gypsum wallboard); this is not known to be a problem in West Virginia

Figure 4.3.10-2: Sketch of Radon Entry Points into a House (Arizona Geological Survey, 2006).



High radon levels were initially thought to be exacerbated in houses that are tightly sealed, but it is now recognized that rates of air flow 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 (radon concentration 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.

The radon concentration of soil gas depends upon a number of soil properties, the importance of which is still being evaluated. In general, ten to fifty percent 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 air flow, 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.

Areas where houses have high levels of radon can be divided into three groups in terms of uranium content in rock and soil:

- Areas of very elevated uranium content (>50 ppm) around uranium deposits and prospects. Although very high levels of radon can occur in such areas, the hazard normally is restricted to within a few hundred feet of the deposit. In West Virginia, such localities occupy an insignificant area.

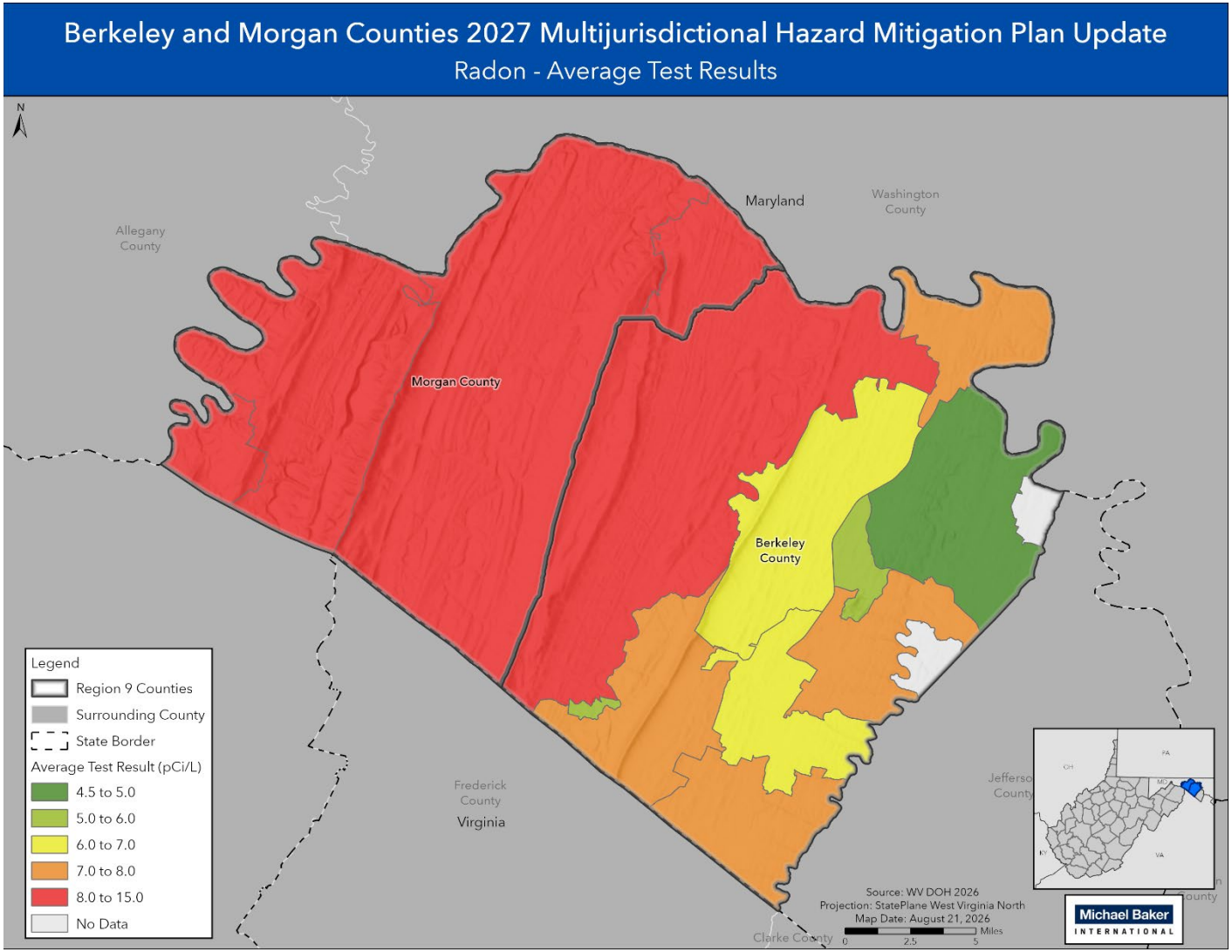
- Areas of common rocks having higher than average uranium content (5 to 50 ppm). In West Virginia, such rock types include granitic and felsic alkali igneous rocks and black shales. In the Reading Prong, high uranium values in rock or soil and high radon levels in houses are associated with Precambrian granitic gneisses commonly containing 10 to 20 ppm uranium, but locally containing more than 500 ppm uranium. In West Virginia, elevated uranium occurs in black shales of the Devonian Marcellus Formation and possibly the Ordovician Martinsburg Formation. High radon values are locally present in areas underlain by these formations.

- Areas of soil or bedrock that have normal uranium content but properties that promote high radon levels in houses. This group is incompletely understood at present. Relatively

high soil permeability can lead to high radon, the clearest example being houses built on glacial eskers. Limestone-dolomite soils also appear to be predisposed for high radon levels in houses, perhaps because of the deep clay-rich residuum in which radium is concentrated by weathering on iron oxide or clay surfaces, coupled with moderate porosity and permeability.

The second factor listed above is most likely the cause of radon levels in the Eastern Panhandle, although high test results may be a result of multiple factors. Figures 4.3.10-3 shows the radon test data available for Berkeley and Morgan counties by zip code. As shown in Figure 4.3.10-3, all of Morgan County and the entire western side of Berkeley County has an average test result of 8.0 to 15 pCi/L, which is much greater than the nationwide average of 1.3 pCi/L..

Figure 4.3.10-3: Average Radon Test Results for Berkeley and Morgan Counties.



4.3.10.2. Range of Magnitude

Exposure to radon is the second leading cause of lung cancer after smoking. It is the number one cause of lung cancer among non-smokers. Radon is responsible for about 21,000 lung cancer deaths every year. Lung cancer is the only known effect on human health from exposure to radon in air and thus far, there is no evidence that children are at greater risk of lung cancer than are adults (CDC, 2026g). The main hazard is from the radon daughter products (218Po, 214Pb, 214Bi), which may become attached to lung tissue and induce lung cancer by their radioactive decay.

According to the EPA, the average radon concentration in the indoor air of homes nationwide is about 1.3 pCi/L. The EPA recommends homes be fixed if the radon level is 4 pCi/L or more. However, because there is no known safe level of exposure to radon, the EPA also recommends that Americans consider fixing their home for radon levels between 2 pCi/L and 4 pCi/L. Table 4.3.10-1 shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action thresholds. As is shown in Table 4.3.10-1, a smoker exposed to radon has a much higher risk of lung cancer.

The worst-case scenario for radon exposure would be that a large area of tightly sealed homes provided residents high levels of exposure over a prolonged period of time without the residents being aware. This worst-case scenario exposure then could lead to a large number of people with cancer attributed to the radon exposure.

Table 4.3.10-1: Radon risk for smokers and non-smokers (EPA, 2026d).

Radon Level (cci/l)	If 1,000 people were exposed to this level over a lifetime…*	Risk of cancer from radon exposure compares to…**	Action Threshold
Smokers			
20	About 260 people could get lung cancer	250 times the risk of drowning	Fix Structure
10	About 150 people could get lung cancer	200 times the risk of dying in a home fire	
8	About 120 people could get lung cancer	30 times the risk of dying in a fall	
4	About 62 people could get lung cancer	5 times the risk of dying in a car crash	
2	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L

Table 4.3.10-1: Radon risk for smokers and non-smokers (EPA, 2026d).			
Radon Level (cci/l)	**If 1,000 people were exposed to this level over a lifetime…***	**Risk of cancer from radon exposure compares to…****	**Action Threshold**
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
Non-Smokers			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix Structure
10	About 18 people could get lung cancer	20 times the risk of dying in a home fire	
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	
NOTE: Risk may be lower for former smokers. ** Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).* *** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.*			

The potential impacts of radon exposure community lifelines are as follows:

Table 4.3.10-2: Most Likely Lifelines Impacted by Radon Exposure.	
Lifelines	**Notes**
	Direct exposure to radon can pose serious health risks and impact the safety of the community.
	Shelters may be at risk if exposed to radon.
	Exposure will increase the chances of lung cancer-causing potential increase in the number of services and resources needed if communities develop more instances of cancer.

4.3.10.3. Past Occurrence

The EPA 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 is much higher than that for the Eastern Panhandle. Data for this update was provided by West Virginia Department of Health. The average radon test results were provided by ZIP code. Communities are also listed by ZIP code if they intersect any portion the ZIP code area.

Table 4.3.10-3: Average Radon Test Results by ZIP Code (WV DOH, 2026).			
ZIP Code	**Community**	**Average Radon Test Score (pCi/L)**	**Housing Units Built Before 1960**
25401	Berkeley County Unincorporated Areas	5.6	4,152
	Martinsburg		
25403	Berkeley County Unincorporated Areas	6.6	478
	Martinsburg		
25404	Berkeley County Unincorporated Areas	4.7	2,275
	Martinsburg		
25405	Berkeley County Unincorporated Areas	7.1	478
	Martinsburg		
25411	Bath	13.9	1,062

Table 4.3.10-3: Average Radon Test Results by ZIP Code (WV DOH, 2026).			
ZIP Code	**Community**	**Average Radon Test Score (pCi/L)**	**Housing Units Built Before 1960**
	Berkeley County Unincorporated Areas		
	Morgan County Unincorporated Areas		
25413	Berkeley County Unincorporated Areas	7.2	205
25419	Berkeley County Unincorporated Areas	7.3	115
25420	Berkeley County Unincorporated Areas	7.8	244
25421	Berkeley County Unincorporated Areas	5.3	0
25422	Morgan County Unincorporated Areas	8.8	125
25427	Berkeley County Unincorporated Areas	8.4	788
	Hedgesville		
	Morgan County Unincorporated Areas		
25428	Berkeley County Unincorporated Areas	7.0	562
25434	Morgan County Unincorporated Areas	14.3	252
	Paw Paw		

4.3.10.4. Future Occurrence

Radon exposure in Berkeley and Morgan counties remains a probability given present soil, geologic, and geomorphic factors. Future occurrence of high radon level hazards can be considered *unlikely* (less than 1% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Development in areas where previous radon levels have been significantly high will continue to be more susceptible to exposure. However, new incidents of concentrated exposure may occur with future development or deterioration of older structures. Exposure can be limited with proper testing for both past and future development and appropriate mitigation measures.

4.3.10.5. Vulnerability Assessment

Structures in Morgan and Berkeley County, particularly in high vulnerability areas as shown in Figure 4.3.10-3, could be susceptible to moderate levels of radon. Smokers can be up to ten times more vulnerable to lung cancer from high levels of radon depending on the level of radon they are exposed to. Older houses that have crawl spaces or unfinished basements are more vulnerable as well because of the increased exposure to soils which could be releasing higher levels of radon gas. Additionally, houses that rely on wells for their water may face an additional risk, although this type of exposure is low and rare in the region.

Proper testing for radon levels should be completed through the Eastern Panhandle, especially in the areas of higher incidence levels and for vulnerable populations that face the contributing risks described above. This testing will determine the level of vulnerability that residents face in their homes, as well as in their businesses and schools. The WV DHHR Office of Environmental Health Services will provide free radon test kits to residents upon request (WV DHHR, 2026). These can be used to evaluate the radon hazard within a building. A Berkeley County sanitarian demonstrating the use of a radon detection kit can be seen in Figure 4.3.10-4. Based on these results, a licensed radon contractor may need to be contacted to enact a mitigation solution. A radon mitigation fan, installed by a radon mitigation contractor, can be seen in Figure 4.3.10-5. This radon mitigation fan extracts radon from the basement of the building. As seen in Figure 4.3.10-3, areas with the highest level of reported tests were located across much of both counties.

Figure 4.3.10-4: Berkeley County Health Department Sanitarian Demonstrates Use of a Radon Detection Kit (Vincent, 2011)



Figure 4.3.10-5: Radon Mitigation Fan Installed on Commercial Building in Martinsburg (SWAT Environmental, 2015)



Berkeley County has adopted the 2018 International Building Code (IBC) and 2018 International Residential Code (IRC), which is now part of the building

approval process in Berkeley County. An appendix to the IRC includes standards for radon mitigation and Berkeley County has been enforcing these standards for roughly a decade. Additionally, the West Virginia Fire Commission has adopted the IBC and IRC statewide for any jurisdiction that chooses to enforce codes. This includes Morgan County, but the county lacks the administrative and enforcement capacities to implement the IBC and IRC.

Radon exposure has minimal environmental impacts. Due to the relatively short half-life of radon, it tends to only affect living and breathing organisms such as humans or pets which are routinely in contained areas (i.e. basement or house) where the gas is released.

4.3.10.6. *Populations at Risk*

Communities with an aged housing stock are the most likely to be exposed to radon exposure as radon creeps in through poor foundations or ventilation systems. Low-income communities are more likely to have aged housing stock, so proper awareness is essential. Low-income communities may also be at an increased risk as home repairs, testing kits, and mitigation systems are significant financial investments. Additionally, those who live in rural areas, where geological conditions may lead to higher radon levels, are at an increased risk.

4.3.11. Thunderstorm, Lightning Strike



4.3.11.1. *Location and Extent*

The extreme weather conditions can exist during any season in West Virginia and the counties. Thunderstorms, associated with strong winds, heavy precipitation, and lightning strikes can all be hazardous under the right conditions and locations. Strong winds and tornadoes can take down trees, damage structures, tip high profile vehicles, and create high velocity flying debris. Large hail can damage crops, dent vehicles, break windows, and injure or kill livestock, pets, and people. Tornadoes, hail, and flooding may also be related to Thunderstorms but due to the potential threat of these events, they are each discussed in separate risk assessments. Tropical storms and hurricanes are also forms of severe storms discussed in a separate hazard profile.

Thunderstorms are one of the most frequently occurring hazards throughout the region (second only to winter storms). NCEI records reflect the most severe of thunderstorms. Storms, however, are common throughout the spring and summer months (although a thunderstorm can occur in any season) that cause downed trees and power lines. Residents and businesses are likely to incur more damage because of these “smaller” storms as individual houses and vehicles are damaged by fallen limbs and businesses are forced to close due to a lack of electricity.

According to the NOAA NWS, a severe thunderstorm is a thunderstorm that produces winds of at least 58 MPH, and/or hail at least one inch in diameter (NOAA NWS, 2026f). Thunderstorms affect relatively

small areas when compared with hurricanes and winter storms. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe (NOAA NSSL, 2026h). The NWS Forecast Office for Baltimore/Washington is responsible for issuing Severe Thunderstorm Watches and Warnings for Berkeley and Morgan Counties. A Severe Thunderstorm Watch is issued by the NWS when severe thunderstorms are possible in and near the watch area. It does not mean that they will occur. It only means they are possible. A Severe Thunderstorm Warning is issued when severe thunderstorms are occurring or imminent in the warning area (NOAA NWS, 2026e).

Lightning does not constitute a severe thunderstorm; every thunderstorm is accompanied by lightning. Lightning is one of the most dangerous aspects of a thunderstorm and can strike up to 10 miles from the main area of the thunderstorm (NOAA NWS, 2026e). Lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. When the opposite charges build up enough, this insulating capacity of the air breaks down and there is a rapid discharge of electricity known as lightning. The flash of lightning temporarily equalizes the charged regions in the atmosphere until the opposite charges build up again. (NOAA NSSL, 2026g)

According to NOAA's National Environmental Satellite, Data, and Information Service (NESDIS), about 400 people are struck by lightning while working or playing in the U.S. annually. Further, roughly 50 people are killed every year with several hundred more injured, temporarily or permanently (NOAA NESDIS, 2025). Lightning events occur across the entirety of West Virginia. Different areas experience varying event frequencies, but in all cases, the deadliest months for lightning are June through September (NOAA NESDIS, 2025). While the impact of flash events is highly localized, strong storms can result in numerous widespread events over a broad area. In addition, the impacts of an event can be serious or widespread if lightning strikes a particularly significant location, such as a power station or large public venue.

Thunderstorms can also create strong winds – often called "straight-line" winds to differentiate thunderstorm winds from tornadic winds. These winds, which have the potential to cause damage, are caused by an outflow generated by a thunderstorm downdraft (NOAA NSSL, 2026a). A downburst is the general term for all localized strong wind events that are caused by a strong downdraft within a thunderstorm. Downbursts with a diameter of less than 2.5 miles are called microbursts and those with a diameter of 2.5 miles or greater are called macrobursts. Macrobursts are an outward burst of strong wind at or near the surface that occurs when a strong downdraft reaches the surface. Macroburst winds can produce damage similar to a tornado. Alternatively, microbursts are small, concentrated downbursts that produce an outward burst of strong winds at or near the surface. Microbursts last five to 10 minutes and can have maximum windspeeds sometimes exceeding 100 mph. Microbursts can be produced with or without precipitation. A derecho is a series of downbursts

associated with a line of thunderstorms. This type of phenomenon has a wind damage swath that can extend more than 240 miles and contain wind gusts of at least 58 mph (NOAA NSSL, 2026k).

4.3.11.2. Range of Magnitude

Because lightning damage is largely unreported, statistics vary considerably. The insurance industry, however, estimates 6.5% of all property/casualty claims are related to lightning strikes (Credit Union National Association, 2015). While it is difficult to quantify lightning losses, it is estimated that $4-5 billion in damage occurs each year. Likewise, the cost of lightning protection to safeguard critical equipment and facilities from lightning strikes during severe weather is enormous. Lightning strikes can also start wildfires. The worst-case scenario for casualties from a lightning strike is envisioned to occur during a capacity sports game, crowded outdoor festival, or another outdoor event with a dense crowd. While to date there have been few casualties in the United States from direct lightning strikes to dense groups of people or from the mass movement of panicked individuals when lightning threatens, it is important to recognize this potential, albeit extremely low risk, event.

Thunderstorms are a regional hazard and all of Berkeley and Morgan Counties are equally susceptible to severe weather throughout the year. Thunderstorms range in magnitude mostly based on the type of storm and weather types associated with them. These storms have the potential to create large-scale damage in both Counties. Thunderstorms can range from smaller storms lasting an hour or so to a widespread long-lived storm called a derecho as described in Table 4.3.11-1.

Table 4.3.11-1: Thunderstorm Types (NOAA NSSL, 2026i).

Category	Description
Single-Cell	Small, brief, weak storms that grow and die within an hour or so. Driven by heating on a summer afternoon. Produce brief heavy rain and lightning.
Multi-Cell	Common thunderstorms in which new updrafts form along the leading edge of rain-cooled air. Individual cells last 30 to 60 minutes, while the system as a whole may last for many hours. May produce hail, strong winds, brief tornadoes, and/or flooding.
Squall Line	Group of storms arranged in a line, often accompanied by “squalls” of high wind and heavy rain. Tend to pass quickly and are less prone to produce tornadoes than supercells. Can be hundreds of miles long but are typically only 10 or 20 miles wide.
Supercell	Long-lived and highly organized storm feeding off an updraft that is tilted and rotating. This rotating updraft - as large as 10 miles in diameter and up to 50,000 feet tall - can be present as much as 20 to 60 minutes before a tornado forms. Most large and violent tornadoes come from supercells.
Bow Echo	Radar signature of a squall line that “bows out” as winds fall behind the line and circulations develop on either end. A strongly bowed echo may indicate high winds in the middle of the line, where the storms are moving forward most quickly. Brief tornadoes may occur on the leading edge of a bow echo. Often the north side of a bow echo becomes dominant over time, gradually evolving into a comma-shaped storm complex

Table 4.3.11-1: Thunderstorm Types (NOAA NSSL, 2026i).	
Category	**Description**
Mesoscale Convection System (MCS)	A collection of thunderstorms that act as a system. An MCS can spread across an entire state and last more than 12 hours. On radar one of these might appear as a solid line, a broken line, or a cluster of cells.
Mesoscale Convective Complex (MCC)	A particular type of MCS, an MCC is a large, circular, long-lived cluster of showers and thunderstorms identified by satellite. It often emerges out of other storm types during the late-night and early-morning hours. MCCs can cover an entire state.
Mesoscale Convective Vortex (MCV)	A low-pressure center within an MCS that pulls winds into a circling pattern, or vortex. With a core only 30 to 60 miles wide and one to three miles deep, an MCV is often overlooked in standard weather analyses. This orphaned MCV will sometimes then become the seed of the next thunderstorm outbreak.
Derecho	A widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. Although a derecho can produce destruction similar to tornadoes, the damage typically is directed in one direction along a relatively straight swath. The term “straight-line wind damage” is sometimes used to describe derecho damage. If the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length, then the event may be classified as a derecho.

Hail, which often accompanies severe summer storms, can also vary widely. Hail is categorized in relation to other known objects. Most hailstorms include a mix of different sizes. Only the very largest hail stones pose serious risk to people and animals caught in the open. When reporting hail, estimates comparing hail to a known object with definite size are good, but measurements using a ruler, calipers, or a tape measure are best (NOAA NSSL, 2026e).

Other weather conditions may show up alongside severe thunderstorms such as lightning strikes and winds. This can compound the potential risks. As previously mentioned, lightning strikes can cause death and injuries and potentially start wildfires. Winds have the potential to cause damage by bringing down tree limbs and generating widespread power outages. Both strong winds and hail can result in property damage. People living in mobile homes are especially at risk for injury and death due to strong winds. Even anchored mobile homes can be seriously damaged if winds gust over 80 MPH (NOAA NSSL, 2026a). A worst-case scenario could involve thunderstorms leading to car crashes, downed trees, and mass power outages.

The magnitude and impacts of other hazards associated with thunderstorms, such as flooding (Section 4.3.4), hail (Section 4.3.5), wildfires (Section 4.3.12), and windstorm (Section 4.3.13) are addressed in other sections of this document.

The potential impacts of thunderstorms and lightning strikes on community lifelines are as follows:

Table 4.3.11-2: Lifelines Most Likely Impacted by Thunderstorms and Lightning Strikes.	
Lifelines	**Notes**
	A direct strike of lightning can harm or even kill individuals struck. Lightning strikes can also cause wildfires.
	Severe wind can bring down power lines resulting in potentially widespread power outages for people and critical facilities. Lightning strikes may cause significant damage to electrical utilities and cause outages.
	Severe winds can bring down power lines and disrupt communications systems, as can lightning. Disruptions to the communication system make it more difficult for emergency response
	Hail and strong winds can cause serious damage to structures, especially mobile homes causing housing instability. Hail, lightning, and high winds can also result in significant damage to agricultural operations, resulting in economic and food losses for the community.
	Downed lines, trees, and flash floods can completely shut down key transportation corridors, making evacuation difficult if needed. Hail and lightning can directly damage vehicles and airplanes.

4.3.11.3. Past Occurrence

According to Vaisala Xweather, 2025 had a 20% increase in lightning activity from 2024 and reached an eight-year high with 252 million lightning strikes (2025). Even though lightning strike deaths and injuries are rare, they do happen.

Tables 4.3.11-3 and 4.3.11-4 lists information regarding hail, heavy rain, lightning, strong wind, and thunderstorm wind events in Berkeley and Morgan Counties between 1950 and 2026, as reported by NOAA NCEI Storm Events Database. There has been a total of 379 thunderstorm-related events in Berkeley County and 191 in Morgan County within that time frame.

Table 4.3.11-3: Thunderstorm-Related Events in Berkeley County Since 1950 (NOAA NCEI, 2026b)					
Severe Storm Event Type	**Number Of Events**	**Injuries**	**Deaths**	**Property Damages**	**Crop Damages**
Hail	94	0	0	$12,500	$3,000
Heavy Rain	10	0	0	$0	$0
Lightning*	5	0	0	$29,000	$0
Strong Wind	16	0	0	$123,100	$0

Table 4.3.11-3: Thunderstorm-Related Events in Berkeley County Since 1950 (NOAA NCEI, 2026b)					
Severe Storm Event Type	**Number Of Events**	**Injuries**	**Deaths**	**Property Damages**	**Crop Damages**
Thunderstorm Wind	254	0	0	$986,600	$57,000
Total	379	0	0	$1,151,200	$60,000
**The only lightning events recorded are those that result in in fatality, injury, and/or property and crop damage (NOAA NCEI, 2026c).*					

Table 4.3.11-4: Thunderstorm-Related Events in Morgan County Since 1950 (NOAA NCEI, 2026b)					
Severe Storm Event Type	**Number Of Events**	**Injuries**	**Deaths**	**Property Damages**	**Crop Damages**
Hail	30	0	0	$750,500	$5,000
Heavy Rain	10	0	0	$0	$0
Lightning*	1	0	0	$75,000	$0
Strong Wind	15	0	0	$17,100	$0
Thunderstorm Wind	135	0	1	$1,000,000	$16,000
Total	191	0	1	$1,842,600	$21,000
**The only lightning events recorded are those that result in in fatality, injury, and/or property and crop damage (NOAA NCEI, 2026c).*					

Thunderstorms with heavy downpours can create slick driving conditions and obscure visibility, and in combination with reckless drivers this can lead to fatalities on the road. On June 16, 2016, a reckless driver caused a 15-vehicle crash during a severe thunderstorm on Interstate 81 between Martinsburg and Spring Mills, as seen in Figure 4.3.11-1. The crash killed one person and injured 10 others. The same storm also contributed to a power outage for thousands, dozens of downed trees, and contributed to a couple of other fatal traffic incidents in northern and eastern West Virginia (Jenkins, 2016).

Figure 4.3.11-1: 15-Vehicle Crash on Interstate 81 on June 16, 2016 (Jenkins, 2016)



Figures 4.3.11-2 and 4.3.11-3 display some pictures gathered from a recent thunderstorm event during the HMP update process. On August 27, 2026, between 2 to 5 inches of rain was dropped across central Berkeley County by a slow-moving thunderstorm system. As a result, severe flash flooding occurred causing school closures (WVNews, 2026b). Section 4.3.4.3 shows the flash flooding throughout the City of Martinsburg.

Figure 4.3.11-2: Tree Damage on Burke Street in Martinsburg City, Berkeley County (August 2026).



Figure 4.3.11-3: Hail on Porter Avenue during the Thunderstorm in Martinsburg City, Berkeley County (August 2026).



4.3.11.4. Future Occurrence

There was a total of 379 thunderstorm-related events in Berkeley County and 191 in Morgan County since 1950. According to the FEMA, current models and studies suggest that while the total number of severe summer storms like thunderstorms may not necessarily increase globally, the intensity of individual storms could rise (FEMA, 2026d). This means that while the number of severe storms in these counties may not increase substantially, increasing their likelihood, the risk associated with these storms will increase alongside their intensity. As global average temperatures continue to rise, associated widespread changes in weather patterns will occur. Extreme weather such as heat waves or large storms are projected to not only become more frequent, but also more intense with human induced climate change (NASA, 2024a). Several people noted more extreme and frequent storms have been occurring throughout both Counties in the past few years on the hazard survey.

The future occurrence of lightning and thunderstorm activity in Berkeley and Morgan counties is anticipated, and the susceptibility to damage from these severe storms has the potential to increase with the increase in intensity of storms. The number of lightning events is influenced by the frequency of a severe thunderstorm occurrence. Therefore, potential future changes in climate and weather conditions may impact the future occurrences of lightning strike. However, the future occurrence of lightning activity is not forecasted, as lightning strikes are frequent and widespread and forecasters' understanding of the cloud electrification process is incomplete (NOAA NSSL, 2026f). The probability

of thunderstorms and lightning strike events in the region is considered *likely* (between 50% & 90% annual probability) according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.11.5. Vulnerability Assessment

The potential for thunderstorms and lightning strikes always exists and will always exist for all areas of Berkeley and Morgan Counties. However, the impact of a severe storm on life, health, and safety is dependent upon several factors including the severity of the event and whether adequate warning time was provided to residents. The high winds of a severe storm can often result in power outages, disruptions to transportation corridors and equipment, loss of workplace access, significant property damage, injuries and loss of life, and the need to shelter and care for individuals impacted by the events. During these events, trees, branches and other objects can cause a large amount of damage especially if they fall onto power lines, buildings, roads, vehicles, and in some cases, people. Utility interruptions can compound the negative effects of storms.

As identified in Table 4.3.11-2, forests, electrical utilities and communications infrastructure may be more at risk from lightning strikes due to the cascading impacts of wildfire, urban fire and utility interruption. There are several electrical/energy/communications community lifelines throughout the two counties, including AC&T, City of Martinsburg – Utilities, and Roach Energy. For a complete list of critical facilities, please see Appendix E.

Most of the land cover in Berkeley and Morgan Counties today is dominated by forest and agriculture (see Figure 2.4-1 of the Community Profile). A lightning strike could spark fire to forests or crops when conditions are favorable anywhere in the counties. As noted in the wildfire section, there are several areas of each county that contain large patches of moderate to high wildfire risk. These areas should be considered higher risk for lightning strikes due to the higher potential for a wildfire to occur.

Losses due to lightning can be lessened by installing surge protection on critical electronic, lightning, or information technology systems. Lightning protection devices and methods, such as lightning rods and grounding, can be installed on a community's communications infrastructure and other critical facilities to reduce losses.

Table 4.3.11-5 displays the expected annual losses to lightning strikes by census tract.

Table 4.3.11-5: Expected Annual Losses to Lightning by Census Tract (FEMA NRI, 2026e).

Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$20,124.57	Relatively Moderate
54003971402	Martinsburg City	$19,389.33	Relatively Moderate
54003971500	Martinsburg City	$12,511.68	Relatively Moderate
54003971600	Martinsburg City	$16,145.29	Relatively Moderate
54003971700	Martinsburg City	$18,094.19	Relatively Moderate

Table 4.3.11-5: Expected Annual Losses to Lightning by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses ($)**	**Expected Annual Loss Rating**
54003971901	Martinsburg City	$20,427.07	Relatively Moderate
54003971902	Martinsburg City	$15,744.91	Relatively Moderate
54003972002	Martinsburg City	$12,239.06	Relatively Moderate
54065970900	Paw Paw Town	$6,915.80	Relatively Low
54065970800	Bath (Berkeley Springs) Town	$10,326.98	Relatively Low
54003971205	Hedgesville Town	$14,761.16	Relatively Moderate

4.3.11.6. Populations at Risk

Socially vulnerable populations are most susceptible to severe weather events, based on several factors: their physical ability to react or respond during a hazard; available financial resources to evacuate and/or recover; and the location and construction of their housing. Vulnerable populations include homeless persons, the elderly (over 65 years old), low income or linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. The population over the age of 65 is also more vulnerable and, physically, they may have more difficulty evacuating. They may require extra time or outside assistance during evacuations and are more likely to seek or need medical attention, which may not be available due to isolation during a storm event. Morgan County has a high concentration of residents over the age of 65.

Additionally, people who are located outdoors, either short-term while recreating or for their jobs, are considered most vulnerable to severe thunderstorm events like hail and lightning strikes. The lack of warning and shelter can leave them exposed to these events. Adequate awareness and storm warning systems may be needed.

4.3.12. Wildfire

4.3.12.1. Location and Extent



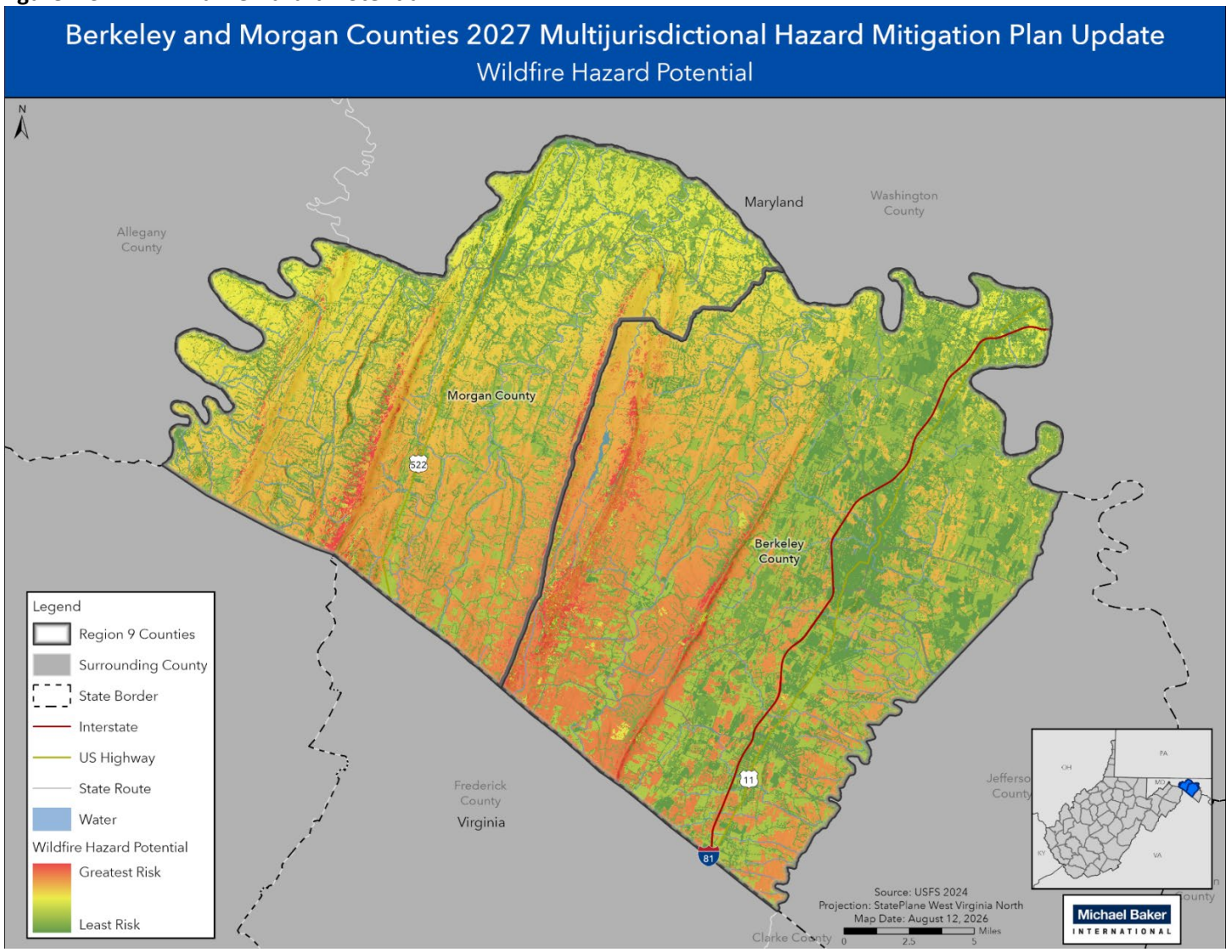
A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke clouds. A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines, and similar facilities. An urban-wildland interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Wildland fires are most common in the spring (March to May) and fall (October to November) months. During spring months, the lack of leaves on the trees allows the sunlight to heat the existing leaves on the ground from the previous fall. The same theory applies for the fall; however, the dryer conditions are a more crucial factor.

Wildfire events can occur at any time of the year but are most likely to occur in the region during a drought. Wildland fires in West Virginia can occur in fields, grass, and brush as well as in the forest itself. Under dry conditions or drought, wildfires have the potential to burn forests as well as croplands. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildland fires are caused by human carelessness, negligence, and ignorance. They are usually signaled by dense smoke that fills the area for miles around. The size of a wildfire is contingent on the amount of fuel available, weather conditions, and wind speed and direction. The United States Forest Service tracks and maps fire hazard daily as seen in Figure 4.3.12-1.

Morgan County is generally more rural in nature than Berkeley County, consisting of large tracts of agricultural, undeveloped, and forested lands. As seen in Figure 4.3.12-1 below, Morgan County mostly consists of high risk (reddish/orange) areas with the fringe of the county containing less risk. As for Berkeley County, the highest risk areas are considered the western half of the county. The forest-urban interface areas carry the most potential for wildfire to spread to structures.

Figure 4.3.12-1: Wildfire Hazard Potential.



4.3.12.2. Range of Magnitude

Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate regional or national firefighting support. The impact of a severe wildfire can be devastating. While some fires are not human-caused and are part of natural succession processes, a wildfire can kill people, livestock, fish, and wildlife. They often destroy property, valuable timber, forage, and recreational and scenic values.

Vegetation loss is often an environmental concern with wildfires, but natural re-growth occurs with time. The most significant environmental impact is the potential for severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event.

Wildfires also have a positive environmental impact in that they burn dead trees, leaves, and grasses to allow more open spaces for new and different types of vegetation to grow and receive sunlight. Another positive effect of a wildfire is that it stimulates the growth of new shoots on trees and shrubs, and a fire's heat can open pinecones and other seed pods.

In addition to the risk wildfires post to the public and property owners, the safety of firefighters is also a concern. Although loss of life among firefighters does not occur often in West Virginia, it is always a risk. More common firefighting injuries include falls, sprains, abrasions, or heat-related injuries such as dehydration. Response to wildfires also exposes emergency responders to the risk of motor vehicle incidents and can place them in remote acres away from the communities that they are chartered to protect.

One of the largest wildfires in West Virginia during the last 40 years occurred in the fall of 1987. A 19,560-acre wildfire blazed through Raleigh County, while another forest fire burned 15,192 acres in Boone County. The 1987 fire season proved to be the state's second worst year on record for forest fires, with more than 416,687 acres damaged (Steelhammer, 2013).

Table 4.3.12-1: Most Likely Lifelines Impacted by Wildfires.

Lifelines	Notes
	Fire departments will need to respond and possibly recover where community safety is threatened. Potential serious injuries and fatalities may occur to people, firefighters and other first responders, and animals.
	Wildfires directly threaten homes and potentially agricultural operations. Wildfires can damage or destroy buildings, crops, and agricultural equipment depending on severity. Economic and food losses could occur to the community.

4.3.12.3. Past Occurrence

The U.S. Fire Administration (USFA) collects data from a variety of sources to provide a statistical analysis of fire incidents nationwide. According to the USFA, the number of fires and fire related injuries has continued to decline over the last several years. However, the number of fire related casualties and the economic losses from wildfire events have both begun to increase again. From 2008 to 2017, fires per million population declined 12.3 percent and injuries per million population declined 21.2 percent. However, in this same time frame, deaths per million population increased 2.4 percent and dollar loss per capita increased 11.9 percent (USFA, 2019).

A 2019 study by the USFA showed the largest number of fires were classified as "outside/other" and accounted for 45 percent of all fires, while residential fires resulted in the highest percentage of fire deaths (80 percent), fire injuries (84 percent), and dollar loss (83 percent). Nonresidential properties, such as industrial and commercial establishments, institutions, and educational facilities, accounted for only 9 percent of all fires, but 29 percent of total dollar loss (NFPA, 2020).

Figure 4.3.12-2: Firefighters battling brush fire on Roberts Road in Great Cacapon (The Morgan Messenger, 2020).



No major wildfires have been identified in the Eastern Panhandle, but this does not mean that vegetation fires do not occur frequently. Representatives from local fire departments throughout the region confirm that brush fires, ranging in size from a single acre to hundreds of acres occur each year. Many of these fires are extinguished before becoming a major problem. Additionally, most of these events occur in rural areas rather than in areas of urban-wildland interface.

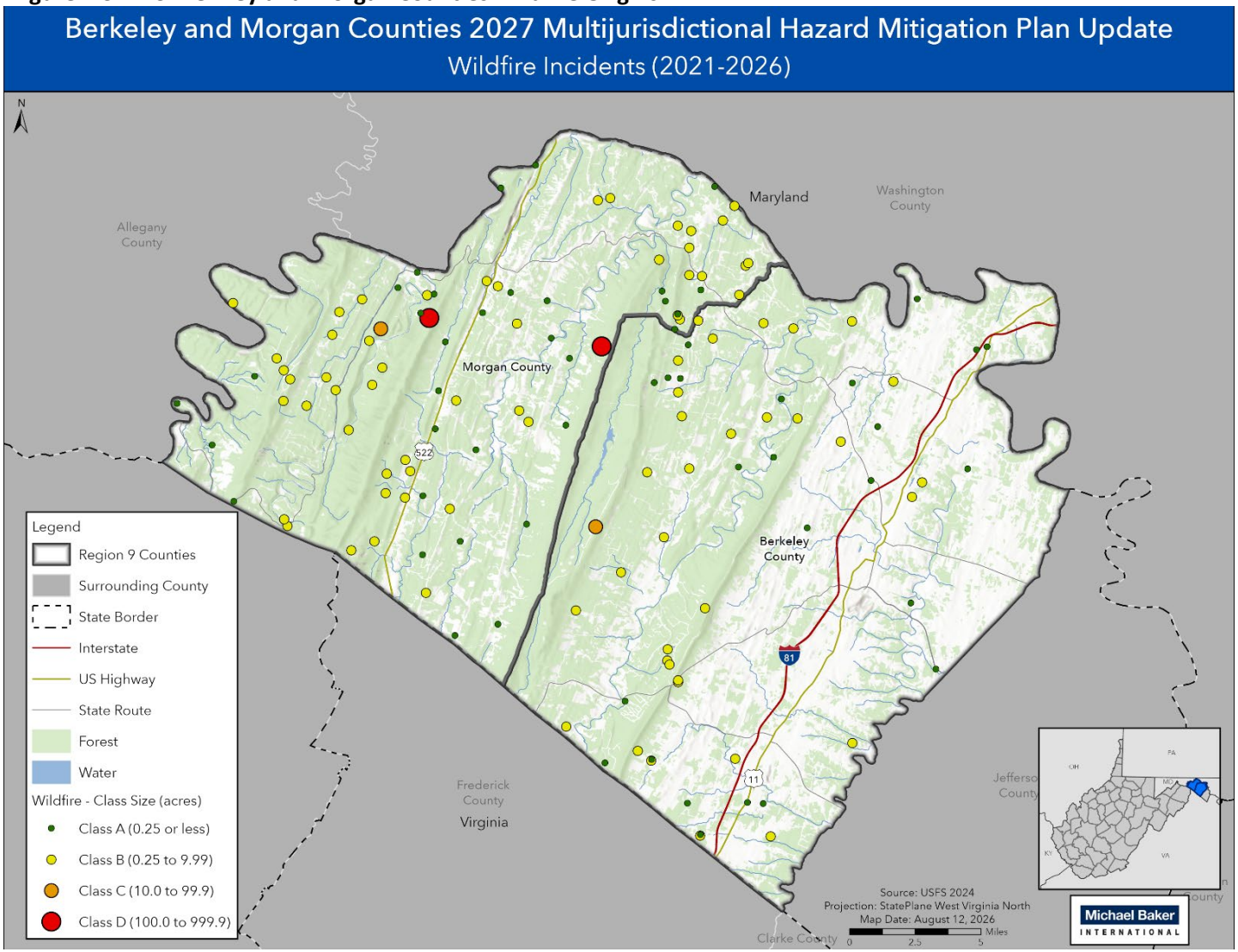
Between January 1, 2021, and July 30, 2026, the National Interagency Fire Center (NIFC) reported 141 wildfires and about 411 acres burned. Figure 4.3.12-3 displays wildfire origins in both counties between the years 2021 and 2026 as reported by the NIFC. The NIFC tracks fire locations and total acres burned.

There have been recent wildfires and brush fires in Berkeley and Morgan counties that have been significant enough to cause damage to acres of fields and forests. In February 2020, firefighters responded to multiple large brush fires that occurred in Berkeley Springs and Great Cacapon. Units that responded to the River Road brush fires were Berkeley Springs, Great Cacapon, South Morgan, Hancock, Hedgesville, Orleans and Reynolds Store Volunteer Fire Companies and Washington County Emergency Rehab Unit 255. Also responding were the West Virginia State Police, the Morgan County

Sheriff's Department, the West Virginia Division of Highways, the West Virginia Division of Forestry, and the West Virginia Division of Natural Resources Police (Evans, 2020). A photo of the incident can be seen in Figure 4.3.12-2.

On March 8, 2021, a large brush fire broke out in the area of Featherbed Lane in Morgan County. The fire spread about eight acres before firefighters were able to tame the flames. No people, animals, or structures were harmed by the fire (Davis, 2021). Most recently, a brush fire caused by a downed power line burned approximately three acres in Cacapon State Park on December 30, 2025. The incident was reported in January 2026 and involved crews from Morgan County, neighboring jurisdictions, and the West Virginia Division of Forestry. The fire was contained the same day and did not threaten structures (WVMetroNews, 2025). Figure 4.3.12-3 depicts fire occurrences across Berkeley and Morgan Counties for the years 2021-2026 as recorded by the USFS.

Figure 4.3.12-3: Berkley and Morgan Counties Wildfire Origins



4.3.12.4. Future Occurrence

Previous events indicate that annual wildfire occurrences in the region are expected. In some cases, an increase in wildfires or acreage burned follows significant drought. Droughts in 1987, 1991 and 1999 had that effect. There were effects of drought visible during the 2001 fire season when 94,233 acres burned, the largest number of acres consumed since 2000. Many wildfires in Berkeley and Morgan counties are also the result of human-caused ignitions. Any fire, without the quick response or attention of fire-fighters, forestry personnel, and/or the public, has the potential to become a wildfire. Morgan County will likely face more wildfires because of its rural nature. Therefore, the probability of a wildfire occurring in Berkeley and Morgan counties is considered *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.12.5. Vulnerability Assessment

Based on the wildfire history of the area, Berkeley and Morgan Counties appear to have a low vulnerability to severe wildfire. However, Figure 4.3.12-1 shows that both counties have a relatively high risk for future wildfires. Specifically, across the southern half of Morgan County and western portion of Berkeley County. The wildfire hazard was defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography, and local weather. These conditions are constantly changing, so the region's vulnerability will fluctuate over time.

The WV Statewide 2023 HMP analysis for wildfire found that historic wildfire property damage in Berkeley County to be between $10,000 - $50,000, and Morgan County to be $150,000+. Morgan County is included in the counties with highest historical property damages (WV Statewide HMP, 2023).

In locations where homes are at risk for wildfires, the BOF's Wildland/Urban Interface Guidance Document is available to assist homeowners, community associations, local government, and developers to assess and mitigate the potential dangers of a wildfire. The guidance also provides information for developing an action plan in coordination with local emergency managers. Communities at risk for wildfires can adopt by local ordinance the "International Wildland-Urban Interface Code" of the Uniform Construction Code.

Table 4.3.12-2 lists the total addressable structures, population, and critical facilities by jurisdiction located within the wildfire risk area. As indicated in the table, the Towns of Bath, Hedgesville, and Paw Paw have no structures, population, or critical facilities within the wildfire risk area. The unincorporated areas of Berkeley and Morgan Counties have the highest vulnerability for structures and population within wildfire risk areas.

Table 4.3.12-2: Community Wildfire Vulnerability for Berkeley and Morgan Counties.									
Jurisdiction	Total Structures	Total Structures in Wildfire Risk Area	Percent of Structures in Wildfire Risk Area	Total Population	Population in Wildfire Risk Area	Percent of Population in Wildfire Risk Area	Total Critical Facilities	Critical Facilities in Wildfire Risk Area	Percent of Critical Facilities in Wildfire Risk Area
Bath	504	0	0.0%	753	0	0.0%	3	0	0.0%
Berkeley Unincorporated	104,115	7,018	6.7%	102,999	9,994	9.7%	52	0	0.0%
Hedgesville	276	0	0.0%	300	0	0.0%	0	0	0.0%
Martinsburg	10,342	18	0.2%	18,777	0	0.0%	16	0	0.0%
Morgan Unincorporated	22,977	766	3.3%	15,900	884	5.6%	11	0	0.0%
Paw Paw	481	0	0.0%	410	0	0.0%	4	0	0.0%

Table 4.3.12-3 below shows the expected annual losses to wildfires by census tract.

Table 4.3.12-3: Expected Annual Losses to Wildfires by Census Tract (FEMA NRI, 2026e).			
Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$203.96	Very Low
54003971402	Martinsburg City	$38.74	Very Low
54003971500	Martinsburg City	$99.17	Very Low
54003971600	Martinsburg City	$29.18	Very Low
54003971700	Martinsburg City	$53.26	Very Low
54003971901	Martinsburg City	$2,437.19	Relatively Low
54003971902	Martinsburg City	$245.27	Very Low
54003972002	Martinsburg City	$26.83	Very Low
54065970900	Paw Paw Town	$598.92	Very Low
54065970800	Bath (Berkeley Springs) Town	$536.85	Very Low
54003971205	Hedgesville Town	$228.41	Very Low

4.3.12.6. Populations at Risk

Communities in rural areas are more susceptible to wildfires than their urban counterparts due to

potential proximity to large fire-prone wooded areas. These areas may have limited evacuation routes, increasing the risk for residents in the path of wildfire. Additionally, households with people with disabilities, specifically related to lung or respiratory issues, are going to be at an increased risk of harm, and county hospitals should be prepared. 25.2% of Morgan County's and 15.3% of Berkeley County's population is disabled.

4.3.13. Windstorm, Tornado

4.3.13.1. Location and Extent



Both tornado and windstorm events can occur throughout Berkeley and Morgan counties. A tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground (NOAA NSSL, 2026j). The impact of tornado or windstorm hazards is ultimately dependent on the population or amount of property (i.e., buildings, infrastructure, agricultural land, etc.) present in the area in which they occur. Tornado events are often so severe that property loss or human fatality is typically inevitable if evacuation or proper construction standards are not implemented.

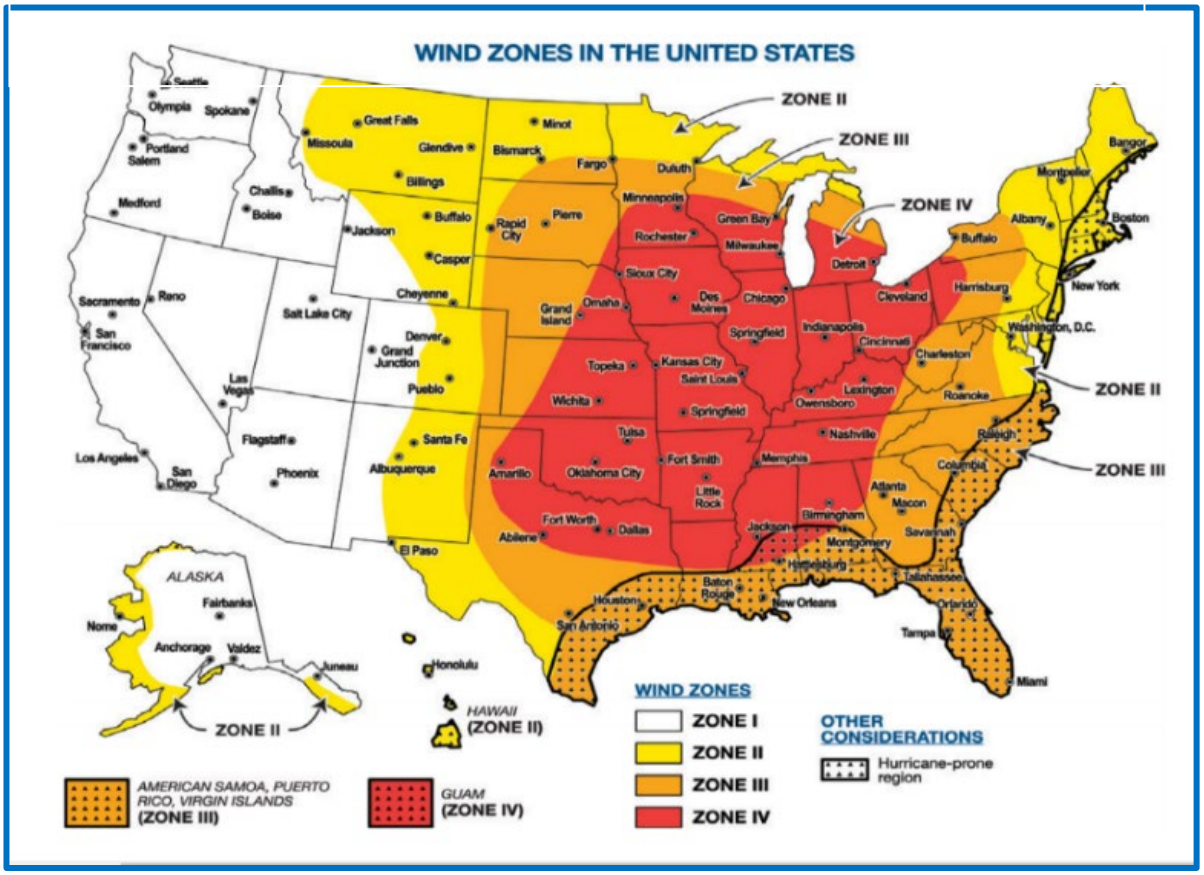
Tornado events are usually localized. However, severe thunderstorms may result in conditions favorable to the formation of numerous or long-lived tornadoes. While tornadoes nationally occur at any time during the day or night or any month of the year, they are most frequent during late afternoon into early evening, the warmest hours of the day, and most likely to occur during the spring and summer months (NOAA NSSL, 2026d).

Tornado movement is characterized in two ways: direction and speed of spinning winds and forward movement of the tornado, also known as the storm track. The typical tornado damage path is about one or two miles, with a width of around 50 yards (NOAA NWS, 2026). Movement can range from almost stationary to more than 60 mph. A typical tornado travels at around 10–20 miles per hour (NOAA NSSL, 2026c). The largest tornado path widths can exceed one mile, while the smallest widths can be less than 10 yards. Widths can even vary considerably during a single tornado, since its size can change during its lifetime. Path lengths can range from a few yards to more than 100 miles (NOAA NWS, 2026d).

Windstorms are generally defined with sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration. Straight-line winds and windstorms are different from tornadoes in that they don't involve any rotation. Straight-line winds, also called damaging winds, are classified as those exceeding 50-60 mph (NOAA NSSL, 2026a). They are experienced on a region-wide scale. They may accompany tornadoes and thunderstorms as most straight-lined winds are a result of outflow generated by a thunderstorm downdraft. Wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles (NOAA NSSL, 2026d).

Figure 4.3.13-1 shows the wind speed zones developed by the American Society of Civil Engineers based on tornado and hurricane historical events. These wind speed zones are intended to guide the design and evaluation of the structural integrity of shelters and critical facilities. The whole Eastern Panhandle falls within Zone III, meaning the region is susceptible to winds up to 200 miles per hour. The hurricane susceptibility is discussed in Section 4.3.6.

Figure 4.3.13-1: Wind Zones of the United States (IBEC, 2019)



4.3.13.2. Range of Magnitude

Each year more than 1,200 tornadoes take place in the United States (NOAA, 2026b). From 2010 to 2021, tornadoes caused $14.1 billion in damages, an average of $2.5 million per storm (Hurst, 2021). While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on Earth. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. Tornadic wind speeds can be as high as 300 miles per hour in the most violent tornadoes. Wind speeds this high can cause automobiles to become airborne, rip ordinary homes to shreds, and turn broken glass and other debris into lethal missiles (NOAA NSSL, 2026d). Most years there are far more

damage reports from thunderstorm straight line winds than from tornadoes (NOAA NWS, 2026c).

Damages and deaths can be especially significant when tornadoes move through populated, developed areas. The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction such as mobile homes.

Since 2007, the Enhanced Fujita Scale (or the EF-Scale) has been used in the United States to describe the magnitude of tornadoes. Prior to 2007, the Fujita Scale (F-Scale) was commonly used to describe magnitude. The EF scale is based on new information about the relationship between wind speed, given in miles per hour (mph), and corresponding damage. It categorizes tornadoes from EF0 to EF5, with EF0 being the lowest magnitude, yet most commonly occurring type of tornado. The strongest tornado recorded in Berkeley and/or Morgan County was a category F2. Table 4.3.13-1 shows the relationship between the EF- and F- Scales. The types of damage that can be expected with each category of tornado are described in Table 4.3.13-2.

Table 4.3.13-1: Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds.

This Fujita Scale		Enhance Fujita Scale	
F Number	3-Second Gust (Mph)	EF Number	3-Second Gust (Mph)
0	45-78	0	65-85
1	79-117	1	86-110
2	118-161	2	111-135
3	162-209	3	136-165
4	210-261	4	166-200
5	262-317	5	Over 200

Table 4.3.13-2: Expected Tornado Damages.

F Or EF Scale	Examples Of Possible Damage
0	Light damage. Some damage to chimneys; broken tree branches; shallow-rooted trees pushed over; damage to sign boards.
1	Moderate damage. Roof surface peeled off; mobile homes pushed off foundations or overturned; moving automobiles pushed off roads.
2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.

3	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
4	Devastating damage. Well-constructed houses leveled; structures with weak foundations damaged or destroyed with an expanded debris field; cars overturned and scattered, and miscellaneous debris generated at various velocities and distances.
5	Catastrophic damage. Well-built houses swept away completely, leaving only the slab foundations.

As noted above, Figure 4.3.13-1 shows the wind speed zones based on tornado and hurricane historical events. The whole Eastern Panhandle falls within Zone III, meaning that shelters and critical facilities should be able to withstand a 3-second gust of up to 200 mph, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. Therefore, these structures should be able to withstand the wind speeds experienced in an F3 tornado event.

Since tornado and windstorm events are typically localized, environmental impacts are rarely widespread. However, where these events occur, severe damage to buildings and plant species is likely. This includes loss of trees and an increased threat of wildfire in areas where dead trees are not removed. Hazardous material facilities should meet design requirements to withstand a three-second gust of up to 160 mph in order to prevent release of hazardous materials into the environment.

The worst-case scenario for windstorm and tornado events in Berkeley and Morgan counties would be an EF5 tornado that strikes the Martinsburg area in Berkeley County. This is the most densely developed and populated area in both counties and a severe tornado here could cause maximum property damage and casualties. Most tornadoes only remain on the ground for around 5 minutes and travel a few miles, but some have tornadoes have remained grounded for over an hour and traveled 70 miles. An EF5 tornado can level houses, throw cars, and deform reinforced or high-rise buildings. An event of this severity is exceptionally unlikely to occur and represents an extreme scenario only, but the possibility should be considered. More typical wind hazard events in Berkeley and Morgan counties involve tree and limb damage, with fallen trees and limbs possibly resulting in damage to nearby vehicles or structures.

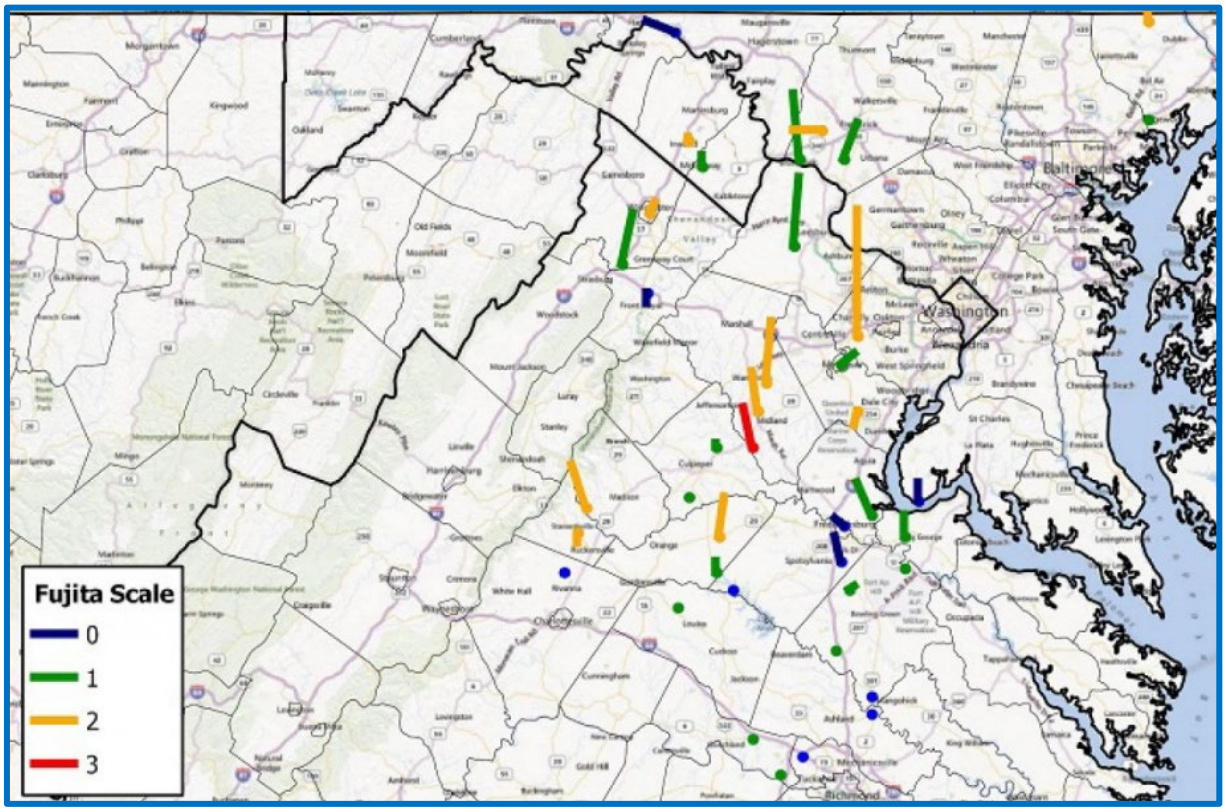
The potential impacts of a tornado or windstorm on community lifelines are as follows:

Table 4.3.12-3: Lifelines Most likely Impacted by Tornadoes or Windstorms.	
Lifelines	**Notes**
	Government officials, including police and fire, will be needed for community safety due to potential harm from tornadoes, high winds, and associated weather conditions. There is the potential for serious injury and death to people and animals from tornadoes and windstorms.
	Tornadoes and windstorms cause significant damage to agricultural operations and structures. Damage to crops could result in significant economic and food losses for the community. Mobile homes and other residential properties could be significantly damaged; people may not be able to reside there anymore causing homelessness.
	Potential direct damage could occur to energy infrastructure from tornadoes and windstorms. People and critical facilities could lose access to electricity due to downed power lines.
	Potential direct damage could occur to hazardous material storage facilities from tornadoes and windstorms. This could result in a hazardous materials release in the county, potentially damaging other infrastructure and endangering people and animals.

4.3.13.3. Past Occurrence

There have been 16 tornado events in Berkeley and Morgan Counties since 1950, as seen in Table 4.3.13-4. They have all occurred between the months of May and September, and 14 out of the 16 tornadoes have been in Berkeley County. The most recent tornado to inflict injuries was a tornado that touched down in Darkesville, spawned by the Hurricane Ivan weather system on September 17, 2004, that injured at least six. This is the most severe documented tornado occurrence in the area was an F2 magnitude. The damage it caused was described in the 2013 WV Statewide HMP, stating that the tornado caused extensive damage to houses and businesses and overturned vehicles on I-81. The path of this tornado can be seen in Figure 4.3.13-2 alongside other tornadoes in the region formed during Hurricane Ivan. Furthermore, Figure 4.3.13-4 displays the historic tornado tracks across Berkeley and Morgan Counties since 1950.

Figure 4.3.13-2: Tornado Tracks of Hurricane Ivan (Prociv, 2004) (NOAA NWS, 2016).



Hurricane Ivan resulted in the most recent severe tornadoes identified in the region. However, a severe windstorm did occur on May 3, 2021. Severe winds swept through the Eastern Panhandle, displacing several families. The National Weather Service confirmed a tornado hit Ranson, WV with peak winds at 90 mph. Emergency Officials reported severe damage in the Ranson area as well as the areas of Bunker Hill and Inwood in neighboring Berkeley County. In Berkeley County, two families were displaced due to damage to mobile homes (McMillion & Greene, 2021).

A more recent thunderstorm wind event on April 19, 2025, resulted in $500,000 in property damage. According to NOAA NCEI, over 100 calls were reported for trees, wires, and poles downed across Morgan County from Berkeley Springs to Great Cacapon. Residents reported shingle and siding damage with a home becoming partially unroofed in Hedgesville. Several trees fell onto homes and cars. The hospital in Berkeley Springs lost power and was blocked off by downed trees (NOAA NCEI, 2026b). A list of other hazardous windstorms from 2000 to May 2026 can be seen in Table 4.3.13-5.

On June 29, 2012, a type of violent wind storm system, called a derecho, moved eastward impacting Indiana, Ohio, West Virginia, Virginia, Washington DC, Maryland, and part of New Jersey, as seen in Figure 4.3.13-3. The storm carried thunder and wind gusts ranging between 60 and 100 mph. Thirteen people were killed, three in West Virginia, and widespread power outages across the impacted area

left 1.6 million people without power. Damages from the storm were reported in the Eastern Panhandle. Meteorologists theorize that the derecho event occurred in part thanks to the above average temperatures being experienced across the impacted region, which helped to fuel the storm (Daniel, 2012).

Figure 4.3.13-3: June 29, 2012 Derecho Wind Storm.

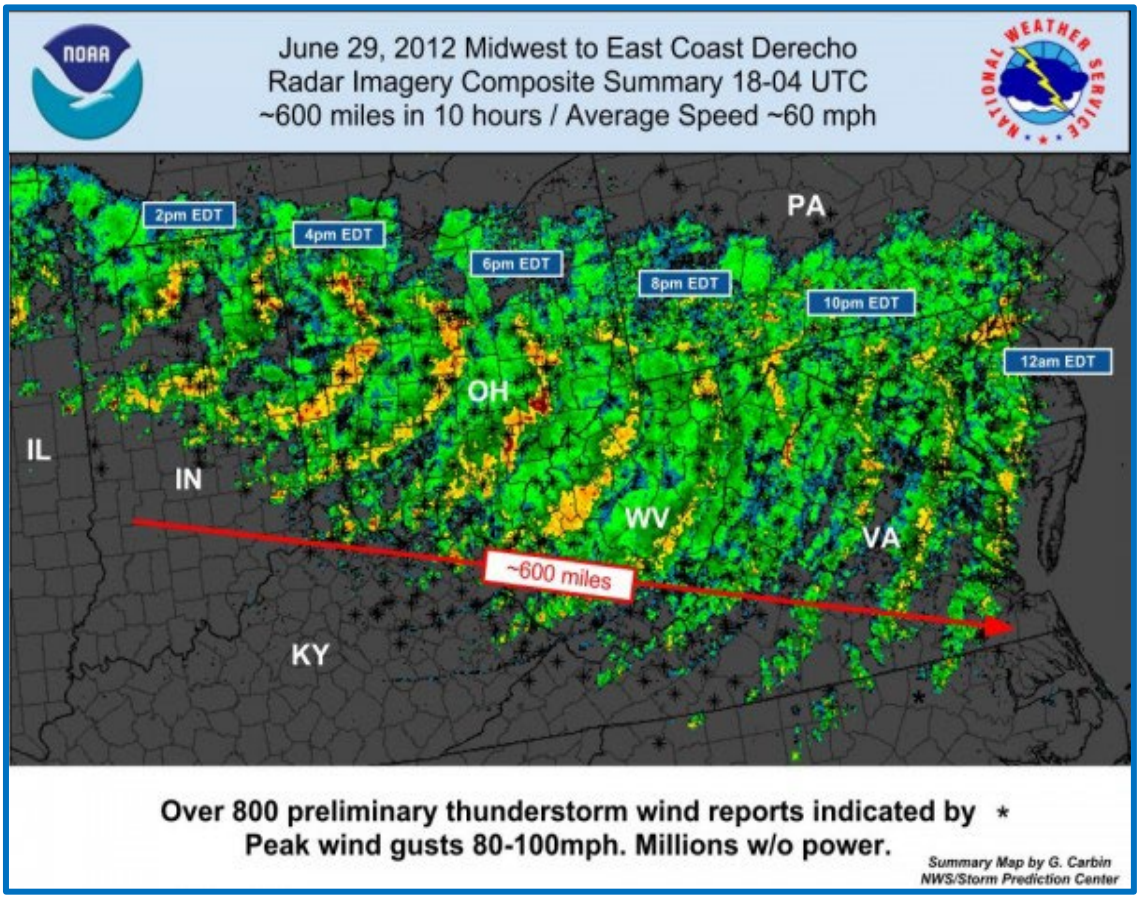


Table 4.3.13-4: Tornado Events in Berkeley and Morgan Counties 1950 – May 2026 (NCEI NOAA, 2026b).

County	Location	Date	Magnitude	Property Damage ($)	Crop Damage ($)	Injuries
Berkeley	N/A	8/16/1954	F1	$0	$0	0
Berkeley	N/A	7/20/1979	F0	$30	$0	0
Berkeley	N/A	10/2/1979	F1	$250,000	$0	1
Berkeley	N/A	8/17/1994	F1	$500,000	$0	0
Morgan	Paw Paw	8/17/1994	F0	$500	$0	0
Berkeley	Ridgeway	6/16/1998	F0	$50,000	$0	0

Berkeley	Martinsburg	6/16/1998	F1	$100,000	$0	0
Berkeley	Bunker Hill	7/30/1998	F1	$80,000	$10,000	0
Berkeley	Arden	5/21/2004	F0	$0	$0	0
Berkeley	Darkesville	9/17/2004	F2	$25,000	$0	6
Morgan	Sleepy Creek	9/17/2004	F0	$25,000	$0	0
Berkeley	Martinsburg	6/8/2014	EF1	$20,000	$10,000	0
Berkeley	Glengary	7/13/2014	EF0	$0	$5,000	0
Berkeley	(Mrb)Shepherd Fld Mr	6/5/2024	EF0	$25,000	$0	0
Berkeley	Bunker Hill	6/5/2024	EF0	$100,000	$0	0
Berkeley	Tomahawk	8/8/2024	EF0	$50,000	$0	0

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).

County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	1/11/2000	High Wind		20,000	Berkeley	7/13/2014	Thunderstorm Wind	52	2,000
Berkeley	1/11/2000	High Wind	50	5,000	Berkeley	7/13/2014	Thunderstorm Wind	52	-
Morgan	1/16/2000	High Wind		20,000	Berkeley	7/13/2014	Thunderstorm Wind	52	-
Morgan	4/8/2000	Thunderstorm Wind		100,000	Berkeley	7/13/2014	Thunderstorm Wind	52	-
Berkeley	5/10/2000	High Wind		2,000	Berkeley	7/13/2014	Thunderstorm Wind	52	2,000
Berkeley	7/28/2000	Thunderstorm Wind		1,000	Berkeley	7/13/2014	Thunderstorm Wind	52	-
Morgan	7/28/2000	Thunderstorm Wind		1,000	Berkeley	7/13/2014	Thunderstorm Wind	52	5,000
Berkeley	11/10/2000	Thunderstorm Wind		2,000	Berkeley	7/13/2014	Thunderstorm Wind	52	5,000
Berkeley	12/12/2000	High Wind	57	-	Berkeley	7/13/2014	Thunderstorm Wind	50	-
Morgan	12/12/2000	Strong Wind		-	Berkeley	7/14/2014	Thunderstorm Wind	52	2,000
Morgan	12/17/2000	Strong Wind		-	Morgan	9/2/2014	Thunderstorm Wind	52	-

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	12/17/2000	Strong Wind		-	Morgan	9/2/2014	Thunderstorm Wind	52	-
Berkeley	1/27/2001	Strong Wind		-	Morgan	9/2/2014	Thunderstorm Wind	52	-
Morgan	1/27/2001	Strong Wind		-	Morgan	9/2/2014	Thunderstorm Wind	52	1,000
Berkeley	2/9/2001	High Wind	50	-	Morgan	9/2/2014	Thunderstorm Wind	52	-
Morgan	2/9/2001	Strong Wind		-	Morgan	9/2/2014	Thunderstorm Wind	52	1,000
Morgan	3/6/2001	Strong Wind		-	Morgan	9/2/2014	Thunderstorm Wind	52	-
Berkeley	3/6/2001	Strong Wind		-	Morgan	9/2/2014	Thunderstorm Wind	52	-
Berkeley	3/13/2001	Thunderstorm Wind	56	-	Morgan	4/20/2015	Thunderstorm Wind	50	-
Berkeley	3/13/2001	Thunderstorm Wind		2,000	Berkeley	5/31/2015	Thunderstorm Wind	50	1,000
Berkeley	3/13/2001	Thunderstorm Wind	72	-	Berkeley	1/12/2016	High Wind	55	-
Berkeley	3/21/2001	Strong Wind		50,000	Berkeley	4/2/2016	High Wind	53	-
Morgan	4/9/2001	Thunderstorm Wind		1,000	Berkeley	4/2/2016	High Wind	50	-
Berkeley	4/9/2001	Thunderstorm Wind		1,000	Berkeley	6/5/2016	Thunderstorm Wind	50	-
Berkeley	6/20/2001	Thunderstorm Wind		25,000	Morgan	6/16/2016	Thunderstorm Wind	50	-
Morgan	2/1/2002	Strong Wind		-	Morgan	6/16/2016	Thunderstorm Wind	50	-
Berkeley	2/1/2002	Strong Wind		-	Morgan	6/21/2016	Thunderstorm Wind	50	-
Morgan	3/9/2002	Strong Wind		-	Berkeley	6/21/2016	Thunderstorm Wind	50	-
Berkeley	3/9/2002	Strong Wind		-	Morgan	6/21/2016	Thunderstorm Wind	50	-
Morgan	3/21/2002	Strong Wind		-	Morgan	6/21/2016	Thunderstorm Wind	50	-
Berkeley	3/21/2002	Strong Wind		-	Berkeley	6/28/2016	Thunderstorm Wind	50	-
Morgan	4/28/2002	Thunderstorm Wind		500	Morgan	7/18/2016	Thunderstorm Wind	50	-
Berkeley	4/28/2002	Thunderstorm Wind		500	Berkeley	7/18/2016	Thunderstorm Wind	50	-
Berkeley	4/28/2002	Thunderstorm Wind		1,000	Morgan	8/13/2016	Thunderstorm Wind	50	-

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	5/13/2002	Thunderstorm Wind		1,000	Morgan	8/16/2016	Thunderstorm Wind	50	-
Berkeley	5/13/2002	Thunderstorm Wind		5,000	Morgan	8/16/2016	Thunderstorm Wind	50	-
Morgan	5/13/2002	Thunderstorm Wind		500	Morgan	9/7/2016	Thunderstorm Wind	50	-
Morgan	5/14/2002	Thunderstorm Wind		20,000	Berkeley	11/20/2016	High Wind	54	-
Berkeley	5/14/2002	Thunderstorm Wind		5,000	Morgan	2/12/2017	High Wind	52	-
Berkeley	5/14/2002	Thunderstorm Wind	54	-	Berkeley	2/12/2017	High Wind	52	-
Berkeley	6/4/2002	Thunderstorm Wind		100	Berkeley	7/22/2017	Thunderstorm Wind	50	-
Berkeley	6/5/2002	Thunderstorm Wind		15,500	Morgan	8/4/2017	Thunderstorm Wind	50	-
Berkeley	6/6/2002	Thunderstorm Wind		7,000	Berkeley	8/4/2017	Thunderstorm Wind	50	-
Morgan	7/9/2002	Thunderstorm Wind		1,000	Morgan	8/12/2017	Thunderstorm Wind	50	-
Berkeley	9/27/2002	Thunderstorm Wind	50	2,000	Morgan	8/12/2017	Thunderstorm Wind	50	-
Morgan	1/8/2003	High Wind	35	-	Morgan	8/12/2017	Thunderstorm Wind	50	-
Berkeley	1/8/2003	High Wind	35	-	Morgan	8/12/2017	Thunderstorm Wind	50	-
Berkeley	2/23/2003	Strong Wind	30	100	Morgan	8/12/2017	Thunderstorm Wind	50	-
Morgan	2/23/2003	Strong Wind	30	100	Morgan	8/12/2017	Thunderstorm Wind	50	-
Berkeley	6/1/2003	Strong Wind	40	1,000	Morgan	8/12/2017	Thunderstorm Wind	50	-
Berkeley	6/30/2003	Thunderstorm Wind	50	2,000	Morgan	9/5/2017	Thunderstorm Wind	50	-
Morgan	8/26/2003	Thunderstorm Wind	50	2,000	Morgan	9/5/2017	Thunderstorm Wind	50	-
Berkeley	8/26/2003	Thunderstorm Wind	55	5,000	Morgan	9/5/2017	Thunderstorm Wind	50	-
Berkeley	9/18/2003	High Wind	50	100,000	Morgan	9/5/2017	Thunderstorm Wind	50	-
Morgan	9/18/2003	High Wind	50	70,000	Morgan	9/5/2017	Thunderstorm Wind	50	-
Morgan	10/15/2003	Strong Wind	44	2,000	Berkeley	9/5/2017	Thunderstorm Wind	50	-

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	10/15/2003	Strong Wind	41	2,000	Berkeley	9/5/2017	Thunderstorm Wind	50	-
Morgan	11/13/2003	Strong Wind	43	5,000	Berkeley	9/5/2017	Thunderstorm Wind	50	-
Berkeley	11/13/2003	Strong Wind	43	5,000	Berkeley	9/5/2017	Thunderstorm Wind	50	-
Berkeley	11/19/2003	Thunderstorm Wind	50	500	Berkeley	9/5/2017	Thunderstorm Wind	50	-
Berkeley	5/14/2004	Thunderstorm Wind	55	5,000	Berkeley	9/5/2017	Thunderstorm Wind	58	-
Berkeley	5/15/2004	Thunderstorm Wind	57	5,000	Berkeley	3/2/2018	High Wind	50	-
Berkeley	5/18/2004	Thunderstorm Wind	50	2,000	Morgan	3/2/2018	High Wind	55	-
Morgan	5/18/2004	Thunderstorm Wind	50	1,500	Morgan	5/14/2018	Thunderstorm Wind	50	-
Morgan	5/21/2004	Thunderstorm Wind	55	3,000	Berkeley	5/31/2018	Thunderstorm Wind	52	-
Berkeley	5/21/2004	Thunderstorm Wind	55	2,000	Berkeley	5/31/2018	Thunderstorm Wind	50	-
Berkeley	5/25/2004	Thunderstorm Wind	60	5,000	Morgan	6/20/2018	Thunderstorm Wind	50	-
Morgan	6/1/2004	Thunderstorm Wind	55	-	Berkeley	6/20/2018	Thunderstorm Wind	50	-
Berkeley	6/1/2004	Thunderstorm Wind	55	2,000	Berkeley	6/20/2018	Thunderstorm Wind	50	-
Morgan	8/4/2004	Thunderstorm Wind	50	-	Berkeley	6/20/2018	Thunderstorm Wind	50	-
Berkeley	12/1/2004	High Wind	50	-	Morgan	7/2/2018	Thunderstorm Wind	50	-
Morgan	12/1/2004	High Wind	50	-	Berkeley	8/17/2018	Thunderstorm Wind	54	-
Morgan	4/3/2005	High Wind	50	-	Berkeley	8/17/2018	Thunderstorm Wind	54	-
Berkeley	6/22/2005	Thunderstorm Wind	50	-	Morgan	8/21/2018	Thunderstorm Wind	50	-
Berkeley	7/27/2005	Thunderstorm Wind	50	-	Morgan	8/21/2018	Thunderstorm Wind	50	-
Berkeley	8/7/2005	Thunderstorm Wind	50	3,000	Berkeley	8/21/2018	Thunderstorm Wind	50	-
Berkeley	1/14/2006	High Wind	50	100,000	Morgan	2/24/2019	High Wind	52	-
Morgan	1/14/2006	High Wind	50	80,000	Berkeley	2/24/2019	High Wind	57	-
Morgan	7/18/2006	Thunderstorm Wind	50	13,000	Berkeley	6/27/2019	Thunderstorm Wind	53	-

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	7/18/2006	Thunderstorm Wind	50	10,000	Berkeley	6/27/2019	Thunderstorm Wind	50	-
Berkeley	7/20/2006	Thunderstorm Wind	55	75,000	Morgan	6/29/2019	Thunderstorm Wind	50	-
Berkeley	7/27/2006	Thunderstorm Wind	50	70,000	Berkeley	6/29/2019	Thunderstorm Wind	50	-
Berkeley	8/26/2006	Thunderstorm Wind	50	15,000	Berkeley	6/29/2019	Thunderstorm Wind	50	-
Morgan	9/28/2006	Thunderstorm Wind	60	85,000	Berkeley	8/18/2019	Thunderstorm Wind	61	-
Berkeley	10/28/2006	Strong Wind	42	20,000	Morgan	10/31/2019	Thunderstorm Wind	52	-
Berkeley	2/22/2007	Strong Wind	45	5,000	Berkeley	11/27/2019	High Wind	50	-
Morgan	2/22/2007	Strong Wind	45	2,000	Morgan	11/27/2019	High Wind	52	-
Morgan	6/1/2007	Thunderstorm Wind	50	2,000	Morgan	3/3/2020	Thunderstorm Wind	52	-
Morgan	6/12/2007	Thunderstorm Wind	50	-	Morgan	3/3/2020	Thunderstorm Wind	52	-
Morgan	6/13/2007	Thunderstorm Wind	50	1,000	Berkeley	3/3/2020	Thunderstorm Wind	52	2,000
Berkeley	6/13/2007	Thunderstorm Wind	50	5,000	Morgan	4/7/2020	Thunderstorm Wind	54	-
Morgan	6/21/2007	Thunderstorm Wind	50	1,000	Berkeley	4/13/2020	Thunderstorm Wind	50	1,000
Berkeley	8/16/2007	Thunderstorm Wind	50	-	Berkeley	4/13/2020	Thunderstorm Wind	50	-
Berkeley	9/26/2007	Thunderstorm Wind	50	1,000	Berkeley	4/13/2020	Thunderstorm Wind	55	1,000
Morgan	9/27/2007	Thunderstorm Wind	50	5,000	Berkeley	4/13/2020	Thunderstorm Wind	50	-
Berkeley	9/27/2007	Thunderstorm Wind	50	2,000	Morgan	6/4/2020	Thunderstorm Wind	50	2,000
Berkeley	9/27/2007	Thunderstorm Wind	50	-	Morgan	6/4/2020	Thunderstorm Wind	50	5,000
Berkeley	9/27/2007	Thunderstorm Wind	50	2,000	Berkeley	6/4/2020	Thunderstorm Wind	50	20,000
Berkeley	12/16/2007	High Wind	51	-	Morgan	6/10/2020	Thunderstorm Wind	50	2,500
Morgan	12/16/2007	High Wind	50	5,000	Morgan	6/22/2020	Thunderstorm Wind	50	3,000
Berkeley	1/30/2008	High Wind	50	-	Berkeley	6/23/2020	Thunderstorm Wind	50	3,000
Berkeley	2/6/2008	Thunderstorm Wind	50	1,000	Berkeley	6/25/2020	Thunderstorm Wind	50	5,000

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Morgan	2/10/2008	High Wind	50	10,000	Morgan	7/21/2020	Thunderstorm Wind	50	2,000
Berkeley	2/10/2008	High Wind	50	-	Morgan	8/1/2020	Thunderstorm Wind	50	3,000
Berkeley	6/4/2008	Thunderstorm Wind	50	25,000	Morgan	8/1/2020	Thunderstorm Wind	55	100,000
Berkeley	6/4/2008	Thunderstorm Wind	50	10,000	Morgan	8/1/2020	Thunderstorm Wind	55	10,000
Berkeley	6/4/2008	Thunderstorm Wind	50	6,000	Morgan	8/25/2020	Thunderstorm Wind	50	1,000
Berkeley	6/4/2008	Thunderstorm Wind	60	5,000	Morgan	8/25/2020	Thunderstorm Wind	50	1,000
Berkeley	6/28/2008	Thunderstorm Wind	59	-	Morgan	8/25/2020	Thunderstorm Wind	50	1,000
Berkeley	6/28/2008	Thunderstorm Wind	56	-	Berkeley	8/28/2020	Thunderstorm Wind	50	2,000
Berkeley	6/28/2008	Thunderstorm Wind	50	5,000	Berkeley	11/15/2020	Thunderstorm Wind	55	10,000
Berkeley	6/28/2008	Thunderstorm Wind	50	15,000	Morgan	11/15/2020	Thunderstorm Wind	50	15,000
Morgan	2/12/2009	High Wind	56	-	Berkeley	5/3/2021	Thunderstorm Wind	50	2,000
Morgan	2/12/2009	High Wind	62	-	Berkeley	5/26/2021	Thunderstorm Wind	50	2,000
Berkeley	8/2/2009	Thunderstorm Wind	61	-	Berkeley	6/21/2021	Thunderstorm Wind	50	3,000
Morgan	2/26/2010	High Wind	50	2,000	Berkeley	6/21/2021	Thunderstorm Wind	55	3,000
Berkeley	2/26/2010	High Wind	50	-	Berkeley	6/30/2021	Thunderstorm Wind	55	4,000
Berkeley	4/8/2010	Thunderstorm Wind	45	4,000	Berkeley	7/17/2021	Thunderstorm Wind	55	10,000
Berkeley	2/25/2011	High Wind	50	-	Berkeley	7/17/2021	Thunderstorm Wind	60	10,000
Berkeley	4/16/2011	Thunderstorm Wind	52	1,000	Berkeley	8/11/2021	Thunderstorm Wind	50	1,000
Morgan	5/26/2011	Thunderstorm Wind	56	1,000	Morgan	8/11/2021	Thunderstorm Wind	50	1,000
Berkeley	5/26/2011	Thunderstorm Wind	52	1,000	Morgan	8/11/2021	Thunderstorm Wind	50	1,000
Berkeley	5/26/2011	Thunderstorm Wind	52	500	Morgan	8/11/2021	Thunderstorm Wind	50	1,000
Morgan	6/12/2011	Thunderstorm Wind	52	2,000	Berkeley	8/28/2021	Thunderstorm Wind	50	1,000

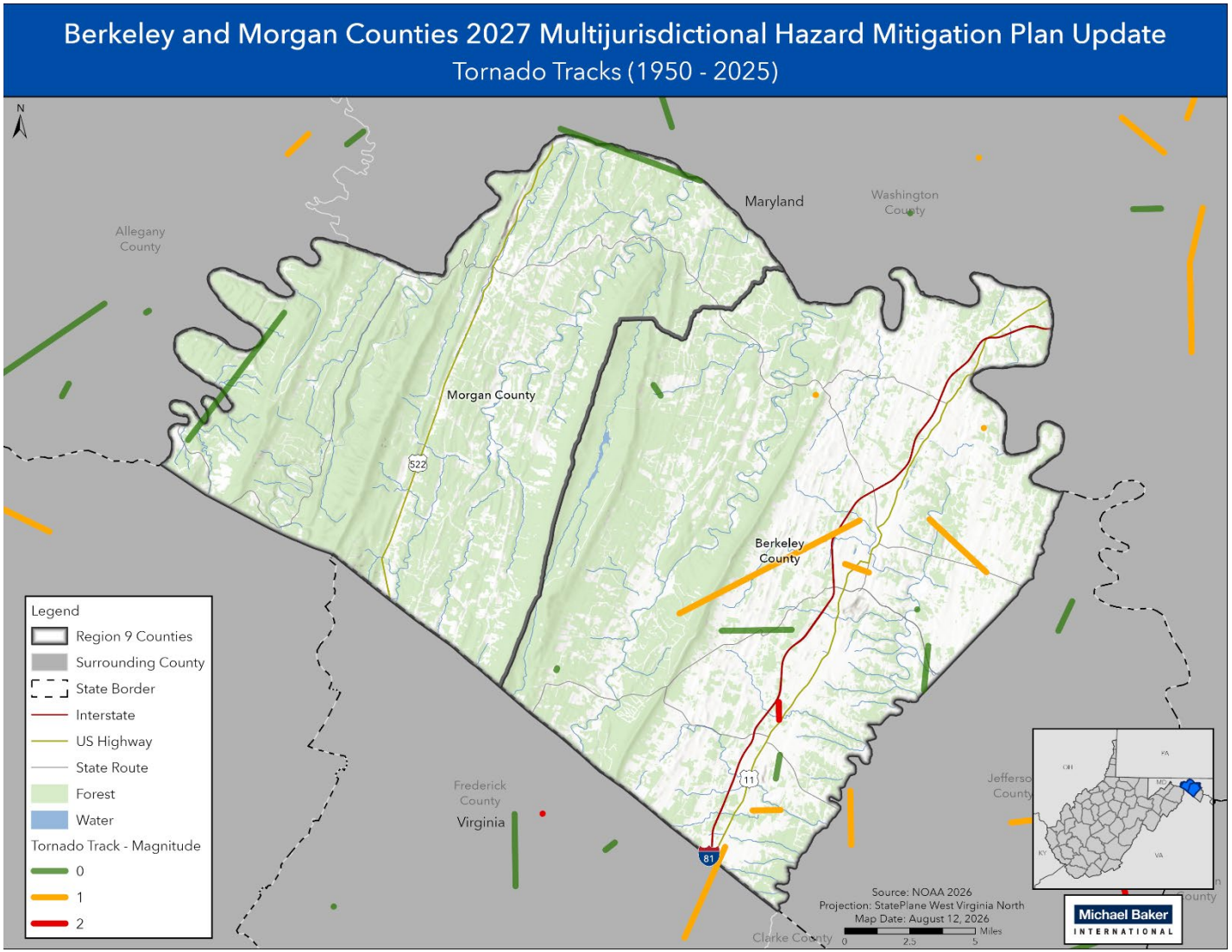
Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Morgan	6/12/2011	Thunderstorm Wind	50	1,000	Morgan	5/20/2022	Thunderstorm Wind	50	1,000
Morgan	7/3/2011	Thunderstorm Wind	52	1,000	Morgan	6/8/2022	Thunderstorm Wind	55	12,000
Berkeley	7/3/2011	Thunderstorm Wind	50	1,000	Berkeley	6/22/2022	Thunderstorm Wind	50	1,000
Berkeley	7/7/2011	Thunderstorm Wind	50	1,000	Morgan	6/22/2022	Thunderstorm Wind	50	3,000
Morgan	7/22/2011	Thunderstorm Wind	52	4,000	Morgan	6/22/2022	Thunderstorm Wind	50	1,000
Morgan	7/22/2011	Thunderstorm Wind	52	5,000	Berkeley	7/1/2022	Thunderstorm Wind	50	1,000
Berkeley	7/22/2011	Thunderstorm Wind	56	2,000	Berkeley	7/1/2022	Thunderstorm Wind	50	2,000
Berkeley	7/22/2011	Thunderstorm Wind	52	3,000	Berkeley	7/1/2022	Thunderstorm Wind	55	12,000
Berkeley	7/22/2011	Thunderstorm Wind	50	3,000	Berkeley	7/1/2022	Thunderstorm Wind	50	1,000
Berkeley	7/22/2011	Thunderstorm Wind	56	2,000	Berkeley	7/1/2022	Thunderstorm Wind	56	-
Berkeley	7/29/2011	Thunderstorm Wind	50	3,000	Berkeley	7/2/2022	Thunderstorm Wind	45	500
Berkeley	8/1/2011	Thunderstorm Wind	59	-	Berkeley	7/18/2022	Thunderstorm Wind	55	30,000
Berkeley	8/1/2011	Thunderstorm Wind	52	-	Morgan	7/23/2022	Thunderstorm Wind	55	15,000
Berkeley	8/1/2011	Thunderstorm Wind	56	10,000	Morgan	8/4/2022	Thunderstorm Wind	50	2,000
Berkeley	8/13/2011	Thunderstorm Wind	52	5,000	Berkeley	8/4/2022	Thunderstorm Wind	43	1,000
Morgan	8/19/2011	Thunderstorm Wind	56	1,000	Berkeley	8/4/2022	Thunderstorm Wind	50	2,000
Morgan	8/19/2011	Thunderstorm Wind	56	-	Berkeley	8/4/2022	Thunderstorm Wind	50	2,000
Berkeley	9/14/2011	Thunderstorm Wind	56	1,000	Berkeley	8/4/2022	Thunderstorm Wind	50	2,000
Berkeley	9/14/2011	Thunderstorm Wind	52	1,000	Berkeley	9/25/2022	Thunderstorm Wind	61	10,000
Berkeley	5/29/2012	Thunderstorm Wind	52	1,000	Berkeley	3/23/2023	Thunderstorm Wind	50	1,000
Morgan	5/29/2012	Thunderstorm Wind	52	1,000	Berkeley	3/23/2023	Thunderstorm Wind	50	1,000
Berkeley	6/22/2012	Thunderstorm Wind	61	2,000	Berkeley	4/1/2023	High Wind	50	-

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	6/22/2012	Thunderstorm Wind	57	500	Morgan	4/1/2023	High Wind	50	-
Morgan	6/29/2012	Thunderstorm Wind	57	5,000	Morgan	6/26/2023	Thunderstorm Wind	52	3,000
Berkeley	6/29/2012	Thunderstorm Wind	66	5,000	Berkeley	7/24/2023	Thunderstorm Wind	52	1,000
Berkeley	6/29/2012	Thunderstorm Wind	70	5,000	Berkeley	7/24/2023	Thunderstorm Wind	52	20,000
Berkeley	6/29/2012	Thunderstorm Wind	66	5,000	Berkeley	7/28/2023	Thunderstorm Wind	61	30,000
Berkeley	6/29/2012	Thunderstorm Wind	57	2,000	Berkeley	7/28/2023	Thunderstorm Wind	52	2,000
Berkeley	6/29/2012	Thunderstorm Wind	52	-	Berkeley	7/28/2023	Thunderstorm Wind	52	3,000
Berkeley	6/29/2012	Thunderstorm Wind	52	2,000	Berkeley	8/7/2023	Thunderstorm Wind	52	1,000
Berkeley	6/29/2012	Thunderstorm Wind	50	-	Berkeley	8/7/2023	Thunderstorm Wind	52	1,000
Berkeley	7/8/2012	Thunderstorm Wind	56	-	Berkeley	8/7/2023	Thunderstorm Wind	52	2,000
Berkeley	7/8/2012	Thunderstorm Wind	56	1,000	Berkeley	8/7/2023	Thunderstorm Wind	56	8,000
Morgan	7/8/2012	Thunderstorm Wind	52	1,000	Berkeley	8/7/2023	Thunderstorm Wind	52	2,000
Morgan	7/8/2012	Thunderstorm Wind	52	1,000	Berkeley	8/7/2023	Thunderstorm Wind	56	6,000
Berkeley	7/18/2012	Thunderstorm Wind	52	1,000	Berkeley	8/7/2023	Thunderstorm Wind	52	3,000
Morgan	8/9/2012	Thunderstorm Wind	52	500	Berkeley	9/7/2023	Thunderstorm Wind	52	3,000
Morgan	8/10/2012	Thunderstorm Wind	52	500	Morgan	9/9/2023	Thunderstorm Wind	52	3,000
Morgan	9/1/2012	Thunderstorm Wind	50	500	Berkeley	5/26/2024	Thunderstorm Wind	52	2,000
Morgan	9/1/2012	Thunderstorm Wind	50	500	Berkeley	5/26/2024	Thunderstorm Wind	52	2,000
Berkeley	9/8/2012	Thunderstorm Wind	50	500	Berkeley	5/26/2024	Thunderstorm Wind	52	2,000
Berkeley	10/29/2012	High Wind	52	-	Morgan	7/20/2024	Thunderstorm Wind	52	5,000
Morgan	10/29/2012	High Wind	60	-	Berkeley	8/3/2024	Thunderstorm Wind	52	3,000
Morgan	4/24/2013	Thunderstorm Wind	56	-	Morgan	8/3/2024	Thunderstorm Wind	52	2,000

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	5/22/2013	Thunderstorm Wind	52	-	Berkeley	8/3/2024	Thunderstorm Wind	52	4,000
Morgan	5/23/2013	Thunderstorm Wind	52	-	Berkeley	8/3/2024	Thunderstorm Wind	52	1,000
Berkeley	6/25/2013	Thunderstorm Wind	52	-	Morgan	8/31/2024	Thunderstorm Wind	52	1,000
Berkeley	6/25/2013	Thunderstorm Wind	52	1,000	Berkeley	8/31/2024	Thunderstorm Wind	52	10,000
Berkeley	6/25/2013	Thunderstorm Wind	52	1,000	Berkeley	8/31/2024	Thunderstorm Wind	52	4,000
Morgan	7/7/2013	Thunderstorm Wind	52	-	Berkeley	2/16/2025	High Wind	54	-
Morgan	7/7/2013	Thunderstorm Wind	52	-	Morgan	3/16/2025	Thunderstorm Wind	52	2,000
Morgan	7/7/2013	Thunderstorm Wind	52	-	Berkeley	3/16/2025	Thunderstorm Wind	52	2,000
Morgan	11/1/2013	Thunderstorm Wind	52	-	Morgan	4/19/2025	Thunderstorm Wind	65	500,000
Morgan	11/1/2013	Thunderstorm Wind	52	-	Berkeley	4/19/2025	Thunderstorm Wind	52	10,000
Berkeley	3/12/2014	High Wind	53	-	Morgan	5/16/2025	Thunderstorm Wind	52	2,000
Berkeley	5/22/2014	Thunderstorm Wind	52	-	Berkeley	5/16/2025	Thunderstorm Wind	52	2,000
Morgan	6/8/2014	Thunderstorm Wind	52	-	Berkeley	5/16/2025	Thunderstorm Wind	56	10,000
Morgan	6/8/2014	Thunderstorm Wind	52	-	Berkeley	5/16/2025	Thunderstorm Wind	54	-
Berkeley	6/8/2014	Thunderstorm Wind	52	-	Berkeley	6/14/2025	Thunderstorm Wind	52	2,000
Berkeley	6/8/2014	Thunderstorm Wind	52	-	Berkeley	6/19/2025	Thunderstorm Wind	52	2,000
Berkeley	6/11/2014	Thunderstorm Wind	52	-	Berkeley	6/25/2025	Thunderstorm Wind	52	1,000
Morgan	6/25/2014	Thunderstorm Wind	52	-	Berkeley	6/25/2025	Thunderstorm Wind	52	2,000
Berkeley	6/25/2014	Thunderstorm Wind	52	3,000	Berkeley	6/25/2025	Thunderstorm Wind	52	1,000
Berkeley	6/25/2014	Thunderstorm Wind	52	1,000	Berkeley	6/25/2025	Thunderstorm Wind	52	1,000
Berkeley	7/2/2014	Thunderstorm Wind	52	1,000	Morgan	6/26/2025	Thunderstorm Wind	52	2,000
Berkeley	7/2/2014	Thunderstorm Wind	52	-	Morgan	6/26/2025	Thunderstorm Wind	52	2,000

Table 4.3.13-5: Hazardous Wind Events In Berkeley and Morgan Counties, 2000 – May 2026 (NCEI NOAA, 2026b).									
County	Date	Type	Wind Speed (Knots)	Property Damage ($)	County	Date	Type	Wind Speed (Knots)	Property Damage ($)
Berkeley	7/2/2014	Thunderstorm Wind	52	-	Morgan	6/26/2025	Thunderstorm Wind	52	4,000
Berkeley	7/2/2014	Thunderstorm Wind	52	-	Berkeley	6/28/2025	Thunderstorm Wind	52	2,000
Morgan	7/8/2014	Thunderstorm Wind	52	-	Berkeley	7/26/2025	Thunderstorm Wind	52	2,000
Morgan	7/8/2014	Thunderstorm Wind	52	2,000	Berkeley	7/26/2025	Thunderstorm Wind	52	3,000
Morgan	7/8/2014	Thunderstorm Wind	52	2,000	Berkeley	7/26/2025	Thunderstorm Wind	52	2,000
Morgan	7/8/2014	Thunderstorm Wind	52	-	Berkeley	7/31/2025	Thunderstorm Wind	52	1,000
Morgan	7/8/2014	Thunderstorm Wind	52	1,000	Berkeley	7/31/2025	Thunderstorm Wind	52	1,000
Morgan	7/8/2014	Thunderstorm Wind	51	-	Berkeley	7/31/2025	Thunderstorm Wind	52	3,000
Morgan	7/8/2014	Thunderstorm Wind	52	-	Berkeley	11/5/2025	Thunderstorm Wind	50	-
Morgan	7/8/2014	Thunderstorm Wind	52	-	Berkeley	2/7/2026	High Wind	51	-
Berkeley	7/8/2014	Thunderstorm Wind	52	5,000	Morgan	5/13/2026	Thunderstorm Wind	52	2,000
Berkeley	7/13/2014	Thunderstorm Wind	52	-	Berkeley	5/13/2026	Thunderstorm Wind	52	1,000
Berkeley	7/13/2014	Thunderstorm Wind	52	-	Berkeley	5/13/2026	Thunderstorm Wind	52	1,000
Berkeley	7/13/2014	Thunderstorm Wind	52	-	Berkeley	5/18/2026	Thunderstorm Wind	52	1,000
					Berkeley	5/18/2026	Thunderstorm Wind	52	2,000

Figure 4.3.13-4: Tornado Tracks in Berkeley and Morgan Counties.



4.3.13.4. Future Occurrence

For the period between 1950 and 2026, 16 tornadoes were reported in Berkeley and Morgan counties by NCEI. Therefore, the annual probability of being in the path of a tornado in the region is relatively minor. While the chance of being hit by a tornado is small, the damage that results when the tornado arrives can be potentially devastating. An F4 tornado, with a 0.01-percent-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. While most of the recent windstorms and tornadoes have occurred outside of the county, their proximity contributes to future risk. Because more windstorms have been seen in the region, it is possible that an increasing number of tornadoes will be seen in Berkeley and Morgan counties.

According to these NCEI records, there have been 409 hazardous wind events in Berkeley County and/or Morgan County since 2000. The region experiences windstorm events more commonly than tornadoes, which causes power failures, loss of communication networks, and residents requiring temporary shelters and provision of supplies.

Climate models project atmospheric conditions conducive to severe thunderstorms, tornadoes, and hail and wind will become more likely, but those events may not actually become more frequent themselves (Kossin et al. 2017). Projecting tornado activity based on more conducive conditions is difficult, as less than 10% of severe thunderstorms even produce tornadoes (Treisman, 2021). Therefore, the impact of climate change on this hazard's occurrence and intensity is unknown.

The probability of tornadoes and windstorms in Berkeley and Morgan counties can be considered *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.13.5. Vulnerability Assessment

For tornadoes or high winds, aged and dilapidated structures or structures not built to applicable building codes are more susceptible to damage. Mobile homes and campgrounds are especially susceptible to damage due to tornado or high wind. Strong winds can rip roofs off of any dilapidated structures and overturn mobile homes. Past experience with tornadoes in the region shows that death and injury are indeed possibilities. Vulnerability to the effects of a tornado or high wind is somewhat dependent upon the age of a structure and state of repair; as building codes become more stringent, buildings are capable of enduring greater wind forces.

In Berkeley and Morgan counties, high winds occur annually. The most common detrimental effects are interruptions in power supply and communications services due to downed wires and blocked roadways due to downed trees. Most severe power failures or outages are regional events. With the loss of power, electrical-powered equipment and systems will not be operational. Examples include lighting, HVAC and ancillary support equipment, communication systems, ventilation system,

refrigerators, sterilizers, and medical equipment. This can cause food spoilage, loss of heat or air conditions, basement flooding (sump pump failure), lack of light, loss of water (well pump failure), lack of phone service, or lack of internet. While it is most often a short-term nuisance rather than a catastrophic hazard, utility interruptions can cause challenges for communications and response, particularly in more rural areas of the county.

High winds often occur during hurricanes and tropical storms. Information about potential annualized losses due to hurricane winds can be found in Section 4.3.6.

All structures and infrastructure might be exposed to the effects of a tornado or other high winds. Depending upon the severity of a tornado or high wind, any existing structures might be damaged to some extent. Any future structures might be exposed to tornados or high winds as this hazard does not occur in specific locations. However, future buildings will be somewhat protected from the effects of tornado or high wind as they will meet the most current State building code requirements for bracing and roof design.

Manufactured housing (i.e. mobiles homes or trailers) is particularly vulnerable to high winds and tornadoes. The U.S. Census Bureau defines manufactured homes as "movable dwellings, eight feet or wider and 40 feet or longer, design to be towed on its own chassis, with transportation gear integral to the unit when it leaves the factory, and without need of a permanent foundation (U.S. Census, 2020)." They can include multi-wide and expandable manufactured homes but exclude travel trailers, motor homes, and modular housing. Due to their lightweight and often unanchored design, manufactured housing is extremely vulnerable to high winds and will generally sustain the most damage.

Table 4.3.13-6 below displays the number of manufactured housing units per jurisdiction. The City of Martinsburg has the most mobile homes (75), while the Town of Paw Paw has the highest percentage of mobile homes with 14.3%. Out of the counties, Berkeley County contains more mobile homes than Morgan County, making areas of the county more vulnerable to the damages of windstorms and tornadoes.

Table 4.3.13-6: Mobile Homes per Jurisdiction (U.S. Census Bureau, ACS, 2024).

County	Total Housing Units	Number Mobile Homes	Percent Mobile Homes
Berkeley County	53,819	5,540	10.3%
Martinsburg City	8,455	75	0.9%
Hedgesville Town	149	0	0%
Morgan County	9,250	1,172	12.7%
Bath (Berkeley Springs) Town	587	4	0.7%
Paw Paw Town	223	32	14.3%

According to the NOAA Strom Events Database, Berkeley and Mogen County have reported a combined $1.2 million property damages and $25,000 in crop damages due to tornadoes. As for extreme wind events, there has been $2.2 million in property damage and $143,000 in crop damage from wind events (NOAA NCEI, 2026b).

Table 4.3.13-7 below shows the expected annual losses to tornadoes by census tract.

Table 4.3.13-7: Expected Annual Losses to Tornadoes by Census Tract (NRI, 2026).

Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$80,310.26	Relatively Moderate
54003971402	Martinsburg City	$51,161.89	Relatively Low
54003971500	Martinsburg City	$40,412.34	Relatively Low
54003971600	Martinsburg City	$56,842.61	Relatively Low
54003971700	Martinsburg City	$58,863.81	Relatively Low
54003971901	Martinsburg City	$69,999.31	Relatively Low
54003971902	Martinsburg City	$58,218.60	Relatively Low
54003972002	Martinsburg City	$34,242.62	Relatively Low
54065970900	Paw Paw Town	$22,862.08	Relatively Low
54065970800	Bath (Berkeley Springs) Town	$38,005.87	Relatively Low
54003971205	Hedgesville Town	$46,164.25	Relatively Low

Table 4.3.13-8 below shows the expected annual losses to severe wind by census tract.

Table 4.3.3-8: Expected Annual Losses to Extreme Wind by Census Tract (NRI, 2026).

Census Tract	Municipalities	Expected Annual Losses ($)	Expected Annual Loss Rating
54003971301	Martinsburg City	$105,420.97	Relatively High
54003971402	Martinsburg City	$100,532.88	Relatively High
54003971500	Martinsburg City	$64,752.36	Relatively High
54003971600	Martinsburg City	$83,493.23	Relatively High
54003971700	Martinsburg City	$93,612.08	Relatively High
54003971901	Martinsburg City	$108,022.63	Relatively High
54003971902	Martinsburg City	$84,835.97	Relatively High
54003972002	Martinsburg City	$63,741.00	Relatively High
54065970900	Paw Paw Town	$78,720.38	Relatively High
54065970800	Bath (Berkeley Springs) Town	$120,415.05	Relatively High
54003971205	Hedgesville Town	$80,281.03	Relatively High

Environmental impacts from tornadoes can include debris in streams, wetlands, and other sensitive environmental features. Tree damage is commonly seen after high wind events. Hazardous material facilities should meet design requirements for the wind zones in order to prevent release of hazardous materials into the environment.

4.3.13.6. Populations at Risk

Regarding equity, there are several communities of consideration when it comes to planning for tornadoes and windstorms. Manufactured home communities, primarily mobile homes, are extremely at risk in the face of tornadoes as they are highly susceptible to high-speed winds. Additionally, households without vehicles, smartphones, or people with disabilities are also at higher risk if evacuation becomes necessary as all of these factors present significant barriers to active response times.

4.3.14. Winter Storm, Nor'easter

4.3.14.1. Location and Extent



Winter storms tend to encompass the entire two counties whereas flooding generally occurs within predictable boundaries along the regulatory SFHA and its main branches and tributaries. They begin as low-pressure systems that move through West Virginia either following the jet stream or developing as extra-tropical cyclonic weather systems over the Atlantic Ocean called nor'easters. These storms are regional events that can impact very large areas hundreds to thousands of miles across over the life of the storm. Risks associated and identified with severe winter storms include but are not limited to the following:

- Emergency medical evacuation of the sick, elderly, and infirmed to shelters.
- Power outages to those on life support systems.
- Communications interruptions and/or outages.
- Loss of the ability to heat homes.
- Interruption of the delivery of home supplies and food.

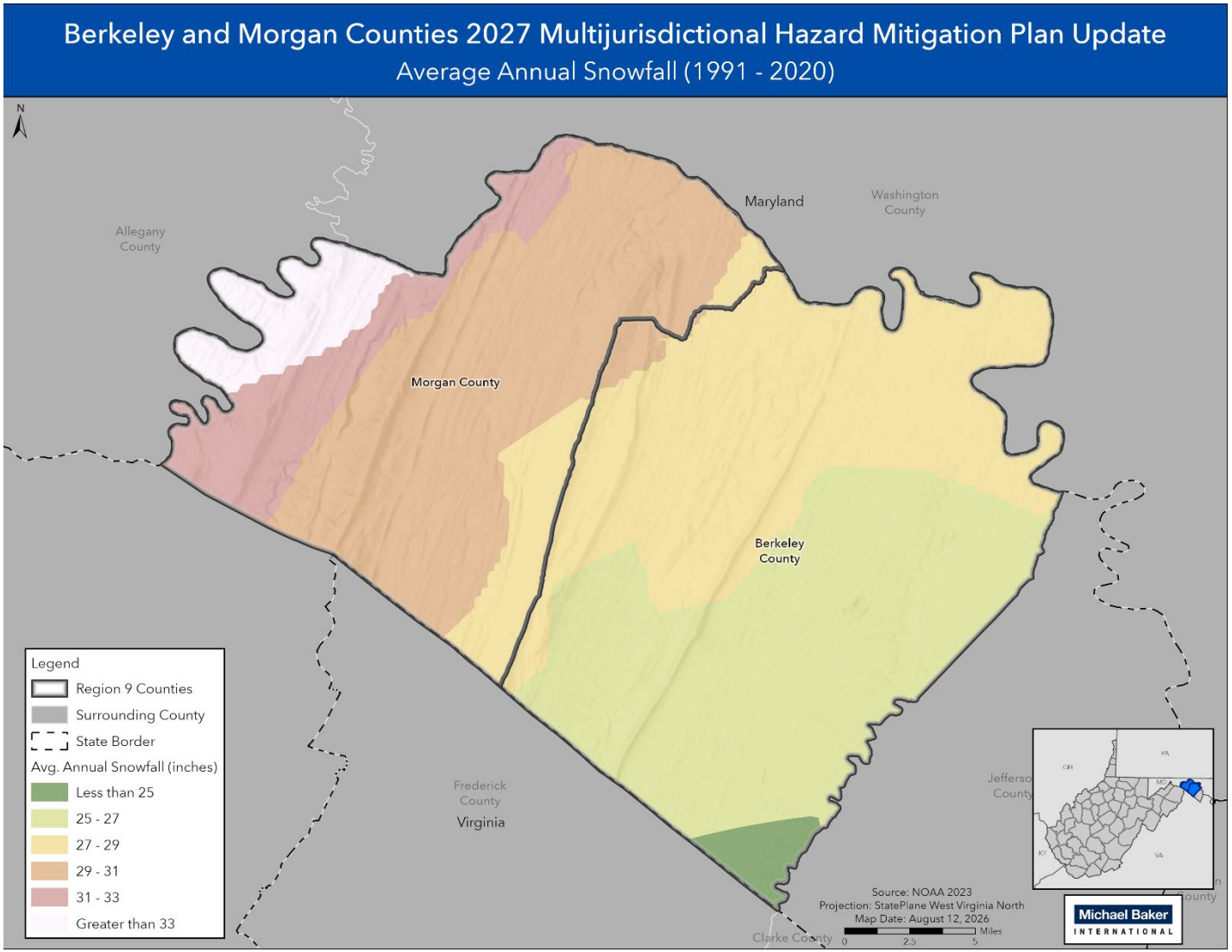
These above-described events fall within 2 general categories 1) road closures due to snow drifts and 2) utility failures (such as damaged supply lines). Additionally, data indicates that structural damage has occurred in several instances in the past as a result of extremely heavy snowfall. Structures damaged were usually buildings such as barns, garages, carports, etc. Furthermore, because of the county's mountainous terrain, severe winter storms frequently result in dangerous driving conditions.

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. The effects of these storms can sometimes last for weeks, bringing several inches or even feet of snow and ice and cold temperatures. Winter storms are made with three ingredients (NOAA NSSL, 2026m):

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

Generally, Morgan County tends to receive a few more inches of snow with the area receiving anywhere from more than 33 to 27 inches of snow annually. While Berkeley County tends to see less than 25 to 29 inches of snow. Theres a small part of Berkeley that borders Morgan County that may receive 29 to 31 inches (see Figure 4.3.14-1).

Figure 4.3.14-1: Mean Annual Snowfall for Berkeley and Morgan Counties.



4.3.14.2. Range of Magnitude

Due to their regular occurrence, these storms are considered hazards only when they result in damage to specific structures or cause disruption to traffic, communications, electric power, or other utilities. A winter storm can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite and freezing conditions. Winter storms can also cause building or structure collapses, most commonly with warehouses and other commercial buildings, if snowfall and accumulation is significant enough (Geis et al. 2012).

Winter storms may include one or more of the following types of weather events or precipitation (NOAA NSSL, 2026l):

- **Snow:** Ice crystals that form in wintertime clouds that cling to each other as they fall forming snowflakes; they will remain in this form if the temperature from cloud to ground is at or below 0°C/32°F. Accumulation can range from none to significant. Wind conditions will impact visibility.
- **Sleet:** Partially melted snowflakes that have passed through a small layer of warm air on their descent, only to refreeze as they approach the ground and form frozen rain drops.
- **Freezing Rain:** Completely melted snowflakes that have passed through a large layer of warm air on their descent; they are then "supercooled" but not frozen by a small layer of cold air directly above the ground. The water drops will refreeze when contacting anything that is 0°C/32°F or below, creating a layer of ice on exposed surfaces. A significant accumulation of freezing rain lasting several hours or more is called an ice storm.
- **Ice Storm:** Storms which results in the accumulation of at least .25" of ice on exposed surfaces. They create hazardous driving and walking conditions. Tree branches and powerlines can easily snap under the weight of the ice. The icy conditions are also dangerous for pedestrians and vehicular traffic.
- **Blizzard:** Storms consisting of snow or blowing snow, winds of at least 35mph, and visibility frequently reduced to less than a ¼ mile. These conditions must last for at least 3 hours. Storms that meet these criteria are not frequent in Berkeley and Morgan counties; however, storms that produce blizzard-like conditions are a common occurrence.
- **Snow Squall:** Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.

Any of the above events can result in the closing of secondary roads, particularly in rural locations, loss of utility services and depletion of oil heating supplies. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up, and/or high winds, which

can break limbs or even bring down large trees. An indirect effect of winter storms is the treatment of roadway surfaces with salt, chemicals, and other de-icing materials which can impair adjacent surfaces through corrosion and impair local water bodies and water supply (Hinsdale, 2018). Winter storms have a positive environmental impact as well, as gradual melting of snow and ice provides excellent groundwater recharge. However, quickly rising temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding.

A recent snowstorm on January 22, 2016, represents the largest impact Berkeley and Morgan counties is anticipated to encounter from a winter storm hazard. During this event, 25 to 40 inches of heavy snow fell across the Eastern Panhandle in less than two days. A photo of the snowfall can be seen in Figure 4.3.14-2. The governor issued a state of emergency, and it took until the evening of January 23 to reopen one lane on both Interstate 81N and 81S, temporarily paralyzing travel. The amount of snow put a strain on critical operations as well, and local emergency management officials were tasked with transporting local medical professionals safely to the medical centers they were employed at. The National Guard was activated to transport emergency responders using Humvees (West Virginia Press Association, 2016). A storm of this magnitude could be considered a worst-case scenario winter storm for Berkeley and Morgan counties. This is the most recent winter storm of this magnitude. Several other large winter storms have occurred since 2016, but none of this magnitude.

Figure 4.3.14-2: Radio Station Van in Martinsburg Covered by the January 2016 Storm (Fogle, 2016).



The potential impacts of winter storms on community lifelines are as follows:

Table 4.3.14-1: Most Likely Lifelines Impacted by Winter Storms.

Lifelines	Notes
Safety and Security	Government administrative services may be impacted through transportation infrastructure issues and community safety may be threatened due to potential harm from storm impacts on power infrastructure, residencies and critical facilities.

Table 4.3.14-1: Most Likely Lifelines Impacted by Winter Storms.	
Lifelines	**Notes**
	Winter storms can cause damage to structures and water utility infrastructure, while the food supply chain may be disrupted due to impacts on transportation infrastructure. Disruption in the food supply chain could result in food shortages in certain areas depending on the severity. Winter storms can also damage buildings and mobile homes.
	People and critical facilities could lose access to electricity, and therefore, a heating source due to direct damage to energy infrastructure or from the strain on the power grid due to an increased usage of heating utilities. There is also the potential increase in fuel usage due to people relying on fuel for heat rather than electrical heating.
	Transportation infrastructure could be directly damaged by winter storms. Winter weather creates dangerous road conditions for people and essential services (police, fire, EMS, etc.) to travel.

4.3.14.3. Past Occurrence

Winter storms are one of the most frequently occurring hazard in the region. Table 4.3.14-2 illustrates the number of winter storm (i.e., snow, ice, and blizzard) events in each county between 2000 and May 2026, which total 365 between the two counties. Some of these instances may have also been categorized as nor'easters; however, this was not differentiated within the database. The total estimated property damage for both counties combined is only $34,000 ($27,000 from Berkeley and 7,000 from Morgan County) with no reported crop damage, deaths, or injuries.

The January 2016 snowstorm was the most severe snowstorm in recent memory, but on December 16, 2020 a snowstorm also impaired both counties. This storm was also labeled as a nor'easter. WV Metro News meteorologists claimed there could be as much as 12 to 18 inches of snow in Berkeley, Morgan, and Jefferson counties. A more recent severe winter storm took place from January 5-6, 2025. This storm resulted in several closures for multiple days. An area of low pressure brought a widespread swath of 6 to 12" of snow from the Alleghenies through the Shenandoah Valley across the DC metro and into Southern Maryland. Berkeley County experienced snowfall ranging from 4.8 to 7 inches in some areas while Morgan County received 4 to 8 inches of snow (NOAA NWS, 2025).

Table 4.3.13-2: Hazardous Winter Weather Events in Berkeley and Morgan counties, 2000 – May 2026 (NCEI NOAA, 2026b).

County	Date	Type	Property Damage ($)	County	Date	Type	Property Damage ($)
Morgan	1/20/2000	Winter Weather	-	Berkeley	2/3/2014	Winter Weather	-
Berkeley	1/20/2000	Winter Storm	-	Morgan	2/4/2014	Winter Storm	-
Morgan	1/25/2000	Winter Storm	-	Berkeley	2/4/2014	Winter Storm	-
Berkeley	1/25/2000	Winter Storm	-	Berkeley	2/12/2014	Winter Storm	-
Morgan	1/30/2000	Winter Storm	-	Morgan	2/12/2014	Winter Storm	-
Berkeley	1/30/2000	Winter Storm	-	Morgan	2/17/2014	Winter Weather	-
Morgan	2/18/2000	Winter Storm	-	Berkeley	2/17/2014	Winter Weather	-
Berkeley	2/18/2000	Winter Storm	-	Morgan	2/19/2014	Winter Weather	-
Berkeley	12/13/2000	Ice Storm	-	Berkeley	2/19/2014	Winter Weather	-
Morgan	12/13/2000	Ice Storm	-	Morgan	3/2/2014	Winter Weather	-
Morgan	12/19/2000	Winter Storm	-	Berkeley	3/2/2014	Winter Storm	-
Berkeley	12/19/2000	Winter Storm	-	Berkeley	3/16/2014	Winter Storm	-
Morgan	1/5/2001	Winter Weather	-	Morgan	3/16/2014	Winter Weather	-
Berkeley	1/5/2001	Winter Weather	-	Berkeley	3/19/2014	Winter Weather	-
Berkeley	1/20/2001	Winter Storm	-	Berkeley	11/26/2014	Winter Weather	-
Morgan	1/20/2001	Winter Storm	-	Morgan	11/26/2014	Winter Storm	-
Berkeley	2/5/2001	Winter Weather	-	Berkeley	12/2/2014	Winter Weather	-
Morgan	2/22/2001	Winter Storm	-	Morgan	12/2/2014	Winter Weather	-
Berkeley	2/22/2001	Winter Weather	-	Berkeley	12/8/2014	Winter Weather	-
Morgan	3/4/2001	Winter Weather	-	Morgan	12/8/2014	Winter Weather	-
Berkeley	3/5/2001	Winter Weather	-	Morgan	12/22/2014	Winter Weather	-
Morgan	3/21/2001	Winter Weather	-	Berkeley	12/22/2014	Winter Weather	-
Morgan	1/6/2002	Winter Storm	-	Berkeley	1/3/2015	Winter Weather	-
Berkeley	1/6/2002	Winter Storm	-	Morgan	1/3/2015	Winter Weather	-
Morgan	1/19/2002	Winter Storm	-	Berkeley	1/6/2015	Winter Weather	-
Berkeley	1/19/2002	Winter Storm	-	Berkeley	1/11/2015	Winter Weather	-
Morgan	12/5/2002	Winter Storm	-	Berkeley	1/23/2015	Winter Weather	-
Berkeley	12/5/2002	Winter Storm	-	Berkeley	1/26/2015	Winter Weather	-
Morgan	12/11/2002	Ice Storm	-	Berkeley	2/16/2015	Winter Weather	-
Berkeley	12/11/2002	Ice Storm	-	Berkeley	2/21/2015	Winter Storm	-
Morgan	12/24/2002	Winter Weather	-	Morgan	2/21/2015	Winter Weather	-
Berkeley	12/24/2002	Winter Weather	-	Berkeley	3/1/2015	Winter Weather	-
Morgan	1/5/2003	Winter Weather	-	Morgan	3/1/2015	Winter Weather	-
Berkeley	1/5/2003	Winter Weather	-	Berkeley	3/3/2015	Winter Weather	-
Berkeley	2/6/2003	Winter Storm	-	Morgan	3/3/2015	Winter Weather	-
Morgan	2/6/2003	Winter Weather	-	Berkeley	3/5/2015	Winter Storm	-

Table 4.3.13-2: Hazardous Winter Weather Events in Berkeley and Morgan counties, 2000 – May 2026 (NCEI NOAA, 2026b).

County	Date	Type	Property Damage ($)	County	Date	Type	Property Damage ($)
Berkeley	2/14/2003	Winter Storm	-	Morgan	3/5/2015	Winter Storm	-
Morgan	2/14/2003	Winter Storm	-	Morgan	3/20/2015	Winter Storm	-
Berkeley	2/26/2003	Winter Weather	-	Berkeley	3/20/2015	Winter Weather	-
Morgan	2/26/2003	Winter Weather	-	Morgan	1/8/2016	Winter Weather	-
Morgan	3/30/2003	Winter Storm	-	Berkeley	1/22/2016	Winter Storm	-
Berkeley	3/30/2003	Winter Weather	-	Morgan	1/22/2016	Winter Storm	-
Morgan	12/4/2003	Winter Storm	-	Berkeley	1/26/2016	Winter Weather	-
Berkeley	12/4/2003	Winter Storm	-	Morgan	1/26/2016	Winter Weather	-
Morgan	12/5/2003	Winter Storm	-	Berkeley	2/9/2016	Winter Weather	-
Berkeley	12/14/2003	Winter Storm	-	Morgan	2/9/2016	Winter Weather	-
Morgan	12/14/2003	Winter Storm	-	Berkeley	2/14/2016	Ice Storm	-
Morgan	1/17/2004	Winter Weather	-	Morgan	2/14/2016	Ice Storm	-
Berkeley	1/17/2004	Winter Weather	-	Morgan	12/11/2016	Winter Weather	-
Morgan	1/23/2004	Winter Storm	-	Berkeley	12/11/2016	Winter Weather	-
Berkeley	1/23/2004	Winter Storm	-	Morgan	12/17/2016	Winter Storm	-
Morgan	1/25/2004	Winter Storm	-	Berkeley	12/17/2016	Winter Storm	-
Berkeley	1/25/2004	Winter Storm	-	Morgan	12/29/2016	Winter Weather	-
Berkeley	2/3/2004	Winter Storm	-	Berkeley	12/29/2016	Winter Weather	-
Morgan	2/3/2004	Winter Weather	-	Morgan	1/5/2017	Winter Weather	-
Morgan	2/5/2004	Winter Weather	-	Berkeley	1/5/2017	Winter Weather	-
Berkeley	2/5/2004	Winter Weather	-	Berkeley	1/10/2017	Winter Weather	-
Berkeley	1/22/2005	Winter Storm	-	Morgan	1/10/2017	Winter Weather	-
Morgan	1/22/2005	Winter Storm	-	Morgan	1/14/2017	Winter Weather	-
Berkeley	2/24/2005	Winter Storm	-	Morgan	1/14/2017	Winter Weather	-
Morgan	2/24/2005	Winter Storm	-	Berkeley	3/13/2017	Winter Storm	-
Berkeley	2/28/2005	Winter Storm	-	Morgan	3/13/2017	Winter Storm	-
Morgan	2/28/2005	Winter Storm	-	Berkeley	3/24/2017	Winter Weather	-
Berkeley	12/5/2005	Winter Weather	-	Morgan	3/24/2017	Winter Weather	-
Berkeley	12/9/2005	Heavy Snow	-	Morgan	1/8/2018	Winter Weather	-
Morgan	12/9/2005	Heavy Snow	-	Berkeley	1/8/2018	Winter Weather	-
Morgan (Zone)	12/15/2005	Winter Storm	-	Morgan	1/16/2018	Winter Weather	-
Berkeley	12/15/2005	Ice Storm	-	Berkeley	1/16/2018	Winter Weather	-
Berkeley	2/11/2006	Heavy Snow	-	Morgan	2/4/2018	Winter Weather	-
Morgan	2/11/2006	Heavy Snow	-	Berkeley	2/4/2018	Winter Weather	-
Berkeley	1/21/2007	Winter Weather	-	Morgan	2/7/2018	Winter Storm	-
Berkeley	2/6/2007	Winter Weather	-	Berkeley	2/7/2018	Winter Storm	-

Table 4.3.13-2: Hazardous Winter Weather Events in Berkeley and Morgan counties, 2000 – May 2026 (NCEI NOAA, 2026b).

County	Date	Type	Property Damage ($)	County	Date	Type	Property Damage ($)
Berkeley	2/12/2007	Winter Storm	-	Morgan	2/17/2018	Winter Weather	-
Morgan	2/12/2007	Winter Storm	-	Berkeley	2/17/2018	Winter Weather	-
Berkeley	2/24/2007	Winter Storm	-	Berkeley	3/20/2018	Winter Storm	-
Morgan	2/24/2007	Winter Storm	-	Morgan	3/20/2018	Winter Storm	-
Morgan	3/7/2007	Winter Storm	-	Morgan	4/2/2018	Winter Weather	-
Berkeley	3/7/2007	Winter Weather	-	Morgan	11/15/2018	Winter Storm	-
Berkeley	3/16/2007	Winter Storm	-	Berkeley	11/15/2018	Winter Storm	-
Morgan	3/16/2007	Winter Storm	-	Morgan	11/24/2018	Winter Weather	-
Berkeley	12/5/2007	Heavy Snow	-	Berkeley	11/24/2018	Winter Weather	-
Morgan	12/5/2007	Heavy Snow	-	Berkeley	1/12/2019	Winter Storm	-
Berkeley	12/15/2007	Winter Storm	5,000	Morgan	1/12/2019	Winter Storm	-
Morgan	12/15/2007	Winter Storm	2,000	Morgan	1/19/2019	Winter Weather	-
Morgan	1/17/2008	Winter Weather	-	Berkeley	1/19/2019	Winter Weather	-
Berkeley	1/17/2008	Winter Weather	-	Berkeley	1/29/2019	Winter Weather	-
Morgan	2/1/2008	Ice Storm	5,000	Morgan	2/1/2019	Winter Weather	-
Berkeley	2/1/2008	Ice Storm	5,000	Berkeley	2/1/2019	Winter Weather	-
Berkeley	2/12/2008	Winter Weather	-	Morgan	2/10/2019	Winter Storm	-
Morgan	2/12/2008	Winter Weather	-	Berkeley	2/10/2019	Winter Weather	-
Berkeley	2/20/2008	Winter Weather	-	Morgan	2/17/2019	Winter Weather	-
Morgan	2/20/2008	Winter Weather	-	Berkeley	2/17/2019	Winter Weather	-
Morgan	2/22/2008	Winter Weather	-	Morgan	2/20/2019	Winter Storm	-
Berkeley	2/22/2008	Winter Weather	-	Berkeley	2/20/2019	Winter Storm	-
Berkeley	11/30/2008	Winter Weather	-	Morgan	3/1/2019	Winter Weather	-
Morgan	11/30/2008	Winter Weather	-	Berkeley	3/1/2019	Winter Weather	-
Berkeley	12/16/2008	Winter Weather	-	Morgan	3/1/2019	Winter Weather	-
Morgan	12/16/2008	Winter Weather	-	Berkeley	3/1/2019	Winter Weather	-
Morgan	12/23/2008	Winter Weather	-	Berkeley	3/3/2019	Winter Storm	-
Berkeley	1/6/2009	Winter Storm	-	Morgan	3/3/2019	Winter Storm	-
Morgan	1/6/2009	Winter Weather	-	Morgan	12/13/2019	Winter Weather	-
Berkeley	1/10/2009	Winter Weather	-	Berkeley	12/13/2019	Winter Weather	-
Berkeley	1/19/2009	Winter Weather	-	Berkeley	12/16/2019	Winter Weather	-
Berkeley	1/27/2009	Winter Storm	-	Morgan	12/16/2019	Winter Weather	-
Morgan	1/27/2009	Winter Storm	-	Morgan	1/7/2020	Winter Weather	-
Berkeley	12/5/2009	Winter Weather	-	Berkeley	1/7/2020	Winter Weather	-
Morgan	12/5/2009	Winter Weather	-	Berkeley	1/18/2020	Winter Weather	-
Berkeley	12/8/2009	Winter Weather	-	Morgan	1/18/2020	Winter Weather	-

Table 4.3.13-2: Hazardous Winter Weather Events in Berkeley and Morgan counties, 2000 – May 2026 (NCEI NOAA, 2026b).

County	Date	Type	Property Damage ($)	County	Date	Type	Property Damage ($)
Berkeley	12/13/2009	Winter Weather	-	Morgan	12/16/2020	Winter Storm	-
Morgan	12/13/2009	Winter Weather	-	Berkeley	12/16/2020	Winter Storm	-
Berkeley	12/18/2009	Winter Storm	-	Berkeley	1/1/2021	Winter Weather	-
Morgan	12/18/2009	Winter Storm	-	Morgan	1/25/2021	Winter Weather	-
Berkeley	12/25/2009	Winter Weather	-	Berkeley	1/25/2021	Winter Weather	-
Berkeley	12/31/2009	Winter Weather	-	Berkeley	1/31/2021	Winter Storm	-
Morgan	12/31/2009	Winter Weather	-	Morgan	1/31/2021	Winter Storm	-
Morgan	1/30/2010	Winter Weather	-	Morgan	2/7/2021	Winter Weather	-
Berkeley	1/30/2010	Winter Weather	-	Berkeley	2/7/2021	Winter Weather	-
Berkeley	2/2/2010	Winter Storm	-	Berkeley	2/10/2021	Winter Weather	-
Morgan	2/2/2010	Winter Weather	-	Morgan	2/10/2021	Winter Weather	-
Berkeley	2/5/2010	Winter Storm	17,000	Morgan	2/10/2021	Winter Storm	-
Morgan	2/5/2010	Winter Storm	-	Morgan	2/13/2021	Winter Weather	-
Berkeley	2/9/2010	Winter Storm	-	Berkeley	2/13/2021	Winter Weather	-
Morgan	2/9/2010	Winter Storm	-	Morgan	2/18/2021	Winter Storm	-
Morgan	12/12/2010	Winter Weather	-	Berkeley	2/18/2021	Winter Storm	-
Berkeley	12/16/2010	Winter Weather	-	Morgan	2/18/2021	Winter Weather	-
Morgan	12/16/2010	Winter Weather	-	Berkeley	2/18/2021	Winter Weather	-
Berkeley	1/11/2011	Winter Weather	-	Berkeley	2/22/2021	Winter Weather	-
Berkeley	1/17/2011	Winter Weather	-	Morgan	2/22/2021	Winter Weather	-
Berkeley	1/18/2011	Winter Weather	-	Morgan	1/6/2022	Winter Storm	-
Morgan	1/26/2011	Winter Storm	-	Berkeley	1/6/2022	Winter Storm	-
Berkeley	1/26/2011	Winter Storm	-	Morgan	1/9/2022	Winter Weather	-
Morgan	2/1/2011	Winter Weather	-	Berkeley	1/9/2022	Winter Weather	-
Morgan	2/1/2011	Winter Weather	-	Berkeley	1/16/2022	Winter Storm	-
Berkeley	2/1/2011	Winter Weather	-	Morgan	1/16/2022	Winter Storm	-
Berkeley	2/5/2011	Winter Weather	-	Morgan	2/13/2022	Winter Weather	-
Morgan	2/5/2011	Winter Weather	-	Morgan	2/24/2022	Winter Weather	-
Morgan	2/21/2011	Winter Weather	-	Berkeley	2/24/2022	Winter Weather	-
Berkeley	2/21/2011	Winter Weather	-	Berkeley	3/12/2022	Winter Storm	-
Berkeley	10/28/2011	Winter Storm	-	Morgan	3/12/2022	Winter Storm	-
Morgan	10/28/2011	Winter Storm	-	Berkeley	4/18/2022	Winter Weather	-
Morgan	1/20/2012	Winter Weather	-	Morgan	4/18/2022	Winter Weather	-
Berkeley	1/20/2012	Winter Weather	-	Morgan	12/14/2022	Ice Storm	-
Morgan	1/22/2012	Winter Weather	-	Berkeley	12/14/2022	Ice Storm	-
Berkeley	1/22/2012	Winter Weather	-	Morgan	12/22/2022	Winter Weather	-

Table 4.3.13-2: Hazardous Winter Weather Events in Berkeley and Morgan counties, 2000 – May 2026 (NCEI NOAA, 2026b).

County	Date	Type	Property Damage ($)	County	Date	Type	Property Damage ($)
Berkeley	12/24/2012	Winter Weather	-	Berkeley	12/22/2022	Winter Weather	-
Morgan	12/24/2012	Winter Weather	-	Morgan	1/25/2023	Winter Storm	-
Morgan	12/26/2012	Winter Storm	-	Berkeley	1/25/2023	Winter Weather	-
Berkeley	12/26/2012	Winter Storm	-	Berkeley	1/6/2024	Winter Storm	-
Berkeley	12/29/2012	Winter Weather	-	Morgan	1/6/2024	Winter Storm	-
Morgan	12/29/2012	Winter Weather	-	Berkeley	1/15/2024	Winter Weather	-
Morgan	1/15/2013	Winter Weather	-	Morgan	1/15/2024	Winter Weather	-
Berkeley	1/15/2013	Winter Weather	-	Morgan	1/19/2024	Winter Weather	-
Morgan	1/25/2013	Winter Weather	-	Berkeley	1/19/2024	Winter Weather	-
Berkeley	1/25/2013	Winter Weather	-	Morgan	2/13/2024	Winter Weather	-
Morgan	1/28/2013	Winter Weather	-	Berkeley	2/13/2024	Winter Weather	-
Berkeley	1/28/2013	Winter Weather	-	Morgan	2/16/2024	Winter Weather	-
Morgan	2/4/2013	Winter Weather	-	Berkeley	2/16/2024	Winter Weather	-
Morgan	2/22/2013	Winter Weather	-	Morgan	12/15/2024	Winter Weather	-
Berkeley	2/22/2013	Winter Weather	-	Berkeley	12/15/2024	Winter Weather	-
Morgan	3/6/2013	Winter Storm	-	Morgan	1/5/2025	Winter Storm	-
Berkeley	3/6/2013	Winter Storm	-	Berkeley	1/5/2025	Winter Storm	-
Berkeley	3/18/2013	Winter Weather	-	Morgan	1/19/2025	Winter Storm	-
Morgan	3/18/2013	Winter Weather	-	Berkeley	1/19/2025	Winter Storm	-
Morgan	3/24/2013	Winter Storm	-	Berkeley	1/20/2025	Winter Weather	-
Berkeley	3/24/2013	Winter Storm	-	Morgan	2/5/2025	Ice Storm	-
Morgan	11/26/2013	Winter Weather	-	Berkeley	2/5/2025	Winter Weather	-
Berkeley	11/26/2013	Winter Weather	-	Morgan	2/8/2025	Winter Weather	-
Berkeley	12/8/2013	Winter Storm	-	Berkeley	2/8/2025	Winter Weather	-
Morgan	12/8/2013	Winter Storm	-	Berkeley	2/11/2025	Winter Weather	-
Berkeley	12/10/2013	Winter Storm	-	Morgan	2/11/2025	Winter Weather	-
Morgan	12/10/2013	Winter Weather	-	Morgan	2/15/2025	Winter Weather	-
Morgan	12/14/2013	Winter Storm	-	Berkeley	2/15/2025	Winter Weather	-
Berkeley	12/14/2013	Winter Weather	-	Morgan	2/17/2025	Winter Weather	-
Morgan	1/2/2014	Winter Weather	-	Berkeley	2/17/2025	Winter Weather	-
Berkeley	1/2/2014	Winter Weather	-	Berkeley	12/2/2025	Winter Weather	-
Berkeley	1/5/2014	Winter Weather	-	Morgan	12/2/2025	Winter Weather	-
Morgan	1/5/2014	Winter Weather	-	Morgan	12/26/2025	Winter Weather	-
Berkeley	1/10/2014	Winter Weather	-	Berkeley	12/26/2025	Winter Weather	-
Morgan	1/21/2014	Winter Storm	-	Morgan	1/1/2026	Winter Weather	-
Berkeley	1/21/2014	Winter Storm	-	Berkeley	1/1/2026	Winter Weather	-

Table 4.3.13-2: Hazardous Winter Weather Events in Berkeley and Morgan counties, 2000 – May 2026 (NCEI NOAA, 2026b).							
County	Date	Type	Property Damage ($)	County	Date	Type	Property Damage ($)
Morgan	2/2/2014	Winter Weather	-	Morgan	1/24/2026	Winter Storm	-
				Berkeley	1/24/2026	Winter Storm	-
				Morgan	3/2/2026	Winter Weather	-
				Berkeley	3/2/2026	Winter Weather	-

Table 4.3.14-3: Number of Winter Storm Events per year in Berkeley and Morgan counties (NOAA NCEI, 2026b).			
Year	Number of Storms	Year	Number of Storms
1996	0	2012	2
1997	4	2013	8
1998	2	2014	9
1999	10	2015	3
2000	9	2016	4
2001	3	2017	2
2002	6	2018	6
2003	9	2019	7
2004	5	2020	2
2005	7	2021	5
2006	0	2022	6
2007	9	2023	1
2008	0	2024	2
2009	5	2025	4
2010	5	2026*	2
2011	3	**Total**	142
*Data was only available up to April 2026 on NOAA NCEI Storm Events Database.			

Furthermore, Tables 4.3.14-4 and 4.3.14-5 show the extreme snowfall maximums over a 1-day, 2-day and 3-day period in Berkeley and Morgan counties. These depths are based on data collected NOAA National Climatic Data Center at: https://www.ncei.noaa.gov/access/monitoring/snowfall-extremes/.

Table 4.3.14-4: Summary of Berkeley County Snowfall and Snow Depth Extremes (NOAA NCEI, 2026a).			
Time Period	Snow Amount (Inches)	Station Name	Date
1-Day	27	MARTINSBURG E W VIRGINIA RGNL	2/24/1914
2-Day	42	MARTINSBURG 2	2/7/2010
3-Day	42	MARTINSBURG 2	2/7/2010

Table 4.3.14-5: Summary of Morgan County Snowfall and Snow Depth Extremes (NOAA NCEI, 2026a).			
Time Period	**Snow Amount (Inches)**	**Station Name**	**Date**
1-Day	26.5	CACAPON ST PK #2	2/12/1983
2-Day	39	CACAPON ST PK #2	1/24/2016
3-Day	39	CACAPON ST PK #2	1/24/2016

4.3.14.4. Future Occurrence

Data from NOAA shows that winter storms are a regular occurrence in Berkeley and Morgan counties. According to the 2023 WV statewide HMP, the probability of future winter weather events for the entire state of West Virginia is 100% for heavy snow, ice storms, winter storms, and winter weather. Along with this, the state has a 12.5% chance of a blizzard and 0% for sleet occurring in any given year. So, the probability of the occurrence of damaging heavy snow or ice storm in the region in any given year is 100 percent for Berkeley and Morgan Counties. The future occurrence of winter storms and nor'easter hazards can be considered *possible* (between 1% & 49.9% annual probability*)* as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

The severity and frequency of major winter storms and nor'easters is expected to remain fairly constant. However, due to increased dependence on various modes of transportation and use of public utilities for light, heat, and power, the disruption from these storms is more significant today than in the past. The future occurrence of climatic events cannot be predicted exactly.

Climate projections show that while precipitation totals are expected to increase, the number of days below 32 degrees Fahrenheit may decrease. This may lead to a decrease in the number of winter storms. That said, the polar jet stream and arctic warming may play a part in large-scale storms still being a potential hazard. Cohen, Pfeiffer, and Francis (2018) noted that warming arctic temperatures have led to a weakening of the polar jet stream, which has allowed warmer, yet still very cold, arctic air to travel southward and provide the other half of the equation for the intense winter storms seen in the Northeast United States. There is a possibility these storms continue to occur and may even occur more frequently, with the warming Atlantic Ocean generating more fuel and the potential for more intense hot air-cold air clashes that strengthen storms (Feuerstein, 2022). However, this study has been criticized due to the small size of the 35-year sample and the potential for compounding factors impacting the data, as various climate modeling techniques have so-far been unable to reproduce the effect and confirm the linkage (Blackport and Screen, 2020). More studies are ongoing.

4.3.14.5. Vulnerability Assessment

Since winter storms are a regular occurrence in Berkeley and Morgan counties, as well as other

counties throughout West Virginia, strategies have been developed to respond to these events. Snow removal and utility repair equipment is present to respond to typical events. The use of auxiliary heat and electricity supplies such as wood burning stoves, kerosene heaters, and gasoline power generators reduces the vulnerability of specific structures. Locations lacking adequate equipment to protect against cold temperatures or significant snow and ice are more vulnerable to winter storm events. Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a twelve-hour period can cause a large number of traffic accidents, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems. Some rural areas of the region are susceptible to isolation due to the loss of telephone communications and road closings. Power failure and interruption of water supplies are common from ice storms, heavy snow, and blizzard conditions. All critical facilities in the region are vulnerable to winter storms

Ice storms also tend to occur several times per year. These storms usually cause temporary icy conditions that result in increased numbers of traffic accidents and falls, but little other impact. Severe ice storms bring a significant accumulation of ice, which can pull down branches, trees, and power lines. These can cause widespread power outages and it can take hours to days to restore service to all customers.

Areas of vulnerability include low-income and elderly populations, mobile homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding related to rapid snow melt.

Critical facilities would be impacted by a storm event, but these structures are largely constructed of concrete and masonry; therefore, they should only suffer minimal structural damage. Because power interruption can occur, backup power is recommended for critical facilities and infrastructure. Motorists may occasionally become stranded on major highways, especially I-81, during these storms. The people must be rescued and provided with shelter until conditions improve. Stranded motorists are also likely on WV Route 9 and in remote and mountain locations.

Vulnerability to the effects of winter storms on buildings is somewhat dependent on the age of a building because as building codes become more stringent, buildings can support heavier loads and as buildings age, various factors may deteriorate their structural integrity. Vulnerability also depends upon the type of construction and the degree to which a structure has been maintained.

The most vulnerable structures are those that were poorly built or are dilapidated. The weight of heavy snow or ice may lead to structural collapse or to minor damage. All structures and infrastructure in both counties are exposed to heavy snow and ice. Structures identified as potentially at risk are older structures. All existing buildings have the potential to experience heavy snow loads from a winter storm. Damages are estimated to be limited to the more dilapidated structures and structures with unreinforced masonry. The number of occupied housing units built before 1960 (at least 64 years

old) in Berkeley County is 7,385 and 1,676 for Morgan County (U.S. Census Bureau, 2024, ACS).

Table 4.3.14-6: Occupied Housing Units Built Before 1960 (U.S. Census Bureau, 2024, ACS).		
Jurisdiction	**Units**	**Percent**
Berkeley County	7,385	13.7%
Martinsburg	3,579	42.4%
Hedgesville	48	32.2%
Morgan County	1,676	18.2%
Bath	267	49%
Paw Paw	85	38.2%

All structures and infrastructure in Berkeley and Morgan counties will be exposed to heavy snow and ice. The adoption and continued enforcement of building codes should allow new construction to able to withstand the weight of heavy snow or ice.

Table 4.3.14-7 displays the expected annual losses to winter weather by census tract.

Table 4.3.14-7: Expected Annual Losses to Winter Weather by Census Tract (FEMA NRI, 2026e).			
Census Tract	**Municipalities**	**Expected Annual Losses ($)**	**Expected Annual Loss Rating**
54003971301	Martinsburg City	$9,938.51	Relatively High
54003971402	Martinsburg City	$7,598.37	Relatively Moderate
54003971500	Martinsburg City	$5,461.39	Relatively Moderate
54003971600	Martinsburg City	$7,401.74	Relatively Moderate
54003971700	Martinsburg City	$7,929.92	Relatively Moderate
54003971901	Martinsburg City	$9,218.11	Relatively High
54003971902	Martinsburg City	$7,425.68	Relatively Moderate
54003972002	Martinsburg City	$4,943.10	Relatively Moderate
54065970900	Paw Paw Town	$3,252.00	Relatively Moderate
54065970800	Bath (Berkeley Springs) Town	$5,107.86	Relatively Moderate
54003971205	Hedgesville Town	$6,325.66	Relatively Moderate

4.3.14.6. Populations at Risk

During winter storms there will be a disproportionate impact on low-income and marginalized communities. Low-income families are more likely to live in substandard housing that is less able to withstand extreme cold. These homes may lack sufficient heating, insulation, and weatherproofing, making them more vulnerable to damage from ice, snow, and cold temperatures. Many low-income

households also experience energy insecurity and may struggle to afford heating during winter months. Energy shutoffs due to unpaid bills can leave them dangerously exposed to cold weather. Elderly households or households with people with disabilities may also face additional challenges due to mobility issues. Icy conditions, snow buildup, and impassable roads or sidewalks can prevent them from leaving their homes.

HUMAN-MADE HAZARDS

Human-made hazards are events caused by humans and typically occur close to or within human settlements. These hazards include environmental degradation, violence, pollution, and accidents. Human-made hazards profiled in this HMP include civil disturbance, cyber terrorism, dam failure, hazardous materials incident, substance use disorder, source water contamination, terrorism, transportation incidents, and utility interruption.

4.3.15. Civil Disturbance

4.3.15.1. Location and Extent



Civil disturbance is a broad term that is typically used by law enforcement to describe one or more forms of disturbance caused by a group of people. Civil disturbances are typically a symptom of, and a form of protest against, major socio-political problems. Civil disturbance hazards include the following:

- **Famine;** when a substantial proportion of the population for a country or region lacks access to proper food, causing acute malnutrition and even death by starvation and disease. This can lead to instability in the country or region from an inability to deal with the crisis caused by famine (United Nations, 2024).
- **Economic Collapse, Recession;** Very slow or negative growth (The Economist, 2022).
- **Misinformation;** Erroneous information spread unintentionally (Makkai, 1970).
- **Civil Disturbance, Public Unrest, Mass Hysteria, Riot;** Group acts of violence against property and individuals, for example (18 U.S.C. § 232, 2026).
- **Strike, Labor Dispute;** Controversies related to the terms and conditions of employment, for example (29 U.S.C. § 113, 2026).

Typically, the severity of the action coincides with the level of public outrage. In addition to a form of protest against major socio-political problems, civil disturbances can also arise out of union protest, institutional population uprising, or from large celebrations that become disorderly. The scale and scope of civil disturbance events vary widely. However, government facilities, landmarks, prisons, and universities are common sites where crowds and mobs may gather.

4.3.15.2. 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. Often that which was intended to be a peaceful demonstration to the public and the government can escalate into general chaos. 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 (Blumer, 1946):

- **Casual Crowd:** A casual crowd is 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. They require substantial provocation to arouse group 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 crowd type is a group assembled to protest a cause.
- **Aggressive Crowd:** An aggressive crowd is comprised of individuals who have assembled and are visibly angry or violent. This crowd often has leaders who attempt to arouse the members or motivate them to action. Members are noisy and threatening and will taunt authorities. They tend to be impulsive and highly emotional, and require only minimal stimulation to arouse them to violence

A mob can be defined as a large disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent and lawless. Like crowds, mobs have different levels of commitment and can be classified into four categories (Alvarez and Bachman, 2023):

- **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 is attempting 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.

The worst-case scenario for the region would be an aggressive crowd or expressive mob protesting on or within a major thoroughfare, most likely formed near a major population hub, like Martinsburg. This scenario would also involve property damage.

The following community lifelines are at risk during a civil disturbance:

Table 4.3.15-1: Most Likely Lifelines Impacted by Civil Disturbance.	
Lifelines	**Notes**
	Community safety may be at risk requiring police intervention. Firefighters may be needed if there is a potential for fires to start.
	Medical personnel might be needed for response and recovery as participants may be injured, they may injure others, or demonstrations may impede emergency service operations.

4.3.15.3. Past Occurrences

In late May 2020, an uprising against racism and police brutality swept the nation. Triggered by the murder of George Floyd by Minneapolis Police in Minnesota, groups in cities and towns across the country hosted protests for several weeks, including in Berkeley and Morgan counties. Peaceful protests and riots occurred throughout the region during the summer months of 2020, in Berkeley Springs, Martinsburg, and other communities. In one instance at a Berkeley Springs protest in August 2020, thirty to fifty people gathered to show support for the Black Lives Matter protest but were met with hundreds of counter protesters carrying Confederate flags and overpowering the speakers of the rally with chants of "U.S.A" and "all lives matter." Police intervened and created a barricade with riot shields when counter protesters advanced towards the gazebo holding the speakers (Rhee, 2020a).

In late March and throughout April 2023 weekly protests occurred at Cacapon State Park as backlash to the WV DNR's plan to build an RV campground in the park. The campground would include 350 spots for RVs and other amenities. Residents were concerned about the ecological impacts, as were environmental groups like the West Virginia Rivers Coalition and Sierra Club, and even the Morgan County Commission. Project implementation would require excessive excavation and clear-cutting of trees and could potentially cause traffic and safety issues and overwhelm the park's sewer plant (Snyder, 2023). Due to the opposition, West Virginia decided to not move forward with the proposal.

More recently, several protests have occurred in response to the Trump Administration. On April 5, 2025, Berkeley Springs, along with 1,300 other towns and cities across the nation, held a "Hands Off" protest. The message of this rally was to tell the Trump Administration and Elon Musk to keep their "hands off" constitutional rights, social programs, government agencies, federal research, legal protections, and personal data. Throughout the United States, about 2 to 3 million people participated in these protests. Berkeley Springs had roughly 100 people turn out to the Morgan County Courthouse with handmade signs to protest. The protest was peaceful with no disturbances reported (Shunney, 2025).

Similarly, over 2,000 "No Kings" protests erupted throughout the nation on June 14, 2026, with over 10 million Americans participating. The goal of these rallies was to protest the overreach happening by the executive branch. One protest occurred in Morgan County at the Morgan County Courthouse and along N. Washington Street with nearly 200 people holding signs and waving American flags. Law enforcement officers were present; however, no major disturbances occurred at the rally (Schauer, 2025). Additionally, "No Kings" protests were planned for March 28, 2026 with one scheduled at the Morgan County Courthouse in Berkeley Springs and on the corner of King and Queen Streets in Martinsburg (Young, 2026).

Table 4.3.15-1: No Kings Protest in Berkeley Springs, Morgan County on June 14, 2025. (Photograph courtesy of Jim Hoyt / *The Morgan Messenger*, 2025).



Likewise, more than 200 high school students from Martinsburg and Hedgesville High Schools walked out of class from February 16-18, 2026. This demonstration was done to protest the increased U.S. Immigration and Customs Enforcement (ICE) activity throughout West Virginia following the Trump Administrations new policies (Jenkins, 2026).

4.3.15.4. Future Occurrences

Civil disturbance is always a possibility as long as there is discrimination or other perceived social or economic injustices. However, it may be possible to recognize the potential for an event to occur in the near-term. For example, an upcoming significant sporting event or other large public gathering in the State, or the response immediately after significant national news involving political or social debates may result in the gathering of large crowds. Local law enforcement should anticipate these types of events and be prepared to handle a crowd so that peaceful gatherings are prevented from turning into unruly public disturbances. Therefore, the probability of civil disturbance occurring in the region is considered *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

4.3.15.5. Vulnerability Assessment

Berkeley and Morgan Counties are most vulnerable to civil disturbance in their most populated municipalities: Martinsburg and Berkeley Springs. Jurisdictional losses for civil disturbance events are difficult to predict and can vary significantly in range. The two communities identified in this section are locations where such events are more likely to occur and therefore should be considered more vulnerable. Adequate law enforcement at these locations minimizes the changes of a small assembly of people turning into a significant disturbance. This will help with improved response times, optimal communications, and containment of the event as during these events major roadways can be blocked and disturb traffic and larger events may involve the interruption or removal of communication. More broadly, in the case of large civil disturbance events, the region may incur losses related to work stoppages in addition to any acts of vandalism that may occur. Failure to pursue a program of civil disturbance awareness may result in increased loss of lives and property

4.3.15.6. Populations at Risk

In terms of equity, communities with less access to the internet and smartphones may have difficulties getting updates on the state of a civil disturbance event. Outreach should also be provided in secondary languages for households with limited English and lower smartphone access and usage. Ensuring that evacuation plans and recovery services are accessible to everyone is critical.

Table 4.3.14-6: Vulnerable Households to Civil Disturbance (U.S. Census Bureau, 2024, ACS).

Jurisdiction	Limited English Speaking Households	Percent	No Telephone Service Available	Percent
Berkeley County	292	0.6%	597	1.2%
Martinsburg	16	3.7%	96	1.2%
Hedgesville	0	0%	2	1.4%
Morgan County	27	0.4%	89	1.2%
Bath	0	0%	0	0.0%
Paw Paw	0	0%	0	0.0%

4.3.16. Cyber Terrorism

4.3.16.1. Location and Extent



Cyber terrorism is a broad term that refers to acts associated with the convergence of terrorism and cyberspace. Generally, cyberterrorism involves unlawful attacks or threats against computers, networks, and the information stored therein to intimidate or coerce a government or its people to achieve political or social objectives (Denning, 2000). These acts can range from taking control of a host website, to using networked resources to directly cause destruction and harm. Table 4.3.16-1 includes the types and methods of cyberattacks as defined by the Pennsylvania Department of Homeland Security (PA DHS). A Pennsylvania resource was consulted because a similar West Virginia Resource could not be located and the information below is applicable beyond Pennsylvania state boundaries.

Table 4.3.16-1 Methods of Cyberattacks (PA DHS, 2017)

Threat	Description
Botnet (also zombies)	A collection of computers subject to control by an outside party, usually without the knowledge of the owners, using secretly installed software robots. The robots are spread by trojan horses and viruses. The botnets can be used to launch denial-of-service attacks and transmit spam.
Card Skimming	The act of using a skimmer to illegally collect data from the magnetic stripe of a credit, debit or ATM card. This information, copied onto another blank card's magnetic stripe, is then used by an identity thief to make purchases or withdraw cash in the name of the actual account holder. Skimming can take place at an ATM and can occur at restaurants, taxis, or other places where a user surrenders his or her card to an employee.
Denial-of-Service Attack	Flooding the networks or servers of individuals or organizations with false data requests so they are unable to respond to requests from legitimate users.
Malicious Code (also malware)	Any code that can be used to attack a computer by spreading viruses, crashing networks, gathering intelligence, corrupting data, distributing misinformation and interfering with normal operations.

Table 4.3.16-1 Methods of Cyberattacks (PA DHS, 2017)	
Threat	**Description**
Pharming	The act of sending an e-mail to a user falsely claiming to be an established legitimate enterprise to scam the user into surrendering private information that will be used for identity theft. The e-mail directs the user to visit a website where they are asked to update personal information, such as passwords and credit card, social security, and bank account numbers that the legitimate organization already has. The website, however, is bogus and set up only to steal the user's information.
Phishing	Using fake e-mail to trick individuals into revealing personal information, such as Social Security numbers, debit and credit card account numbers and passwords, for nefarious uses.
Spam	Unsolicited bulk e-mail that may contain malicious software. Spam is now said to account for around 81 percent of all e-mail traffic.
Spear Phishing	A type of phishing attack that focuses on a single user or department within an organization, addressed from someone within the company in a position of trust and requesting information such as login IDs and passwords. Spear phishing scams will often appear to be from a company's own human resources or technical support divisions and may ask employees to update their username and passwords. Once hackers get this data, they can gain entry into secured networks. Another type of spear phishing attack will ask users to click on a link, which deploys spyware that can thieve data.
Spoofing	Making a message or transaction appear to come from a source other than the originator.
Spyware	Software that collects information without a user`s knowledge and transfers it to a third party.
Trojan Horse	A destructive program that masquerades as a benign application. Unlike viruses, Trojan horses do not replicate themselves, but they can be just as destructive. One of the most insidious types of Trojan horse is a program that claims to rid your computer of viruses but instead introduces viruses onto your computer.
Virus	A program designed to degrade service, cause inexplicable symptoms or damage networks.

Table 4.3.16-1 Methods of Cyberattacks (PA DHS, 2017)	
Threat	**Description**
Worm	Program or algorithm that replicates itself over a computer network and usually performs malicious actions, such as using up the computer's resources and possibly shutting the system down. A worm, unlike a virus, has the capability to travel without human action and does not need to be attached to another file or program.

Cyberattacks may not always constitute acts of cyberterrorism because some acts may have relatively small impacts and only produce annoyances. A cyberattack is generally considered an act of cyberterrorism when the following motivations are present:

- **Effects-based:** When computer attacks result in effects that are disruptive enough to generate fear comparable to a traditional act of terrorism.
- **Intent-based:** When unlawful or politically motivated computer attacks are done to intimidate or coerce a government or people to further a political objective, or to cause grave harm or severe economic damage (Rollins and Wilson, 2007).

Cyberattacks can be further divided into the following categories based on the complexity of the attack:

- **Simple-Unstructured:** Simple-unstructured attacks are the most common. These are amateurish attacks with relatively minimal consequences.
- **Advanced-Structured:** Advanced-structured attacks are more sophisticated and consequential and have a greater emphasis on targeting victims prior to an attack, resulting in a more debilitating effect.
- **Complex-Coordinated**: Complex-coordinated attacks are the most advanced and most troublesome type of attacks where success could mean a network shutdown (Denning, 2000).

Cyber terrorism can cause severe disruptions to transportation, public safety, and utility services, all of which are critical infrastructure that are highly dependent on information technology. Cyber terrorism can take many forms, including attacks through physical means, electronic means, and use of malicious code. Cyber terrorists can also have a wide range of personal, political, or cultural agendas. All state agencies, as well as individuals, businesses, and other institutions in the region, are potential targets for cyberterrorism. Potential threats include identity theft, loss of sensitive information, disruption of services, and other malicious activity.

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. Cyberattacks are also unpredictable and typically occur without warning.

4.3.16.2. Range of Magnitude

In recent years, cyber terrorism has become a significant threat and can impact people, businesses, institutions, local governments, and state agencies to varying degrees. Impacts from a large-scale cyberterrorism event could disrupt the state's economy and potentially threaten its economic stability. The magnitude of a cyber terrorism attack will vary greatly based on the extent of systems affected and duration of the impact. Additionally, the magnitude will vary based upon which specific system is affected by an attack, the ability to preempt an attack, and an attack's effect on continuity of operations. The largest threat to institutions from cyber terrorism comes from any processes that are networked and controlled via computer. The county and individual municipalities should address and take measures to reduce any vulnerabilities that could allow access to sensitive data or processes.

4.3.16.3. Past Occurrences

During the COVID-19 Pandemic of 2020-2021, more than 50,000 West Virginians received attempted unemployment scam in their mail or email. Scott Adkins, acting commissioner with Workforce West Virginia, said they received more than 50,000 fraudulent claims based around the Pandemic Unemployment Assistance (PUA) program (WSAZ 3, 2020). Many attacks seemed to stem from credit bureau data breaches that exposed personally identifying details, and public officials sought to shore up government defenses to avoid agencies falling to such a breach themselves. This led to the creation and signing by Governor Justice of the Creating WV Cyber Incident Reporting Bill. The legislation is designed to lay the groundwork for tightening up cyber defenses and enable faster response to threats by helping state officials better understand the scope of problems impacting various agencies, learn about attacks soon after they happen and regularly review defense strategies (Patterson-Gordon, 2021).

On May 7, 2021, the Colonial Pipeline suffered a ransomware attack that impacted equipment managing the pipeline. In response, the Colonial Pipeline Company halted all the pipeline's operations. This caused gas shortages across the east coast, with some (limited) effects in West Virginia. This was the largest cyberattack on an oil infrastructure target in the history of the United States (Kerner, 2022).

Another large-scale attack was the Equifax data breach in 2017, which was estimated to potentially impact over 700,000 residents of West Virginia and over 145.5 million nationally. The information

accessed included names, Social Security numbers, birthdates, addresses, and driver's license numbers (WHSV, 2019). Additionally, in 2014 the largest data breach in history impacted over 3 billion Yahoo user accounts, including the names, email address, date of birth, and telephone numbers of over 500 million users (CSO, 2018). In terms of a data breach cyber-attack, this could be considered a worst-case scenario event. Large-scale data breach events are becoming more common.

Locally, several attacks have occurred. Region 9 mentioned during the June 15, 2021 RAMS meeting that Morgan County's server was hacked in 2020. To better protect themselves in the future, the county installed firewalls, created a Cloud, created a backup server, and hired an IT Director. Another cyber-attack against Morgan County 911 happened in May 2025 which disrupted multiple county systems for several days. The county disconnected data connections to the 911 center while investigating the incident. The Sheriff's Office reported impacts to the inmate roster and warrants system (CSIDB, 2025). The most significant cyberattack in Berkeley County was a 2023 ransomware attack against Berkeley County Schools, which caused internet and phone outages and disrupted school operations (The Record, 2023).

In addition to large-scale acts of cyber terrorism, smaller cyberattacks occur daily. Billions of emails are sent each day, and spam and phishing emails account for a significant share of all email traffic. Additionally, brute force attacks, which are trial and error attempts to obtain user passwords and pins, are frequently used by criminals attempting to crack encrypted data or gain access to private accounts. Firewalls can be effective at keeping security threats such as these out, but once a cybercriminal gains access to a system, they can attack from within. For example, gaining access to a state employees email account would allow a hacker to send additional phishing emails from within a network, which may not be as monitored as closely as attacks from outside the system. This is known as spear phishing.

4.3.16.4. Future Occurrences

Cyber terrorism is an emerging hazard that has the potential to impact the region's computer infrastructure and the systems and services that are provided to the public. Concerns about cyberterrorism throughout the United States is growing as its impacts could have potentially crippling effects. Security experts describe the threat of cyberterrorism as imminent. The future occurrence of cyberterrorism can be considered *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

The West Virginia Office of Technology's website details mitigation tactics that individuals and business owners can take to prevent breaches in cybersecurity, including daily cyber security tips and presentations (WV Office of Technology, 2021).

4.3.16.5. Vulnerability Assessment

Generally, cyber terrorism has no direct effect on the environment; however, the environment may be affected if a hazardous materials incident occurred because of critical infrastructure failure as a result of cyber terrorism. Similarly, an act of cyber terrorism on a hazardous materials facility could have devastating environmental consequences if the plant suffered an intentional release. Please see Section 4.3.18 for more information on hazardous materials incidents.

All county and municipal facilities are vulnerable to cyber terrorism. While the physical structures of these buildings are generally not at risk, information systems and data stored within them are vulnerable. Government computer networks contain sensitive information that is integral to the security of the State and could be the target of a cyberattack. County and municipal governments may also possess and maintain forms of personal and financial information, including tax filings, birth and death records, Social Security numbers, medical information, and more. Additionally, many critical facilities that are essential to Berkeley and Morgan Counties's operations are reliant upon computer networks to monitor and control critical functions. For example, an attack on internet access or the power grid could have detrimental impacts on county services and functions. Additionally, a large-scale computer breach could lead to economic costs in lost productivity to the impacted agency/organization and potentially related businesses and industries. However, lost revenues and productivity would depend on the type of magnitude of the cyber terrorism event.

All communities in the region are vulnerable on some level, directly or indirectly, to a cyber terrorism attack. However, in general, areas with higher concentrations of government or industry facilities may have higher risk. Berkeley County is likely more susceptible to a cyber terrorism attack than Morgan County as it has higher concentrations of people, businesses, and critical infrastructure.

4.3.16.6. Populations at Risk

Households with those 65 or older may be more susceptible to cyber-attacks as older adults tend to have lower levels of digital literacy compared to younger generations. This makes them more susceptible to scams, phishing, and other forms of cybercrime. The Town of Bath has the greatest percentage of 65+ individuals 28.2% older adults, while the City of Martinsburg has the greatest population of 65+ individuals with 3,096 people. These two communities may be more susceptible to cyber-attacks. People in low-income or marginalized communities often have less access to education and resources on cybersecurity. The communities may not be able to afford the most up to date technology or cybersecurity tools, such as firewalls, antivirus, or secure home networks leaving them more exposed to cyber threats.

4.3.17. Dam Failure



Due to data sensitivity, the Dam Failure profile can be found in **Appendix F**.

4.3.18. Hazardous Materials Incident

4.3.18.1. Location and Extent



Hazardous material incidents pose threats to the natural environment, the built environment, and public safety through the diffusion of harmful substances, materials, or products. Hazardous materials can include toxic chemicals, infectious substances, bio-hazardous waste, and any materials that are explosive, corrosive, flammable, or radioactive. Hazardous material releases can occur wherever hazardous materials are manufactured, used, stored, or transported. Such releases can occur along transportation routes, including road and rail, or at fixed-site facilities. Hazardous material releases can result in human and wildlife injury, property damage, and contamination of air, water, and soils.

Fixed-site facilities that use, manufacture, or store hazardous materials in Berkeley and Morgan Counties pose risk and must comply with both Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA). This legislation requires that all owners or operators of facilities that manufacture, produce, use, import, export, store, supply, or distribute any extremely hazardous substance, as defined by the EPA, at or above the threshold planning quantity, as established by EPA, shall report to the county where the facility is located and to the state that the facility is subject to the requirement to assist the Local Emergency Planning Committee (LEPC) in the development of an Off-site Emergency Response Plan. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities. Due to the sensitive nature of SARA facility information, Berkeley and Morgan Counties will not release information regarding specific SARA facilities for this plan. However, reports from facilities that have released toxic material into the environment are accessible by the public under the Toxic Release Inventory (TRI). TRI was established under EPCRA and expanded under the Pollution Prevention Act of 1990.

In general, facilities that utilize hazardous materials are located near major thoroughfares and in more developed areas of Berkeley County. Figure 4.3.18-1 shows the general location of hazardous materials facilities in each county. Morgan County houses no TRI facilities, while only the eastern half of Berkeley County contains TRI facilities. Some notable facilities in Berkeley County, which report through the EPA TRI, are listed in Table 4.3.18-1.

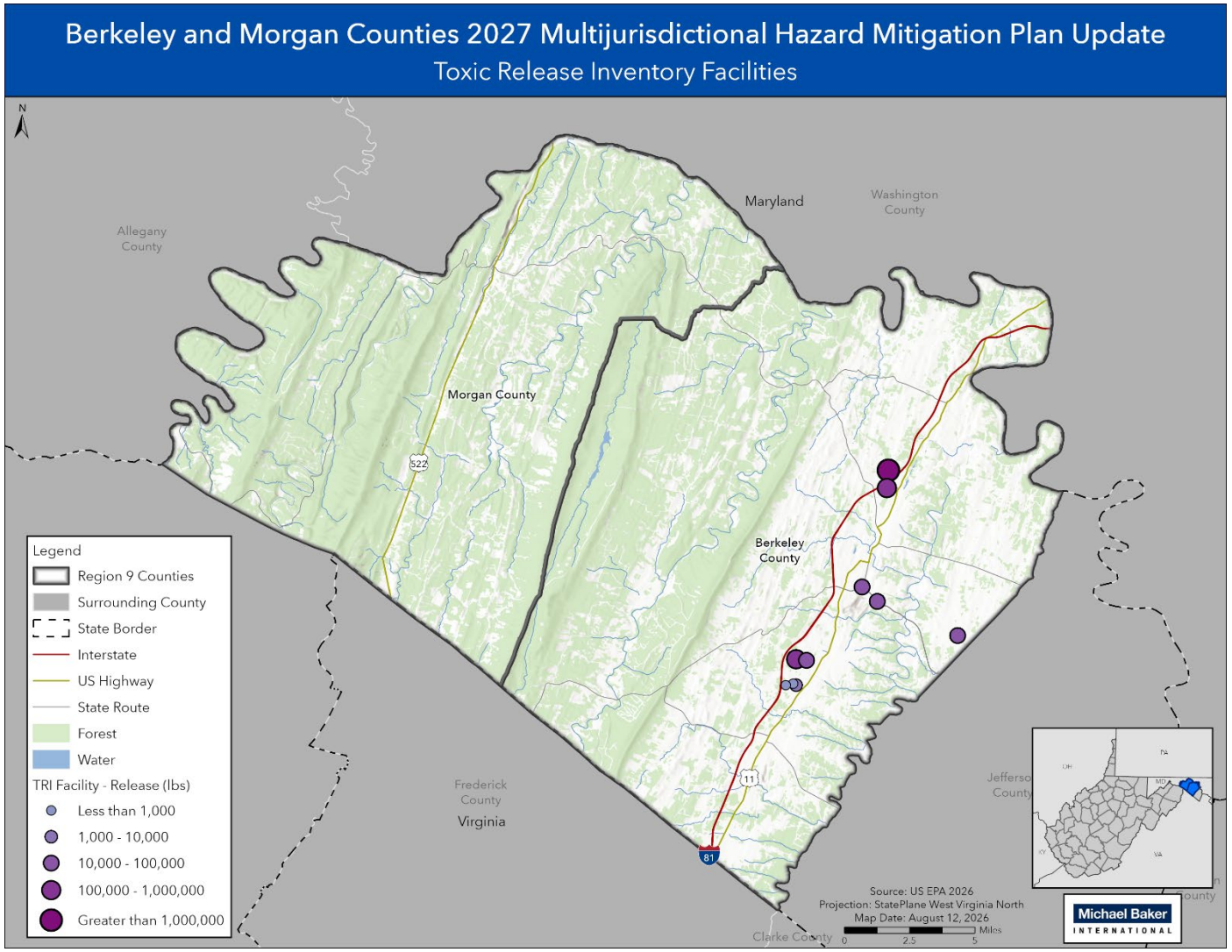
Table 4.3.18-1: TRI Facilities in Berkeley County and Each Facility's Top Three Released Chemicals (EPA, 2026g).				
Facility	**Address**	**Chemical 1 Released**	**Chemical 2 Released**	**Chemical 3 Released**
ALLMINE PAVING LLC	1042 Development Drive, Inwood, Wv 25428	Benzo[g,h,i]perylene	Polycyclic aromatic compounds	
ARGOS USA - MARTINSBURG	1826 S Queen St, Martinsburg, Wv 25401	Ammonia	LEAD and LEAD COMPOUNDS	MANGANESE and MANGANESE COMPOUNDS
ASSOCIATED ASPHALT MARTINSBURG LLC	855 Corning Way, Martinsburg, Wv 25405	MANGANESE and MANGANESE COMPOUNDS	MANGANESE and MANGANESE COMPOUNDS	Polycyclic aromatic compounds
BUREAU OF ALCOHOL TOBACCO FIREARMS & EXPLOSIVES	244 Needy Rd, Martinsburg, Wv 25405	Lead	LEAD and LEAD COMPOUNDS	
CHEM-PAK INC	242 Corning Way, Martinsburg, Wv 25405	N-Hexane	Toluene	Xylene (mixed isomers)
CONCRETE PIPE & PRECAST LLC-MARTINSBURG PRECAST PLANT	Corning Way, Martinsburg, Wv 25405	Lead		
CONTINENTAL BRICK CO	154 Charles Town Rd, Martinsburg, Wv 25405	Hydrochloric acid	Hydrogen fluoride	
ECOLAB INC	942 Baker Rd, Martinsburg, Wv 25405	2-Phenylphenol	Ammonia	Certain glycol ethers
FASLOC INC POTOMAC RIVER PLANT	447 Dupont Rd, Martinsburg, Wv 25404	Benzoyl peroxide	Styrene	Acetone
GENERAL HYDROPONICS	10612 Apple Harvest Dr, Martinsburg, Wv 25403	Nitrate compounds (water dissociable; reportable only when in aqueous solution)		
KNAUF INSULATION INC.	4812 Tabler Station Rd, Inwood, Wv 25428	Ammonia	CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)	MANGANESE and MANGANESE COMPOUNDS
MAAX US CORP.	718 Midatlantic Pkwy, Martinsburg, Wv 25401	Methyl methacrylate	Styrene	Dimethyl phthalate
PROCTER & GAMBLE TABLER STATION MANUFACTURING PLANT	396 Development Dr, Inwood, Wv 25428	Certain glycol ethers	Nitrate compounds (water dissociable;	Zinc compounds

Table 4.3.18-1: TRI Facilities in Berkeley County and Each Facility's Top Three Released Chemicals (EPA, 2026g).				
Facility	**Address**	**Chemical 1 Released**	**Chemical 2 Released**	**Chemical 3 Released**
			reportable only when in aqueous solution)	
QUAD/GRAPHICS INC	855 Caperton Blvd Attn: Environ. Coord., Martinsburg, Wv 25403	CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)	COPPER and COPPER COMPOUNDS	Toluene
VARIFORM INC.	91 Variform Dr, Martinsburg, Wv 25405	ANTIMONY and ANTIMONY COMPOUNDS	CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)	MANGANESE and MANGANESE COMPOUNDS

In addition to fixed-site hazardous materials release, there are increasingly large numbers of chemicals, oils, radioactive materials, and other hazardous substances spilled as a result of highway, rail, and waterway accidents, storage tank leakage, pipeline break, and/or other accidents. On occasion, these events become a major disaster and force people to evacuate and/or lose their homes and businesses. According to the U.S. DOT's Office of Operations and the U.S. Census Bureau, it is estimated that 11 percent of all freight transported by trucks is hazardous material.

A number of major highways can be used in the region for the transport of hazardous materials including I-81, US-11, US-522, and WV-9. Additionally, many of these roads cross rivers and streams and travel through downtown and residential areas, increasing the potential to pollute surface water and groundwater and cause harm to life and property.

Figure 4.3.18-1: Toxic Release inventory Facilities within Berkeley and Morgan Counties



4.3.18.2. Range of Magnitude

Hazardous material incidentscan contaminate air, water, and soils, possibly resulting in death and/or injuries. 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. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

With a hazardous material incident, whether accidental or intentional, there are several potentially exacerbating or mitigating circumstances that will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous material release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous material release include:

- **Weather conditions**. Affects how the hazard occurs and develops
- **Micro-meteorological effects of buildings and terrain**. Alters dispersion of hazardous materials
- **Non-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 severity of the incident is dependent not only on the circumstances described above, but also with the type of material released and the distance and related response time for emergency response teams. The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (i.e., centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

A worst-case scenario event of a hazardous material incident would be if a release occurred in the most populous areas, such as dense Martinsburg neighborhoods. A hazardous material incident would likely cause the evacuation of all nearby residents. Alternatively, a release on a major regional highway, such as I-81, could injure motorists and/or shut down traffic for hours.

The environmental impacts of hazardous material incidents include:

- Hydrologic effects – surface and groundwater contamination
- Other effects on water quality such as changes in water temperature
- Damage to streams, lakes, ponds, estuaries, and wetland ecosystems

- Air quality effects – pollutants, smoke, and dust
- Loss of quality in landscape
- Reduced soil quality
- Damage to plant communities – loss of biodiversity; damage to vegetation
- Damage to animal species – animal fatalities; degradation of wildlife and aquatic habitat; pollution of drinking water for wildlife; loss of biodiversity; disease.

A worst-case scenario event for a hazardous materials incident would be a large fire at the Quad/Graphics facility or other hazardous material-containing facilities of similar size. A large fire would result in the release and/or combustion of significant quantities of hazardous chemicals, threatening nearby residents and businesses and endangering or preventing any response from firefighters.

The potential impacts of hazardous materials incidents on community lifelines are as follows:

Table 4.3.18-2: Most Likely Lifelines Impacted by Hazardous Materials Release.

Lifelines	Notes
	Fire departments may be called into response and recovery if leaks or other issues result in explosions and fires.
	Impacts from hazardous materials releases include environmental contamination, which can impact agricultural operations and water supplies.
	Releases can have adverse impacts on communities, leading to more strain on the local healthcare system.
	There are potential negative consequences of incidents occurring while transporting these materials. These incidents may cascade into impacts associated with environmental contamination depending on size and how far the contaminate is able to move.

4.3.18.3. Past Occurrence

There have been no catastrophic or worst-case scenario hazardous materials incidents in Berkeley or Morgan County. However, several recent minor incidents have been identified that could be indicative of the risk Berkeley and Morgan Counties may face. These incidents had the potential to be much more severe than their final resolution, but thanks to proper and rapid responses by emergency responders and facility employees, the impact of these incidents was limited.

Table 4.3.18-3 highlights all HazMat Incident Reports reported by the U.S. Department of Transportation from 2000- August 2026.

Table 4.3.18-3: HazMat Incident Statistics for Berkeley and Morgan Counties (USDOT 2026).

Incident City	Date of Incident	Commodity Released	Mode of Transport
Martinsburg	8/7/2026	Corrosive liquid, acidic, organic, N.O.S	Highway
Martinsburg	6/24/2026	Hydrogen peroxide, aqueous solutions with not less than 20 percent but not more than 40 percent hydrogen peroxide	Highway
Martinsburg	6/23/26	Paint including paint, lacquer, enamel, stain, shellac, solutions, varnish, polish, liquid filler and liquid lacquer base	Highway
Martinsburg	6/19/26	Lithium ion batteries including lithium ion polymer batteries	Highway
Martinsburg	3/25/2026	Hypochlorite solutions with more than 5 percent but less than 16 percent available chlorine	Highway
Martinsburg	2/12/2026	Hypochlorite solutions with more than 5 percent but less than 16 percent available chlorine	Highway
Martinsburg	10/31/25	Formic acid with not less than 5% but less than 10% acid by mass	Highway
Martinsburg	10/1/2025	Isopropanol or Isopropyl Alcohol	Highway
Inwood	3/14/2024	Sodium hydroxide	Highway
Martinsburg	2/20/2023	Nitric acid other than red fuming, with more than 70 percent nitric acid	Highway
Martinsburg	9/6/2022	Methanol	Highway
Martinsburg	8/3/2022	Sodium hydroxide	Highway
Martinsburg	10/29/2021	Sodium hydroxide, solution, nitric acid other than red fuming, corrosive liquid, acidic	Highway
Martinsburg	10/20/2020	hydrogen peroxide, aqueous solutions	Highway
Berkeley Springs	2/8/2009	Liquefied petroleum gas	Highway
Martinsburg	6/5/2015	hydrogen peroxide, aqueous solutions	Highway
Martinsburg	8/19/2014	hydrogen peroxide, aqueous solutions	Highway
Charles Town	4/28/2014	toxic liquid, inorganic, n.o.s.	Highway
Martinsburg	12/10/2013	gasoline includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	Highway
Martinsburg	10/24/2013	hydrogen peroxide, aqueous solutions	Highway
Berkeley Springs	11/12/2012	gasoline includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	Highway

Table 4.3.18-3: HazMat Incident Statistics for Berkeley and Morgan Counties (USDOT 2026).			
Incident City	**Date of Incident**	**Commodity Released**	**Mode of Transport**
Martinsburg	1/18/2012	elevated temperature liquid, n.o.s., at or above 100 c and below its flash point (including molten metals, molten salts, etc.)	Highway
Martinsburg	8/30/2010	liquefied petroleum gas	Highway
Martinsburg	1/27/2010	acetic acid, glacial or acetic acid solution, with more than 80 percent acid, by mass	Highway
Martinsburg	12/30/2009	resin solution, flammable	Highway
Hedgesville	3/17/2009	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	7/3/2007	resin solution, flammable	Highway
Martinsburg	10/11/2006	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Falling Waters	10/11/2006	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	8/30/2006	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Kearneysville	2/4/2006	sodium hydroxide, solution	Rail
Inwood	1/18/2006	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	9/16/2005	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Falling Waters	7/16/2005	paint including paint, lacquer, enamel, stain, shellac solutions, varnish, polish, liquid filler and liquid lacquer base	Highway
Martinsburg	11/9/2004	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Inwood	10/12/2004	sodium hydroxide, solution	Highway
Martinsburg	9/27/2004	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	7/27/2004	corrosive liquid, acidic, organic, n.o.s.	Highway
Martinsburg	6/4/2004	resin solution, flammable	Highway
Berkeley Springs	4/29/2004	phosphoric acid solution	Highway
Inwood	12/24/2003	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Berkeley Springs	12/23/2003	elevated temperature liquid, n.o.s., at or above 100 c and below its flash point (including molten metals, molten salts, etc.)	Highway
Martinsburg	12/22/2003	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	11/25/2003	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	7/11/2003	hypochlorite solutions	Highway
Martinsburg	5/7/2003	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Berkeley Springs	4/29/2003	phosphoric acid solution	Highway
Martinsburg	3/17/2003	diesel fuel	Highway

Table 4.3.18-3: HazMat Incident Statistics for Berkeley and Morgan Counties (USDOT 2026).			
Incident City	**Date of Incident**	**Commodity Released**	**Mode of Transport**
Martinsburg	2/5/2003	resin solution, flammable	Highway
Inwood	2/3/2003	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Bunker Hill	11/13/2002	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	8/8/2002	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	4/29/2002	hydrogen peroxide, aqueous solutions	Highway
Martinsburg	2/28/2002	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Hedgesville	10/10/2001	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Inwood	9/27/2001	sulfuric acid with more than 51 percent acid	Highway
Berkeley Springs	5/9/2000	Hydrochloric acid solution	Rail
Martinsburg	3/5/2001	diesel fuel	Highway
Martinsburg	1/4/2001	sulfuric acid	Highway
Martinsburg	9/28/2000	fuel oil, no. 1, 2, 4, 5, or 6	Highway
Martinsburg	9/11/2000	styrene monomer, stabilized	Highway
Martinsburg	8/2/2000	elevated temperature liquid, n.o.s., at or above 100 c and below its flash point (including molten metals, molten salts, etc.)	Highway

Martinsburg Chemical Leak (December 23, 2019) - The site of the incident was a sewage treatment plant on 500 East John Street, where a chlorine spill caused vapor to escape into the surrounding area. The evacuation order extended in a half-mile radius from the treatment plant. The spill occurred during a transport tanker offload in which sodium hypochlorate and ferric chloride were accidentally mixed (Holmes, 2019). A photo of a road closure caused by this incident can be seen in Figure 4.3.18-2.

Figure 4.3.18-2: Martinsburg Police block traffic along State Circle, closing traffic due to a chlorine leak at the water treatment plant on East John Street (LeRose & Francis, 2019)



Berkeley Springs Fuel Spill (October 16, 2014) – A diesel fuel of unknown origin leaked into Warm Springs Run and the sanitary sewer system. Several reports of a fuel odor were made to 911 by Bath residents. There was no contamination of source water, as the water intake for the municipal water system was not located near the spill (Lovelace, 2015).

U.S. Silica Acid Spill (May 13, 2014) – An employee of U.S. Silica in Berkeley Springs was moving an empty tank and failed to uncouple a hose attached to a pipe. This caused three lines to rear, resulting in a release of 50 gallons of sulfuric acid 250 gallons of sodium hydroxide, and 75 gallons petroleum sulfonate into a secondary containment area. Emergency responders prepared to evacuate parts of Sand Mine Road and Fairview Drive should any vapors impact nearby residential areas, and initially closed Route 522, though it was quickly reopened (Strader, 2014).

Ecolab Acid Leak (January 31, 2014) – A small fire in the insulation of an aboveground storage tank (with a 10,000 gallon maximum capacity) holding 4,000 gallons of acetic acid at the Ecolab Martinsburg plant resulted in a release of the tank's contents into a concrete containment area. Nearby residents downwind of the plant were evacuated and the release of students was delayed at nearby schools. There were no injuries and no chemicals were released into the environment, and the fire was controlled in about 15 minutes (Umstead & Dearth, 2014).

I-81 Ecolab HazMat Spill (August 25, 2009) – A leak was discovered by a tractor trailer driver shipping material from Ecolab in Martinsburg. The interstate was closed down and a response perimeter was

established. Emergency responders identified the leaking material as floor wax, which is not considered hazardous. However, other materials being shipped by the tractor trailer were corrosive and hazardous. The interstate was re-opened shortly after the leak was identified (Your4State, 2009a).

Quad/Graphics Facility Fire (June 12, 2009) – A fire began at one of the commercial printing presses at the Quad/Graphics Martinsburg facility. The fire began when a broken part of the press caused a hydraulic fluid leak, which then ignited due to the high ambient air temperatures in the building. The fire was confined to the press. No injuries were reported, and though it took about an hour to control the fire, most of that time was spent trying to draw smoke out of the facility. The smoke caused about $100,000 in damages. According to Table 4.3.18-1, Quad/Graphics is one of the largest hazardous material facilities in the region, with significant amounts of highly flammable chemicals on-site (Printing Impressions, 2009).

Another incident connected to hazardous materials was the discovery of a clandestine methamphetamine laboratory in the basement of a house in Berkeley Springs that resulted in the arrest of two individuals on March 5, 2014. Such labs are identified as a source of hazardous material, as methods used to "cook" the drug involve caustic and explosive chemicals. These chemicals are typically not disposed of properly either and can contaminate soil and water on the property. The WV DEP and police receive special training in how to conduct a proper and safe response to methamphetamine laboratory situations. These labs can pose not only a risk to responders and those manufacturing the drug, but also to nearby residents (Shunney, 2014).

Hazardous material releases on transportation routes cannot be discounted either. According to data from the U.S. Department of Transportation, seven hazardous materials transportation incidents have occurred in Martinsburg since 1977 that resulted in $5,000 of damage or more. One particular incident occurred in 1992 when 300 gallons were released from a portable tank of sodium hydrosulfide that resulted in 11 injuries. Four incidents with damages of $5,000 or more have occurred in Berkeley Springs since 1986. A cargo tank motor vehicle carrying elevated temperature liquid released 2,000 gallons in Berkeley Springs in 2003, causing over $100,000 in damages. All reported incidents occurred on the highway (USDOT, 2026).

There is also active construction of a 24-mile natural-gas distribution-line project that Mountaineer Gas Co. is constructing from Morgan County, W.Va., to the northern end of the company's system in the Martinsburg. A second segment of the expansion project includes extending natural-gas service from near the Berkeley-Jefferson County line where it currently ends to the Rockwool stone-wool-insulation manufacturing plant under construction about three miles away in Ranson, WV.. A third segment project also has been considered for the Shepherdstown area. Statewide, Mountaineer Gas has proposed more than $119 million in infrastructure and system enhancements through 2023, including about $16.5 million in the Eastern Panhandle that includes the extension of gas service to the Rockwool plant site off Charles Town Road. This pipeline poses a hazard for both counties, but no serious incidents have been reported thus far.

4.3.18.4. Future Occurrence

While some hazardous material release incidents have occurred in Berkeley and Morgan Counties in the past, they are generally considered difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group. Intentional acts are addressed under Section 4.3.21, Terrorism. Future occurrences could take place at any facility making use of or storing hazardous materials or any thoroughfare for hazardous materials into, out of, or through each county.

Many steering committee members predict that there will be an increase in hazardous waste incidents moving forward. These incidents are likely to occur in areas of growth, such as the I-81 corridor near Martinsburg, as indicated in the Berkeley County Comprehensive Plan Growth Management Map. Highway improvements, such as the Berkeley Springs US-522 Bypass project that is currently taking place, may also cause an increase in truck traffic as highways are widened and improved. Overall, the probability of future hazardous materials incidents is *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology (See Section 4.4.1-1).

4.3.18.5. Vulnerability Assessment

Areas that are home to one or more hazardous materials facilities should be considered vulnerable to hazardous materials incidents from fixed facilities. Table 4.3.18-1 shows the most significant TRI facilities in Berkeley County. As shown in Figure 4.3.18-1, all of Morgan County and western Berkeley County do not have any current TRI facilities and therefore, have a much lower relative vulnerability to fixed hazardous materials incidents. All TRI facilities are concentrated throughout the eastern extent of Berkeley County,

As shown in Table 4.3.18-4, the unincorporated areas of Berkeley County and the City of Martinsburg are the only areas to have TRI facilities. Within a 1.5-mile radius from each TRI facility in Berkeley County and Martinsburg, there are 21,065 and 6,032 structures, respectively. This represents about 20.2% of all buildings in Berkeley County and 58.3% in Martinsburg. Within a 1.5-mile radius from each TRI Facility, there are 23 critical facilities, representing about 44.2% of all critical facilities in Berkeley County. As for Martinsburg, 11 critical facilities (68.8%) are within a 1.5-mile radius of TRI facilities. The unincorporated areas of Berkeley County house 24,466 people (23.8%) within 1.5 miles of a TRI facility. Although a smaller amount, Martinsburg houses a higher percentage (57.6%) of its population within 1.5 miles of a TRI facility.

Table 4.3.18-4: Community TRI Vulnerability for Berkeley and Morgan Counties.									
Jurisdiction	Total Structures	Total Structures within 1.5 Miles of TRI Facility	Percent of Structures within 1.5 Miles of TRI Facility	Total Population	Population within 1.5 Miles of TRI Facility	Percent of Population within 1.5 Miles of TRI Facility	Total Critical Facilities	Critical Facilities in within 1.5 Miles of TRI Facility	Percent of Critical Facilities within 1.5 Miles of TRI Facility
Bath	504	0	0.0%	753	0	0.0%	3	0	0.0%
Berkeley Unincorporated	104,115	21,065	20.2%	102,999	24,466	23.8%	52	23	44.2%
Hedgesville	276	0	0.0%	300	0	0.0%	0	0	0.0%
Martinsburg	10,342	6,032	58.3%	18,777	10,808	57.6%	16	11	68.8%
Morgan Unincorporated	22,977	0	0.0%	15,900	0	0.0%	11	0	0.0%
Paw Paw	481	0	0.0%	410	0	0.0%	4	0	0.0%

Areas of each county located near major transportation routes that could be used to transport hazardous materials locally or regionally could be sources of non-fixed hazardous materials incidents. I-81, Route 522, and WV Route 9 as demonstrated by previous incidents, pose a significant threat in Berkeley County. Hazardous material incidents here can result from crashes, overturning, leaks, or other events involving vehicles carrying hazardous materials. Railroads are also used to transport some types of hazardous materials. The location of rail lines in Berkeley and Morgan Counties is shown in Figure 4.3.22 and discussed further in Section 4.3.22. CSX rail lines run along the northern and western edge of Morgan County and through the center of Berkeley County. It is possible that these rail lines are used to transport crude oil and other hazardous materials that could leak if crashes, derailments, or other disastrous events occur along rail lines (Evans, 2015).

Many areas of West Virginia are vulnerable to hazardous materials incidents connected directly with oil and gas wells, but according to the WV DEP's Office of Oil and Gas there are no permitted oil or gas operations in the Eastern Panhandle region (TAGIS WV DEP, 2021b).

4.3.18.6. Populations at Risk

Marginalized communities, particularly low-income and minority populations, are often located near industrial facilities, waste sites, and transport routes for hazardous materials. These areas are more likely to experience spills, leaks, or accidents involving toxic substances making them more

susceptible. Children, the elderly, and people with preexisting health conditions are particularly vulnerable to the effects of hazardous materials. Municipalities with high concentrations of these groups should plan accordingly.

4.3.19. Substance Use Disorder

4.3.19.1. Location and Extent



Substance Use Disorder (SUD) is complex a condition in which there is uncontrolled use of a substance despite harmful consequence. People with SUD have an intense focus on using a certain substance(s) such as alcohol, tobacco, or illicit drugs, to the point where the person's ability to function in day-to-day life becomes impaired. People keep using the substance even when they know it is causing or will cause problems (Torrise, 2024).

Opioid addiction occurs when an individual becomes physically dependent on opioid, a class of drugs that reduces pain. Opioid is used as a broad term and includes opiates (natural opioids), which are drugs extracted from the seed pods of opium poppy plants. Opioids can also be semi-synthetic, meaning made in laboratories by chemically processing natural opioids, or synthetic, meaning it was made entirely in a laboratory with no natural ingredients (NIDA, 2024). According to the Alcohol and Drug Foundation (2025), opioids come in many forms such as tablets, capsules, syrup, films, nasal spray, skin patches, or injections.

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. Prescription opioids can be synthetic - methadone, oxycodone (OxyContin), or hydrocodone (Vicodin), or natural, like morphine (CDC, 2025a).
- **Fentanyl:** A powerful synthetic opioid that is 50 times stronger than heroin and 100 times more powerful than morphine and used for treating severe pain. Illegally made and distributed fentanyl is becoming more prevalent (CDC, 2024b).
- **Heroin:** An illegal, highly addictive natural opioid processed from morphine that can be injected, smoked, and/or snorted. Heroin has mostly been replaced by illegally made fentanyl (IMF) and most heroin available has been combined with IMF. About 5% of all opioid overdose deaths in 2023 involved heroin. The rate of heroin overdose deaths in the United States has been decreasing since 2018 (CDC, 2025b).

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. In 2024, West Virginia ranked 1st in the nation for drug overdose deaths per 100,000 total population. The CDC listed West Virginia as having a drug mortality rate of 48.9 deaths per 100,000 West Virginians (CDC, 2026a). Nationwide, the odds of dying from accidentally overdosing surpass

dying from an automobile accident (Flower & Senthilingam, 2019).

4.3.19.2. Range of Magnitude

Substance Use Disorder (SUD) can lead to overdose, which can be fatal. The most dangerous side effect of a drug overdose is depressed breathing. The lack of oxygen to the brain causes permanent brain damage, leading to organ failure, and eventually, death. Signs and symptoms include respiratory depression, drowsiness, disorientation, pinpoint pupils, and clammy skin.

Opioid use during pregnancy can also impact a fetus in the womb. The incidence of this condition, known as neonatal abstinence syndrome, increased from 4.6 per 1,000 births to 6.7 per 1,000 between 2012 and 2016 in the United States, with opioid usage during pregnancy continuing to rise (Anbalagan and Mendez, 2022). There are additional ways substance use disorder can impact more than just those that suffer from it. Those individuals are a part of families, and the impacts of their substance use can disrupt their families across generations. They are also a part of Berkeley and Morgan Counties communities. There may be impacts on the counties educational systems, social services such as child welfare, food insecurity, reducing productivity, and more. There are emotional, societal, and fiscal impacts that go beyond the direct effects to individuals, or the economic impacts calculated at the local and state level. This range of impacts suggests that treatments and mitigation measures should consider a more holistic perspective, even pursuing goals around community resilience as compared to targeting individuals.

First responders — paramedics, police officers, and fire fighters — are also affected by West Virginia's substance use crisis. In addition to the crisis consuming time and resources, first responders also face exposure risk, particularly to synthetic fentanyl. The most likely method of exposure is skin exposure, which clinical toxicology experts state presents an extremely low risk. Additional methods of exposure are inhalation, ingestion, contact with a mucous membrane, or with a needlestick (North Carolina Department of Health and Human Services, 2017). According to the US DHHS National Institute on Drug Abuse (NIDA), as little as 2 milligrams of fentanyl, the equivalence of a few grains of salt, can be fatal (NIDA, 2025). Since fentanyl is indistinguishable from several other narcotics and powdered substances, first responders must take extra precaution when dealing with calls related to drug abuse.

According to a recent study, environmental scientists at the Cary Institute of New York found traces of opioids and other drugs in streams, rivers, and lakes. These traces came from human urine and feces, and medications that have been flushed down the toilet. The EPA suggests that pharmaceuticals entering the waterways negatively affect aquatic ecosystems, including fish and animal populations (EPA, 2025).

The potential impacts of substance abuse on community lifelines are as follows:

Table 4.3.19-1: Most Likely Lifelines Impacted by Substance Abuse.	
Lifelines	**Notes**
	Government services are needed to aid individuals with substance use disorders. First responders may be at risk of exposure for certain substances. Mitigation actions should be aimed at increasing awareness of available services.
	Negative impacts on public health may require medical treatment and mental health services. There may be cascading impacts on family and friends, who may require mental health services as well. Mitigation actions for this lifeline may be focused on stockpiling and administering emergency treatments.

4.3.19.3. *Past Occurrences*

Though the substance use disorder crisis is complex, it is widely acknowledged that the crisis began in the late 1990s when pharmaceutical companies introduced opioid-based pain medication such as OxyContin, Percocet, and Vicodin. As these drugs become more frequently prescribed, misuse and overdose increased, and it became clear that prescription opioids were highly addictive (NIDA, 2024).

The WV DHHR Health Statistics Center (HSC) also collects statistics on fatal drug overdoses on a county level since 2014. Tables 4.3.19-2 and 4.3-19-3 display all drug over deaths and opioid-related deaths for Berkeley and Morgan Counties from 2013 to 2025. Berkeley County had the most total drug deaths in 2020 with 114. Since then, the overdose deaths have steadily been declining with only 27 in 2025. Similarly, Morgan County peaked in drug overdose deaths in 2021 with 12.

Table 4.3.19-2: All Drug Overdose Deaths and Opioid-Related Deaths for Berkeley County from 2013-2025 (WV DHHR HSC, 2026).		
Year	**All Drug Overdose Deaths**	**Opioid-Related Overdose Deaths**
2013	53	47
2014	47	39
2015	51	47
2016	95	89
2017	93	89
2018	73	67
2019	65	57
2020	114	108
2021	98	87
2022	94	87
2023	71	64
2024	33	25
2025	27	24

Table 4.3.19-3: All Drug Overdose Deaths and Opioid-Related Deaths for Morgan County from 2013-2025 (WV DHHR HSC, 2026).		
Year	**All Drug Overdose Deaths**	**Opioid-Related Overdose Deaths**
2013	9	9
2014	1-4	1-4
2015	1-4	1-4
2016	5	5
2017	10	10
2018	11	11
2019	7	6
2020	9	9
2021	12	11
2022	8	7
2023	7	7
2024	1-4	1-4
2025	8	7

Furthermore, the CDC has mortality rate and overdose deaths available for the years 2014 through 2024 for the entire state of West Virginia. West Virginia's death rate, which was 48.9 per 100,000 in 2024, is double the national mortality rate. Total deaths peaked in 2021 with 1,501 overdoses as shown in Table 4.3.19-4. The year of 2024 saw a sharp decline in total deaths compared to the previous year (556 less deaths).

Table 4.3.19-4: Mortality Rate and Overdose Deaths for West Virginia from 2014-2024 (CDC, 2026a).		
Year	**Total Deaths**	**Mortality Rate**
2014	627	35.5
2015	725	41.5
2016	884	52
2017	974	57.8
2018	856	51.5
2019	870	52.8
2020	1,330	81.4
2021	1,501	90.9
2022	1,335	80.9
2023	1,377	81.9
2024	821	48.9

4.3.19.4. Future Occurrences

West Virginia peaked in drug overdose deaths in 2021 with 1,501 total deaths. Similarly, Morgan County peaked in 2021 with 12 deaths and Berkeley County in 2020 with 114 deaths. Since then, both Counties and West Virginia overall have experienced a decrease in drug overdose deaths.

However, future occurrences of opioid addiction and misuse, overdose, and fatalities are unclear as the state moves forward with overdose prevention initiatives. In October 2017, President Trump declared a nationwide Opioid Emergency Declaration. President Trump's declaration would allow the government to cut red tape and direct resources, including expanded access to medical services in rural areas. This emergency declaration is still ongoing in 2026. Overall, the probability of the future occurrence of substance use disorder can be considered *likely* (between 50% & 90% annual probability) across the region according to the Risk Factor Methodology (see Table 4.4.1-1).

West Virginia has a well-established Prevention First Network (https://wvpreventionfirst.org/) that includes state, regional and local leaders who contribute to prevention planning and coordination activities in the state. Berkeley County also hosts a harm reduction program through their Recovery Resource Center. The program focuses on the area's youth with outreach programs at community centers and after-school programs. Through the Recovery Resource Center, the county also hosts the Juvenile Opioid Treatment, Intervention & Prevention Program Team which works to support those most vulnerable to the opioid epidemic. Weekly youth groups are also hosted at the Center (Berkeley County, 2026b).

Both Berkeley County and Morgan County contain a Day Report Center, which is a treatment alternative to incarceration for nonviolent offenders whose substance abuse problems have led to legal involvement. Supervision and treatment services provided by the Day Report Centers have two goals: 1) To provide much needed substance abuse treatment and drug screening which is not available in the Eastern Regional Jail to appropriate offenders 2) To reduce taxpayer costs associated with incarceration (Berkeley County, 2026a; Morgan County, 2026). More information regarding the Day Report Center for Berkeley County is available here: https://www.berkeleywv.org/799/Day-Report-Center. Similarly, multiple resources can also be accessed through Morgan County's Day Report Center website at https://morgancountywv.gov/day-report-center/day-report-resources/.

Berkeley County noted on the mitigation action progress form that the county began providing services to Jefferson County after the abrupt closure of the Jefferson County DRC in June of 2025. Further, there has been an estimated 50% increase of active program participants over the last 5 years. Theres also a 21% recidivism rate for program graduates for 5 years post-graduation, while the National average is 76%.

4.3.19.5. Vulnerability Assessment

County facilities are not at risk to the substance use disorder crisis, but there are some occupation-

specific risks that may make some employees more vulnerable. Employees working in direct patient care are vulnerable to fentanyl exposure. Since fentanyl can be ingested orally, inhaled through the nose or mouth, or absorbed through the skin or eyes, any substance suspected to contain fentanyl should be handled with extreme caution. Exposure to a small amount of fentanyl can lead to respiratory depression or death. Fentanyl-related substances have been found in powders, pills, capsules, liquids, and on blotter paper. The CDC recommends various levels of PPE depending on the number of illicit drugs present and the job type. Figure 4.3.19-1 displays the four job types most likely to interact with illicit drugs and the level of PPE that should be worn depending on the drug amount present (CDC, 2024d).

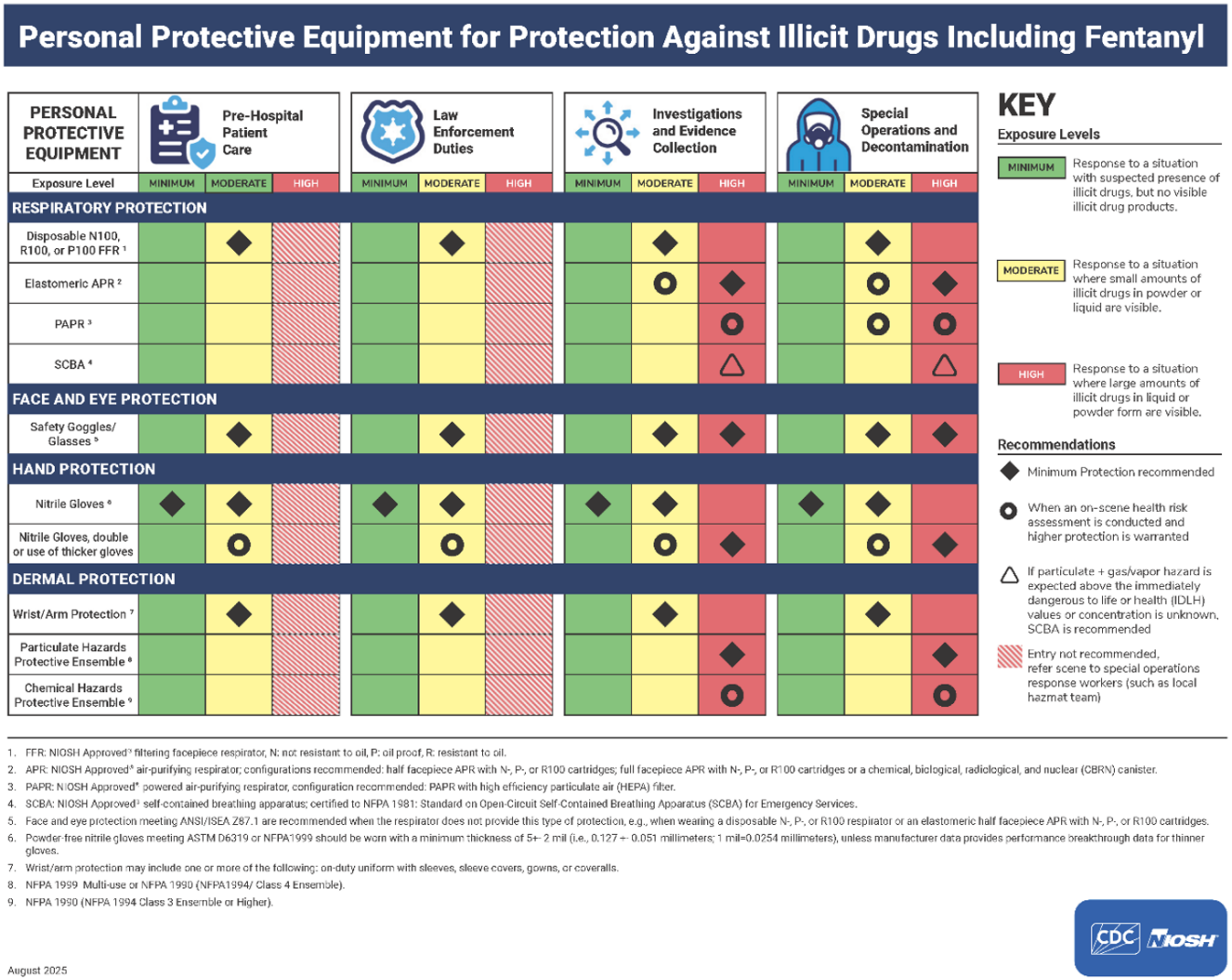
Additionally, absenteeism from jobs associated with a substance abuse addiction in high-risk areas could lead to economic loss through lost productivity and increased medical costs.

In general, jurisdictions that are more densely populated are more vulnerable to substance addiction threats as access to the drugs increases. However, rural communities have experienced larger per-capita substance-related deaths.

Jurisdictional losses in the SUD crisis stem from lost wages, productivity, and resources rather than losses to buildings or land. Locally, many West Virginia counties have seen an increase of time and resources devoted to the substance abuse as overdose and response increases, however there is no comprehensive tracking mechanism to record total local losses associated with the SUD.

Impacts including total costs to jurisdictions are only beginning to be understood, researched, and tracked. There is no comprehensive database currently tracking monetary losses at the local level. However, the American Enterprise Institute (AEI), using national data from the CDC and White House Council of Economic Advisors, calculated a total cost per capita ($4,739), of the opioid epidemic for West Virginia, the highest in the country (AEI, 2018). Using this per capita estimate in combination with county population estimates, losses can be estimated for Berkeley and Morgan Counties. It is important to note that this methodology assumes equal per capita opioid misuse and fatalities across all counties, however, based on reported drug overdoses and drug related deaths, it is known that some counties, including those in the southern and eastern panhandle regions, are more vulnerable and more likely to experience higher per capita costs while counties in central West Virginia tend to be less vulnerable and likely have lesser costs per capita. Another important caveat regarding this methodology is that a portion of the costs will have been state losses rather than county or jurisdictional, but the ratio of state to local cost burden is unknown at this time. It is estimated that Berkeley County has had a total per capita cost of $546,751,369 and Morgan County has had a total per capita cost of $84,752,276.

Figure 4.3.19-1: Diagram Identifying PPE for Various Responders (CDC, 2024d).



4.3.19.4. Populations at Risk

People of color are more susceptible to drug overdose deaths, most likely due to the barriers that people of color face when attempting to access mental health services and substance use treatment (CDC, 2022). The CDC also affirms that as county-level income inequality increases, overdose rates increase, especially among Black and Latino groups. This points to the fact that lower-income groups may be more susceptible to drug overdose (CDC, 2022).

According to the U.S. Department of Labor, individuals with certain underlying conditions and characteristics may be more prone to overdose due to heightened sensitivity to opioid effects. These conditions and characteristics may include advanced age (65+), respiratory conditions, wasting syndrome, and those with impaired energy or strength (Department of Labor, n.d.). Some other groups are at higher risk of drug misuse, which may lead to higher rates of overdose. These groups include younger adults (18-25 years old); those living with mental health disorders including depression, anxiety, and post-traumatic stress disorder; and those with a history of alcohol or other substance abuse (U.S. Department of Labor, 2026).

4.3.20. Source Water Contamination



4.3.20.1. Location and Extent

Source water is made up of sources of water, such as streams, rivers, lakes, reservoirs, springs and groundwater that provide water to public drinking water supplies and private wells (EPA, 2026a). The safe Drinking Water Act defines the term "contaminant" to be any physical, chemical, biological, or radiological substance or matter in water (EPA, 2026f). Source water contamination occurs when a substance enters the source water, degrades the water quality, and causes it to become unsafe or unfit for human use and consumption. Water is vital to everyday life, and contamination can create serious health hazards and/or leave a community without a local source of drinking water.

The federal Safe Drinking Water Act sets standards on the construction and operation of public water systems and requires the protection of surface water sources and source water contribution areas near ground water supply wells from contaminants. The WV Bureau for Public Health also completed assessments regarding the location and susceptibility of source water for WV public water systems. In 2014, WV regulations were amended, requiring water utilities to develop Source Water Protection Plans analyzing the threat of contamination, planning for contamination emergencies, and developing potential mitigation measures (De Riddler, 2025a).

Private water wells are used extensively across West Virginia. However, contamination of a private water well would likely only endanger a few individuals, while contamination of a major source water used by a public water utility could impact thousands. In Berkeley County, the largest public water suppliers are the Berkeley County Public Service Water District (BCPSWD) and the City of Martinsburg's Water & Sewer Department. The BCPSWD has three major public water supply plants, the Bunker Hill location, serving a population of about 37,597, the Potomac River system (seen in Figure 4.3.20-2), serving roughly 39,042, and the Glenwood Forest plant, which serves 1,102 (WV Department of Health, 2026b; De Riddler, 2025a &, 2025b). The Bunker Hill plant draws water from one surface water source, the Baker Lakes Quarry, and two groundwater sources, the LeFevre Spring and Springdale Well. It typically relies on groundwater and uses the surface water when emergency conditions require it. The Potomac River system utilizes water from the Potomac River and three groundwater wells, utilizing all of the sources simultaneously (De Riddler, 2025a &, 2025b). According to the 2026 Glenwood Forest Consumer Confidence Report, the water for Glenwood Forest comes from three groundwater wells.

Due to Berkeley County's growing population, updates to the county's water system were drastically needed. Currently, the county is in the process of constructing a new treatment plant that utilizes an ultrafiltration membrane system with a treatment capacity of 6.0 million gallons per day. This plant is being constructed at the same location as the Bunker Hill Plant (Hise, n.d.). A Facebook post update was provided from the BCPSWD in April 2026. The project is currently over 50% complete. The

BCPSWD estimates the entire new plant will be fully constructed by the fall of 2027. Figure 4.3.20-1 below shows one of the pictures provided from the BCPSWD Facebook post (BCPSWD, 2026a). Similarly, the Potomac River Plant is receiving an upgrade and expansion. Another BCPSWD Facebook post provided an update for the project on July 30, 2025. The project expands the treatment capacity from 6 to 10 million gallons per day, doubles the sedimentation capacity, and increases the finished water pumping capacity (BCPSWD, 2025). Figure 4.3.20-2 below displays the Facebook post update photo.

Figure 4.3.20-1: The New Bunker Hill Plant Under Construction as of April 2026 (BCPSWD, 2026a).



Figure 4.3.20-2 The Potomac River Plant Expansion Progress as of July 2025 (BCPSWD, 2025). **Figure**



The City of Martinsburg water system serves 15,652 customers, and it relies on two groundwater sources, Kilmer Spring and Big Spring Source Well, for water during its normal operations (Marchun, 2024). It is also equipped to draw raw water from a nearby reservoir for a backup source of supply in an emergency (City of Martinsburg, 2026).

Morgan County also has two major public water systems, Berkeley Springs Water Works and Paw Paw Water Works. Berkeley Springs Water Works serves about 3,526 people and draws its water from three springs, and a water channel leading to a plant intake (Jainniney, 2021). The Paw Paw Water Works serves 488 people and withdraws its water from the Potomac River (Bowers, 2021).

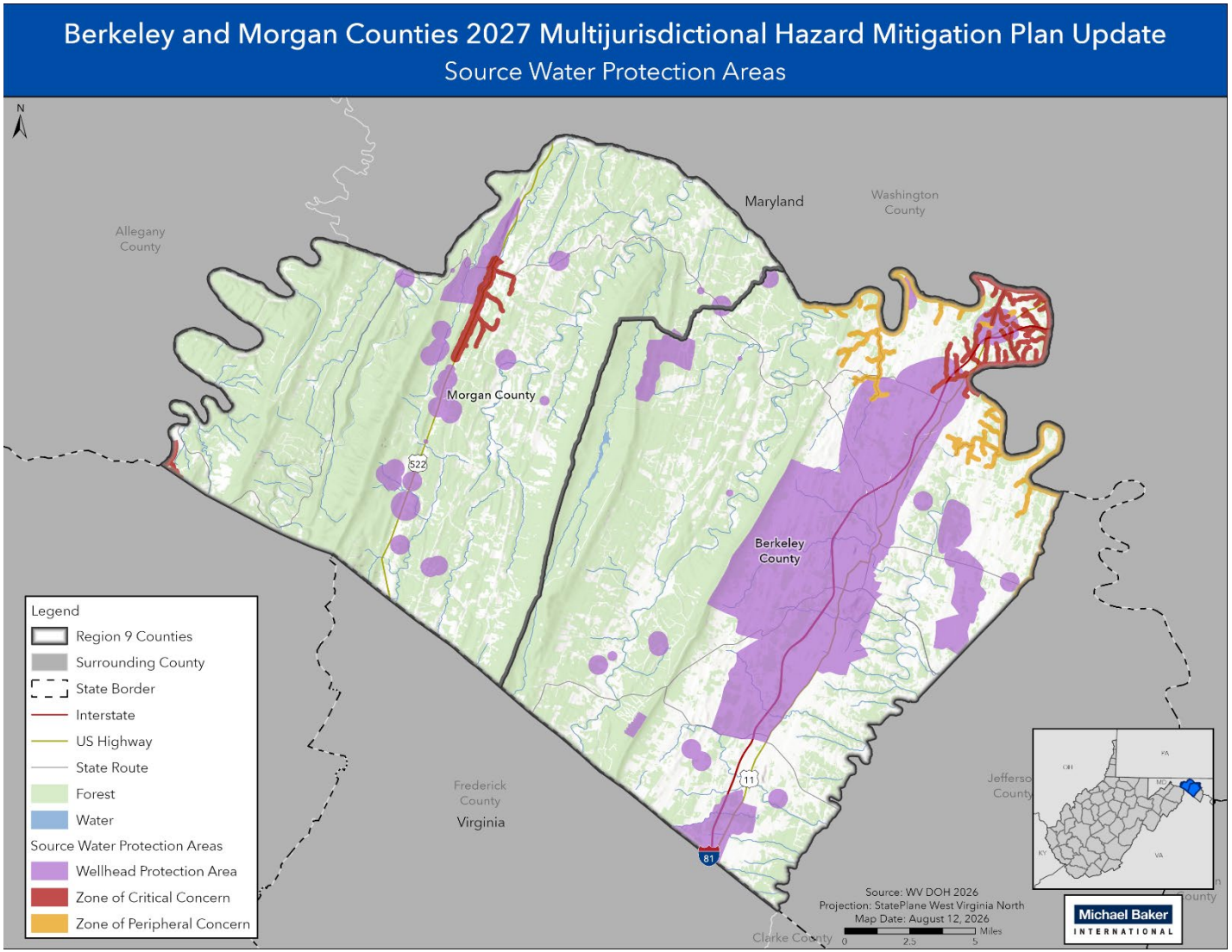
It is important to consider that contamination does not have to directly impact the source water, because contaminants can be washed into surface water through runoff and transported through tributaries into larger bodies of water that may be used for drinking water. Contaminants released underground can migrate through groundwater and contaminate wells and springs. Therefore, the state and federal government created special protections and assessment requirements for source water areas. These special protection areas include wellhead protection areas, which are areas contributing to the recharge of the groundwater source (well or spring), within a five year time of

travel (De Riddler, 2025a).

There are also two "zones of concern" for public water supplies. The Zone of Critical Concern (ZCC) is a corridor along streams that warrant more detailed scrutiny due to its proximity to the surface water intake and the intake's susceptibility to potential contaminants within that corridor. The length of the ZCC is based on a five-hour time-of travel of water in the streams to the water intake, plus an additional one-quarter mile below the water intake. The width of the ZCC is 1,000 feet measured horizontally from each bank of the principal stream, and five hundred feet measured horizontally from each bank of the tributaries draining into the principal stream. The other zone is the Zone of Peripheral Concern (ZPC), which is similar to the ZCC, but includes an additional five-hour time-of-travel of water in the streams further than the perimeter of the ZCC, which creates a protection zone of ten hours above public water supply intakes (De Riddler, 2025a).

A map of these source water protection areas in Berkeley and Morgan Counties can be seen in Figure 4.3.20-3. This data is the most recent supplied by the WV DEP. This figure shows that most source water areas susceptible to contamination appear to be congregated in the middle of both counties, running in a line from southwest to northeast. The areas are often near more developed parts of the county as well, as these locations tend to have more residents and require the water treatments plants necessary to supply water to these residents. Residents in rural areas typically rely on private water wells.

Figure 4.3.20-3: Source Water Protection Areas for Berkeley and Morgan Counties.



4.3.20.2. Range of Magnitude

According to the EPA (2026b), there are four general categories of drinking water contaminants:

- **Physical** – impact the physical appearance or other physical properties of water. (Ex. sediment or organic material suspended in the water of lakes, rivers and streams from soil erosion).
- **Chemical** - include naturally occurring or man-made elements or compounds. (Ex. nitrogen, bleach, salts, pesticides, metals, human or animal drugs, and toxins produced by bacteria).
- **Biological** - organisms in water, typically referred to as microbes or microbiological contaminants. (Ex. bacteria, viruses, protozoa, and parasites).
- **Radiological** - chemical elements with an unbalanced number of protons and neutrons resulting in unstable atoms that can emit ionizing radiation. (Ex. cesium, plutonium and uranium).

The impact of source water contamination varies widely with the amount of and type of contaminant. Drinking water is reasonably expected to contain at least small amounts of some contaminants. Some drinking water contaminants may be harmful if consumed at certain levels in drinking water while others may be harmless. The presence of contaminants does not necessarily indicate that the water poses a health risk (EPA, 2026f).

The potential impacts of source water contamination on community lifelines are as follows:

Table 4.3.20-1: Most Likely Lifelines Impacted by Source Water Contamination.

Lifelines	Notes
	Source water contamination can poison water supplies and agricultural operations.
	Source water contamination can have adverse impacts on the health of residents, leading to more strain on the local healthcare system.

4.3.20.3. Past Occurrence

The push across the State of West Virginia for greater source water protection was triggered in 2014 when more than 10,000 gallons of an industrial chemical used to process coal spilled into the Elk River upstream of an intake for a water treatment plant serving Charleston. This left 300,000 residents without potable water, with a do-not-use order lasting up to 10 days in some areas (Gerken, 2015). Some residents reported minor adverse health effects from inhalation of the chemical after

contaminated water was used to flush toilets or when contaminated water was flushed from plumbing systems. These health effects included skin irritation, nausea, diarrhea, sore throat, and respiratory symptoms (Venere, 2015). This had significant impacts in Charleston outside of health impacts too, including shortages of drinkable bottled water, economic stresses on residents who could not afford to buy bottled water, public distrust of local and state government, and ecological impacts (Gerken, 2015). A similar occurrence on the Potomac River, which provides water to multiple public water systems in the Eastern Panhandle, could be considered a worst-case scenario.

Source water contamination impacted the Eastern Panhandle directly the next year, when 10,000 gallons of synthetic latex used for paper coating was spilled into the North Branch of the Potomac River by a Verso paper mill in Luke, MD. This resulted in a five-day shutdown of the BCPSWD Potomac River plant's river intake as the chemical plume passed by the intake. This intake closure forced the BCPSWD to purchase water from the City of Martinsburg water system, as the other two BCPSWD were not able to accommodate the additional demand (McVey, 2016). A contaminated section of the Potomac River can be seen in Figure 4.3.20-4.

Figure 4.3.20-4 Potomac River after September 2015 Verso Paper Mill Contaminant Release (Sawyers, 2015)Figure 4.3.20-4: Potomac River after September 2015 Verso Paper Mill

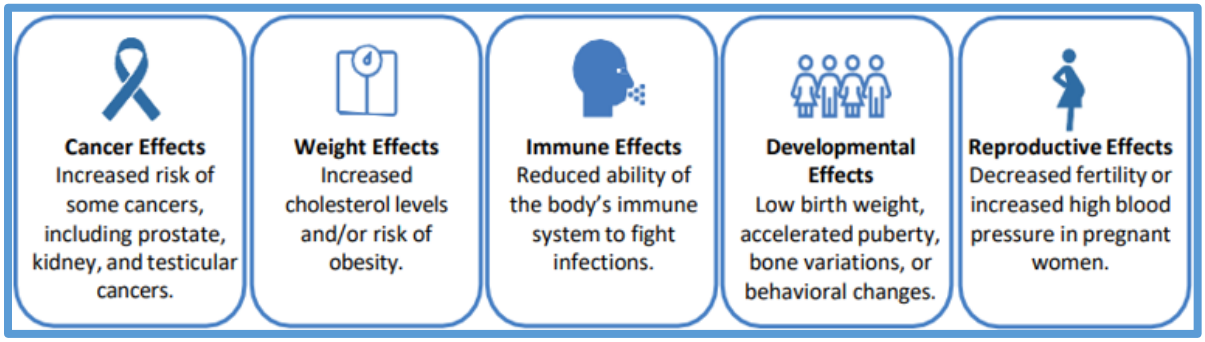


In 2014, it was discovered that the Big Spring Well for the City of Martinsburg contained harmful levels of per- and polyfluoroalkyl substances, also known as PFAS. PFAS are a group of thousands of extremely persistent manmade chemicals, often called "forever chemicals", used as stain and water repellants in many industrial and consumer products. The Big Spring Well was taken offline two years

later once the EPA established health advisory levels. In 2017, use of the Big Spring Well resumed since a granular activated -carbon treatment system was installed. As a result, PFAS concentrations in Martinsburg water have been below the EPA health thresholds. The source of contamination for Martinsburg comes from the aqueous film-forming foam containing PFAS at the Shepherd Field Air National Guard base outside the City. This foam has been used since the 1970's to fight fires and train firefighters. The compounds in the foam soaked into the ground and seeped off-site and into Martinsburg's Big Springs well (Wheeler, 2022).

According to the EPA, research on the effects of PFAS exposure is currently ongoing. However, studies have shown that exposure to certain levels of PFAS can cause the following effects described in Figure 4.3.20-5.

Figure 4.3.20-5: Potential Effects from Certain Levels of PFAS Exposure (EPA, 2023).



In addition to the entire Martinsburg area water system, several private wells were found to be contaminated with PFAS. Additionally, the forever chemicals were discovered in water samples from the nearby streams. This prompted the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) to advise residents to heed local fish consumption advisories. However, it was noted that no PFAS-related fish consumption advisories from WV were issued. Several fish samples were sent to the U.S. Geological Survey's National Fish Health Laboratory in Kearneysville, WV for chemical analysis. As a result, several lawsuits have been filed on behalf of residents and public water system customers against manufacturers of firefighting foam containing PFAS (Wheeler, 2022).

Along with environmental samples, the ATSDR collected blood and urine samples from the residents of the area throughout September and October 2019. All tap samples collected during the Environmental Assessment (EA) in 2019 met EPA's Health Advisories (HA) for PFAS. Furthermore, out of the seven PFAS chemicals tested, five were detected in more than 74% of blood samples. These include PFHxS, PFOS, PFOA, PFNA, and PFDA. It was noted that the PFHxS levels in the EA participants were 2.5 times higher than the national levels (CDC ATSDR, 2024). Figure 4.3.20-6 displays the Berkeley County EA blood level results compared to the national average. Figure 4.3.20-7 shows where samples were taken from the Berkeley County area near the Shepherd Field Air National Guard Base.

Figure 4.3.20-5 Comparison of Berkeley County PFAS Blood Levels to the National Average (CDC) ATSDR, 2024).Figure 4.3.20-6: Comparison of Berkeley County PFAS Blood Levels to

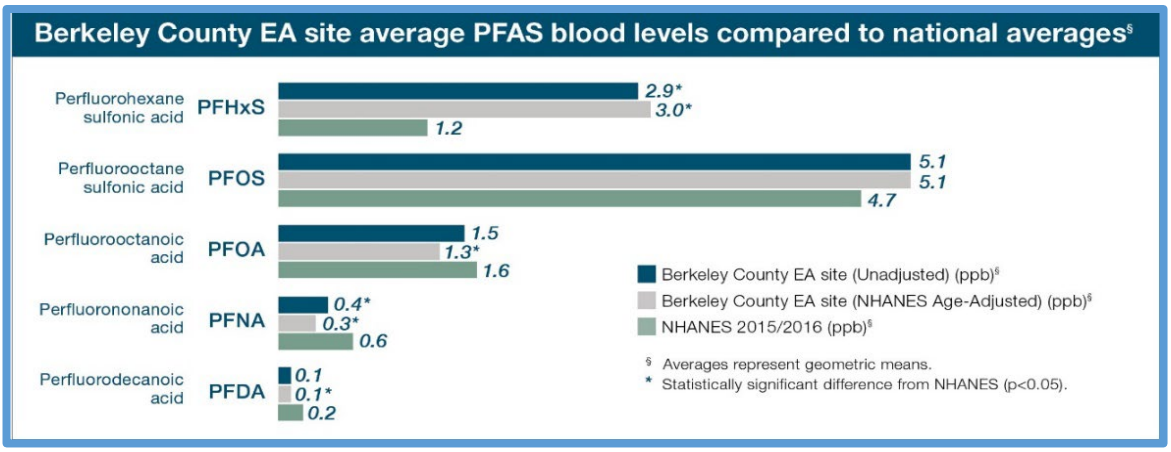
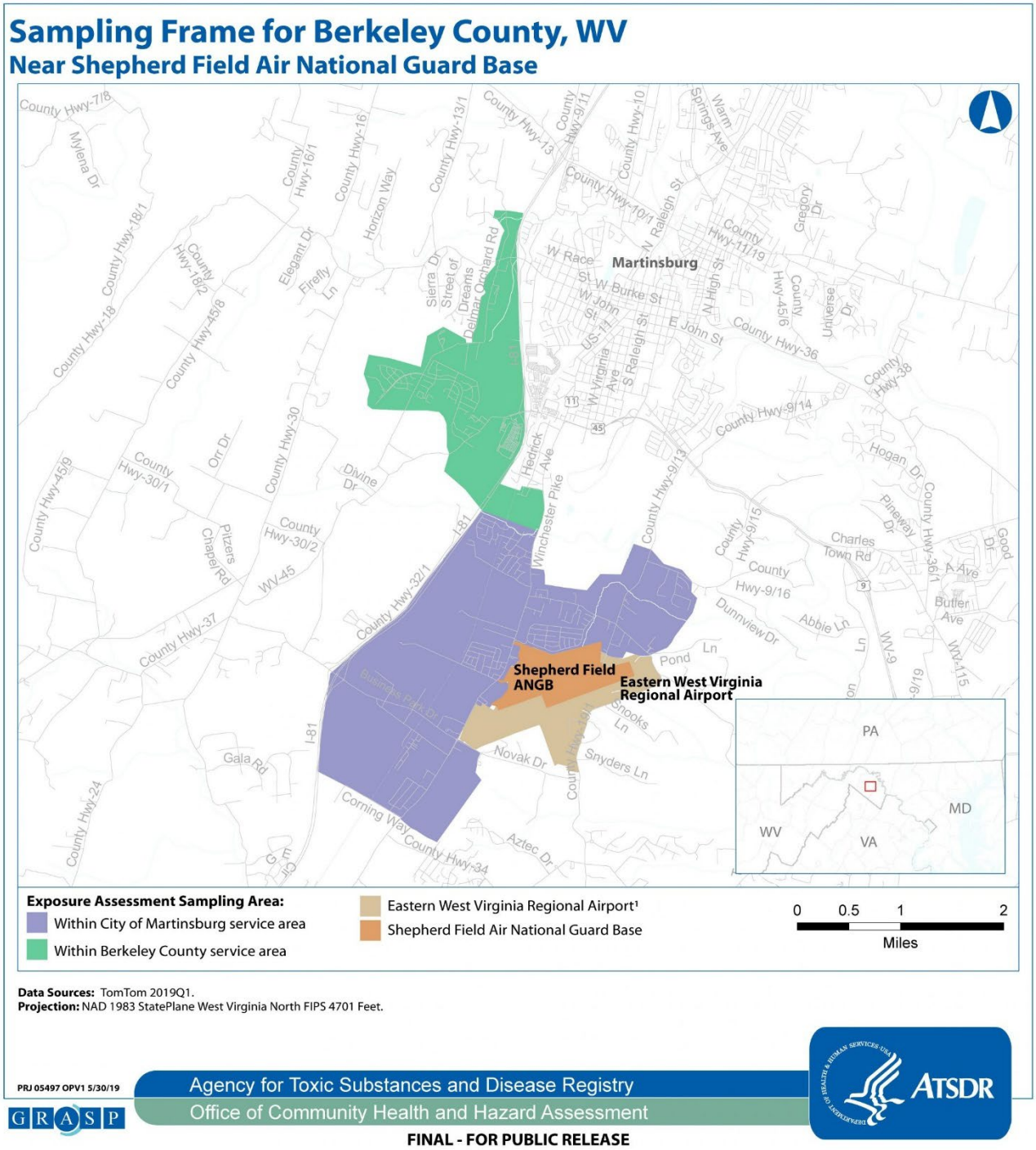


Figure 4.3.20-7: Sampling Area for the 2019 EA Near the Shepherd Field Air National Guard Base (CDC ATSDR, 2024).



According to the CDC ATSDR (2024), a statistical model was used to study relationships between various demographic characteristics and lifestyle variables of the tested residents. The models showed that, in general:

- **Blood levels** of PFHxS, PFOS, and PFOA varied by age.
- **Blood levels in females increased** by 1.5% to 2.4% for every year of age.
- **Blood levels of PFHxS in males** decreased by 0.5% but increased for PFOS and PFOA by 0.2% for every year of age.
- **Males had higher blood levels** of PFHxS, PFOS, and PFOA than females.
- **The difference** between males and females was larger in younger people.
- **Long-time residents** have higher PFHxS blood levels.
- **PFHxS increased by 5.3%** for every additional year an adult participant lived in Berkeley County EA site.

The CDC ATSDR recommends that Martinsburg City and Berkeley County continue to monitor concentrations of PFAS in drinking water, properly maintain all treatment systems to remove PFAS from the municipal drinking water, and share the results of PFAS monitoring for drinking water with community members (CDC ATSDR, 2024).

4.3.20.4. Future Occurrence

As aforementioned, statewide initiatives to mitigate future source water occurrences hope to prevent any future events. Local public utilities are also seeking to limit contaminant sources and have plans in place to mitigate the effects of any severe contamination. However, severe source water contamination is still possible, and future occurrences are difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group. Intentional acts are addressed under Section 4.3.21, Terrorism. Any increase in hazardous material facilities or the transportation of hazardous materials (addressed in Section 4.3.18) will increase the risk of source water contamination. Overall, the probability of future source water contamination events is *possible* (between 1% & 49.9% annual probability) as defined by the Risk Factor Methodology (See Section 4.4.1-1).

4.3.20.5. Vulnerability Assessment

Both Berkeley and Morgan Counties public water systems are vulnerable to contamination. A large contamination concern for Berkeley County water supply facilities are highways, specifically I-81, due to the possibility of vehicle fluid spills or hazardous material freight which could impact Potomac River intakes and nearby groundwater supply wells. This threat is underlain by karst topography which enables contaminants to spread underground more effectively. I-70 and WV Route 522 as well as the 522-bypass, could impact Morgan County water systems. The second largest concern is the nearby CSX rail lines, which can be seen in Figure 4.3.22-4. Derailments and spills could impact source water,

and CSX rail lines run through source water protection areas in both counties.

Other major concerns for both Berkeley and Morgan Counties facilities include commercial activity that lies within source water protection areas, such as gas stations and auto repair shops which have the potential to improperly release hazardous waste into environment. Similarly, new construction development expands impervious surfaces which can reduce natural recharge and increase stormwater contaminants (like road salt, hydrocarbons, and nutrients) into the groundwater system. Agricultural activities can increase nutrient runoff, and old septic and sewer systems can leak into protection areas. Sinkholes are also a hazard, as they can create direct conduits from the surface to groundwater supplies, bypassing natural soil filtration processes and making groundwater wells more vulnerable (De Riddler, 2025a). Water systems without backup source water or with source waters that are located very close together are particularly vulnerable.

Furthermore, increased development, specifically in Berkeley County, but also parts of Morgan County will likely lead to increased nonpoint source pollution (NPS). NPS pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. NPS pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and ground waters (EPA, 2025). Urbanized areas affect water quality through increased runoff from impervious surfaces and increased pollutant loads. With increased impervious surfaces through development, the region can expect to experience an increase in stormwater runoff carrying harmful pollutants.

4.3.20.6. Populations at Risk

Anyone who consumes contaminated drinking water has the potential to be negatively affected. In the case of the current PFAS contamination of Martinsburg's water supply, all residents are affected negatively in some way. However, the results of the CDC ATSDR showed males had a higher blood level of PFHxS, PFOS, and PFOA than females. Furthermore, due to elderly residents living in the area longer, they contained a higher concentration of PFAS and thus may deal with more negative health effects. Moreover, low-income individuals who may rely on fishing in contaminated streams for a food source or are unable to afford filtered water from the store are more likely to be affected in any source water contamination scenario. Additionally, children's health can be negatively affected by drinking water contaminants through a range of ways, including gastrointestinal illness, developmental effects such as learning disorders, endocrine disruption, and cancer (EPA, 2026c).

4.3.21. Terrorism

4.3.21.1. Location and Extent



The term "terrorism" refers to intentional, criminal, malicious acts, but 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).

An important consideration in evaluating terrorism hazards is the existence of facilities, landmarks, or other buildings of international, national, or regional importance. Outside of several federal government buildings in Martinsburg, while possessing many notable landmarks from a local historic perspective, there are no sites in Berkeley or Morgan County which are considered significant landmarks in terms of national or international importance. Threats against the agricultural community and major transportation corridors, however, could be potential terrorist targets. The Eastern Panhandle could also be impacted by terrorism due to its proximity to the National Capital Region, which is one of the most target-rich areas of the country. Should a terrorist strike the National Capital Region, the region could see a mass influx of residents evacuating the area and major highways such as I-81 could become impassable due to the volume of traffic. The region could also suffer the indirect economic effects of the incident as many residents work in or close to D.C.

Nonetheless, terrorism can take many forms and terrorists have a wide range of personal, political, or cultural agendas. Therefore, there is no location that is not a potential terrorist target. Workplace and school shootings and bomb threats have received much attention in recent years. Two other types of terrorist activity that may be particularly relevant to Eastern Panhandle is agriterrorism and intentional hazardous material releases. Agriterrorism is the direct, intentional, generally covert contamination of food supplies or introduction of pests and/or disease agents to crops and livestock. Berkeley and Morgan Counties have significant amounts of rural land and a substantial local agricultural economy.

There are also several SARA Title III facilities and a few major transportation routes that traverse the region; making intentional hazardous material incidents a potential threat to citizens and the environment. This hazard is addressed in Section 4.3.18. Critical facilities including police stations, hospitals, fire stations, schools, wastewater treatment plants, and water supply facilities, may be potential terrorist targets.

4.3.21.2. Range of Magnitude

Terrorist attacks can take many forms, including agriterrorism, arson/incendiary attack, armed attack,

biological agent, chemical agent, cyberterrorism, conventional bomb, intentional hazardous material release, nuclear bomb, and radiological agent. The severity of terrorist incidents depends upon the type of method used, the proximity of the device to people, animals, or other assets, and the duration of exposure to the incident or device. For example, chemical agents are poisonous gases, liquids, or solids that have toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death. Severity of injuries depends on the type and amount of the chemical agent used and the duration of exposure. Biological agents are organisms or toxins that have illness-producing effects on people, livestock, and crops. Because some biological agents cannot be easily detected and may take time to develop, it is difficult to know that a biological attack has occurred until victims display symptoms. In other cases, the effects are immediate. Those affected by a biological agent require the immediate attention of professional medical personnel. Some agents are contagious, and victims may need to be quarantined.

The West Virginia State Fusion Center defines eight signs of Terrorism (West Virginia Fusion Center, 2026):

- **Surveillance:** Someone recording or monitoring activities. This may include the use of cameras, note taking, drawing diagrams, annotating on maps, or using binoculars or other vision-enhancing devices.
- **Elicitation:** People or organizations attempting to gain information about operations, capabilities, or people. Elicitation attempts may be made by mail, email, telephone, or in person. This could also include eavesdropping or friendly conversation.
- **Tests of Security:** Any attempts to measure reaction times to security breaches, attempts to penetrate physical security barriers, or monitor procedures in order to assess strengths and weakness.
- **Funding:** Suspicious transactions involving large cash payments, deposits, or withdrawals. Collections for donations, the solicitation for money, and criminal activity are common signs of terrorist funding.
- **Supplies:** Purchasing or stealing explosives, weapons, ammunition, etc. This also includes acquiring military uniforms, decals, flight manuals, passes or badges (or the equipment to manufacture such items), and any other controlled items.
- **Impersonation:** People who do not seem to belong in the workplace, neighborhood, business establishment, or anywhere else.
- **Rehearsal:** Putting people in position and moving them around according to their plan without actually committing the terrorist act.
- **Deployment:** People and supplies getting into position to commit the act. This is the

person's last chance to alert authorities before the terrorist act occur.

A worst-case scenario event for Berkeley and Morgan Counties would likely involve an active shooter incident at a public event, school, place of assembly, or area with high population density. A disaster of this scale could result in widespread injuries and fatalities.

The potential impacts of terrorism on community lifelines are as follows:

Table 4.3.21- 1: Most Likely Lifelines Impacted by Terrorism.

Lifelines	Notes
	Community safety is often threatened, and police, fire, and other government services are either targeted or needed to respond to terroristic threats or actions.
	Water resources and the food supply chain may be targeted by biological terrorism. If targeted, people and livestock in the county could become ill and require medical attention. Depending on the severity of the illness and the vulnerability of people impacted, people and livestock may die as a result. If the biological agent is contagious, victims might need to be quarantined as well to prevent a potential epidemic or pandemic.
	Energy infrastructure may be a potential target for terrorism. If power infrastructure is damaged, people and critical facilities (such as hospitals that need power for medical machines) could lose access to electricity. Gas stations and other fueling facilities targeted could result in explosions or gas shortages for the area depending on the attack. Most people rely on vehicles for transportation throughout the county.
	Hazardous materials facilities may be a potential target for terrorism. This could result in the release of hazardous materials, potentially damaging other infrastructure and endangering people and animals.

4.3.21.3. Past Occurrence

There have been several high-profile incidents that could be considered under the umbrella of terrorism or brought charges of terrorism against an individual.

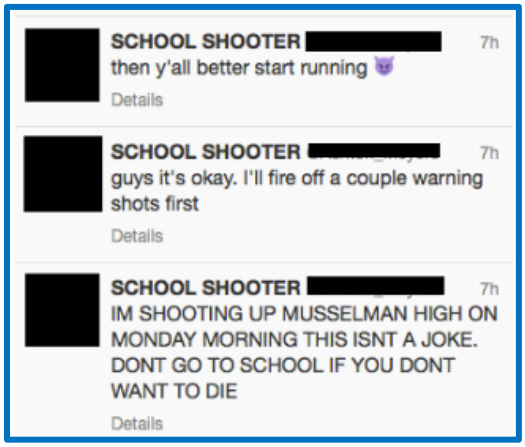
An incident resulting in terrorism charges that garnered national attention was the arrest of William Alemar on August 20, 2012. Alemar was arrested after he was reportedly jogging in a bulletproof vest, carrying two knives, holding a training rifle, and possessing unloaded ammunition clips near several Martinsburg schools. Gear from Alemar's apartment can be seen in Figure 4.3.21-1. It was eventually uncovered that Alemar was an Army veteran and a member of the National Guard. Alemar was charged with a felony committing a terroristic act and wearing body armor while committing a felony offense, as well as misdemeanors including public intoxication and willful disturbance of a school. The case resulted in a plea deal where Alemar accepted the penalty for the misdemeanors and the felony charges, including the charge of a committing a terroristic act, were dropped (WJLA, 2012).

Figure 4.3.21-1 Military Style Gear Identified in Alemar's Apartment by Police (WJLA, 2012).Figure 4.3.21-1: Military Style Gear Identified in Alemar's Apartment by Police (WJLA, 2012).



Other reported incidents have included threats of violence by students and young adults against local schools. A February 2016 incident resulted in four Hedgesville students being taken into custody by police and recommended for expulsion by Hedgesville High School Administrators. The students were involved with threats posted online against the high school. A former Mussleman High School student was arrested in October 2014 and was charged with making threats of terrorist acts after using a Twitter account to threaten the Berkeley County school. A few of the Twitter posts resulting in the incident can be seen in Figure 4.3.21-2, and other posts specifically name individual school staff, target racial groups, and involve inflammatory and explicit language. The investigation involved the Federal Bureau of Investigation, West Virginia State Police, Martinsburg Police, and the Berkeley County Sheriff's Department. Police presence was increased at Musselman High School and throughout the county during the incident (Miistich & McCormick, 2014). Nationwide, all terrorist threats are taken seriously, and resulting investigations and response expend significant resources and require specialized training and equipment for emergency response personnel. These types of incidents are of serious concern to all communities.

Figure 4.3.21-2: Three of the Threatening Twitter Posts (Miistich & McCormick, 2014)



In August of 2020, a Berkeley Springs man was arrested after allegedly posting terrorist threats prior to a protest held in the town. A press release stated: "Sheriff Bohrer became aware of threats made

on social media from investigation in house and also with assistance from the West Virginia Fusion Center that a subject was posting concerning threats to public safety at the Black Lives Matter Rally to be held in Berkeley Springs State Park on (Aug. 21)." The Sheriff's Office stated they had already been scanning social media for threats leading up to the rally. (Rhee, 2020b).

In December 2024, a Berkeley County delegate-elect was arrested by the West Virginia State Police and charged with making threats of terrorist acts directed at state lawmakers and legislative delegates following a dispute within a Republican Caucus meeting. (Milbourne, 2024)

4.3.21.4. Future Occurrence

The probability of terrorism occurring cannot be quantified with as great a level of accuracy as that of many natural hazards. Furthermore, these incidents generally occur at a specific location, such as a government building, rather than encompassing an area such as a floodplain. Thus, planning should be asset-specific, identifying potentially at-risk critical facilities and systems in the community. Once a comprehensive list of critical assets has been developed, it should be prioritized so that efforts can be directed to protect the most important assets first. Then, beginning with the highest-priority assets, the vulnerabilities of each facility or system to each type of hazard should be assessed.

For the purpose of developing a realistic prioritization of terrorism hazard mitigation projects, three elements should be considered in concert:

- Relative importance of the various facilities and systems in the asset inventory
- Vulnerabilities of those facilities
- Threats that are known to exist

Critical assets and infrastructures are systems whose incapacity or destruction would have a debilitating effect on the county:

- Emergency services
- Government services
- Water supply systems
- Transportation networks
- Telecommunications infrastructure
- Electrical power systems
- Gas and oil facilities

As previously noted, aside from some federal buildings there are no sites which are considered significant landmarks in terms of national or international importance in the region. The potential threat of an incident occurring at these federal government facilities or during a major event or public is greater, while the many notable landmarks from a local historic perspective throughout the region are less at risk.

Based on historical events, it is possible that Berkeley and Morgan Counties will experience a suspected terrorist incidents or threat in a given year. Previous events have been limited in scope, but the severity of a future incidents cannot be predicted with any sufficient level of certainty. Prediction of terrorist attacks is almost impossible because terrorism is a result of human factors. As long as fringe groups maintain radically different ideas than that of the government or general population, terrorism is a possibility. Overall, the future occurrence of a terrorist attack can be considered *unlikely* (less than 1% annual probability) across the region according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.21.5. Vulnerability Assessment

Since the probability of terrorism occurring cannot be quantified in the same way as that of many natural hazards, it is not possible to assess vulnerability in terms of likelihood of occurrence. Instead, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in a community, planning efforts can be put in place to reduce the risk of attack. All communities in Berkeley and Morgan Counties are vulnerable on some level, directly or indirectly, to a terrorist attack. However, communities where specific potential targets are located should be considered more vulnerable. Site-specific assessments should be based on the relative importance of a particular site to the surrounding community or population, threats that are known to exist and vulnerabilities including:

Inherent Vulnerability

- Visibility – How aware is the public of the existence of the facility?
- Utility – How valuable might the place be in meeting the objectives of a potential terrorist?
- Accessibility – How accessible is the place to the public?
- Asset mobility – is the asset's location fixed or mobile?
- Presence of hazardous materials – Are flammable, explosive, biological, chemical and/or radiological materials present on site? If so, are they well secured?
- Potential for collateral damage – What are the potential consequences for the surrounding area if the asset is attacked or damaged?
- Occupancy – What is the potential for mass casualties based on the maximum number of individuals on site at a given time?

Tactical Vulnerability

Site Perimeter

- Site planning and Landscape Design – Is the facility designed with security in mind – both site-specific and with regard to adjacent land uses?
- Parking Security – Are vehicle access and parking managed in a way that separates vehicles and structures?

Building Envelope

- Structural Engineering – Is the building's envelope designed to be blast-resistant? Does it provide collective protection against chemical, biological, and radiological contaminants?

Facility Interior

- Architectural and Interior Space Planning – Does security screening cover all public and private areas?
- Mechanical Engineering – Are utilities and HVAC systems protected and/or backed up with redundant systems?
- Electrical Engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lightning sufficient?
- Fire Protection Engineering – Are the building's water supply and fire suppression systems adequate, code-compliant, and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?
- Electronic and Organized Security – Are systems and personnel in place to monitor and protect the facility?

Sites that may potentially be vulnerable to terrorist attacks include the courthouse, town centers, county airports, public schools and education centers, major regional employers, fairs and festivals. A list of critical facilities is provided in **Appendix E**.

The West Virginia Fusion Center also exists to provide resources, expertise, and information to the center with the goal of maximizing the ability to detect, prevent, investigate, and respond to criminal and terrorist activity. Intelligence processes through which information is collected, integrated, evaluated, analyzed, and disseminated are a primary focus. Data fusion involves the exchange of information from different sources including law enforcement, public safety, and the private sector. Relevant and actionable intelligence results from analysis and data fusion. The fusion process helps agencies be proactive and protect communities.

4.3.21.6. Populations at Risk

Regarding equity in the face of an act of terrorism, there are several communities to consider. Emergency response plans should include terrorism and take into account the needs of diverse populations, including non-English speakers, individuals with disabilities, and those with limited access to technological resources like smartphones or internet connections.

4.3.22. Transportation Incidents

4.3.22.1. Location and Extent



For this analysis a transportation incident is defined as an incident involving highway, air, or rail travel. Incidents involving hazardous materials are considered under Section 4.3.18 of this report. This analysis includes the location of all public airports, passenger and freight rail lines, and highways where major accidents are likely to occur.

Within Berkeley and Morgan Counties, there are thousands of miles of roads and over 170 bridges. Key freight routes include I-81, WV Route 9, and US 11, and are heavily traveled by large trucks. These trucks can create additional traffic hazards. Figures 4.3.22-1 and 4.3.22-2 show the major roads in the counties and railroads. Figure 4.3.22-3 shows the road network in Berkeley and Morgan Counties and the average annual daily traffic that can be expected on those roads. A CSX main rail service line runs horizontally across the entire Eastern Panhandle, along the eastern and northern edge of Morgan County and cuts across Berkeley County through Martinsburg. The CSX rail service lines are shown in Figure 4.3.22-4. There is a potential for major accidents on any of these roads, bridges, or railways.

Figure 4.3.22-1: Transportation Systems Throughout Berkeley County.

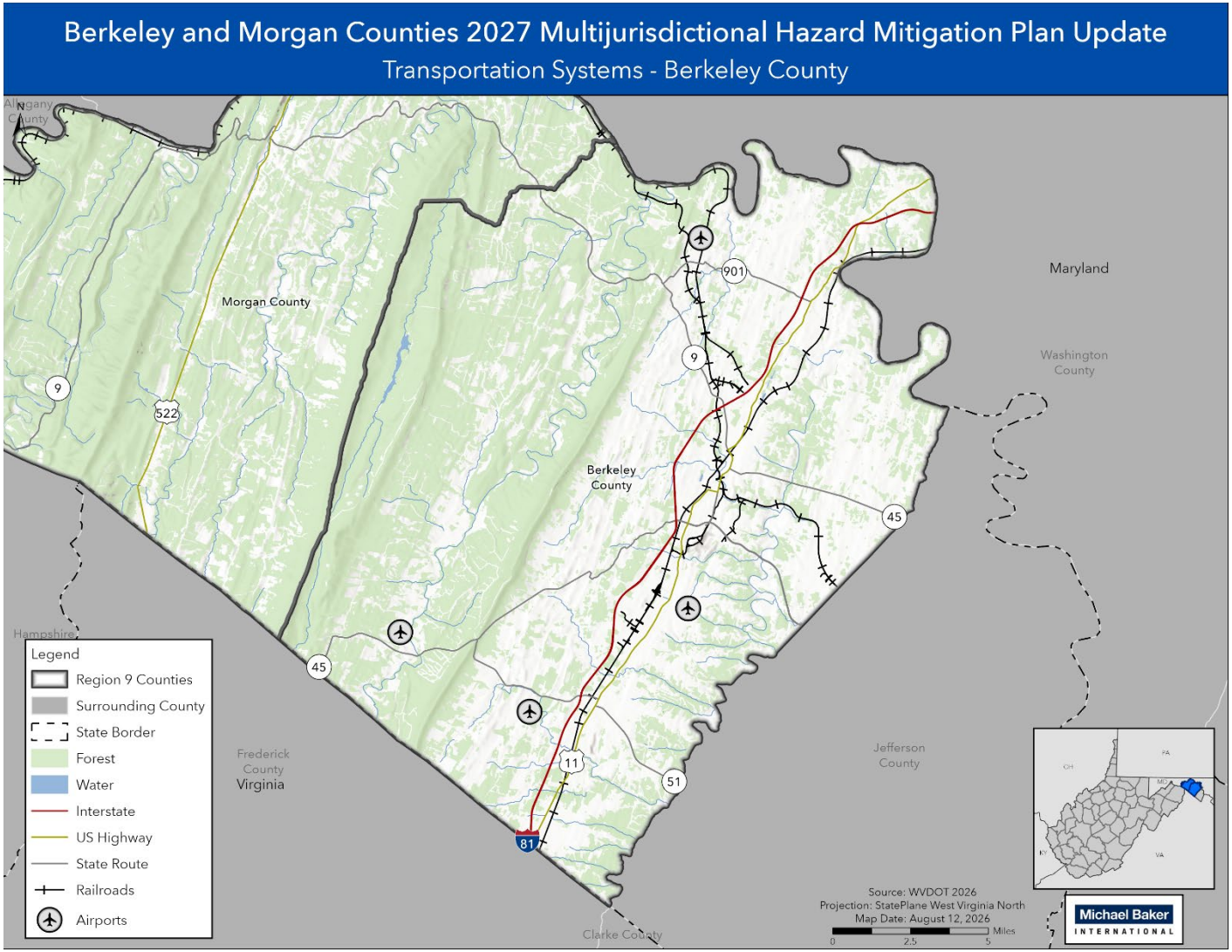


Figure 4.3.22-2: Transportation Systems Throughout Morgan County

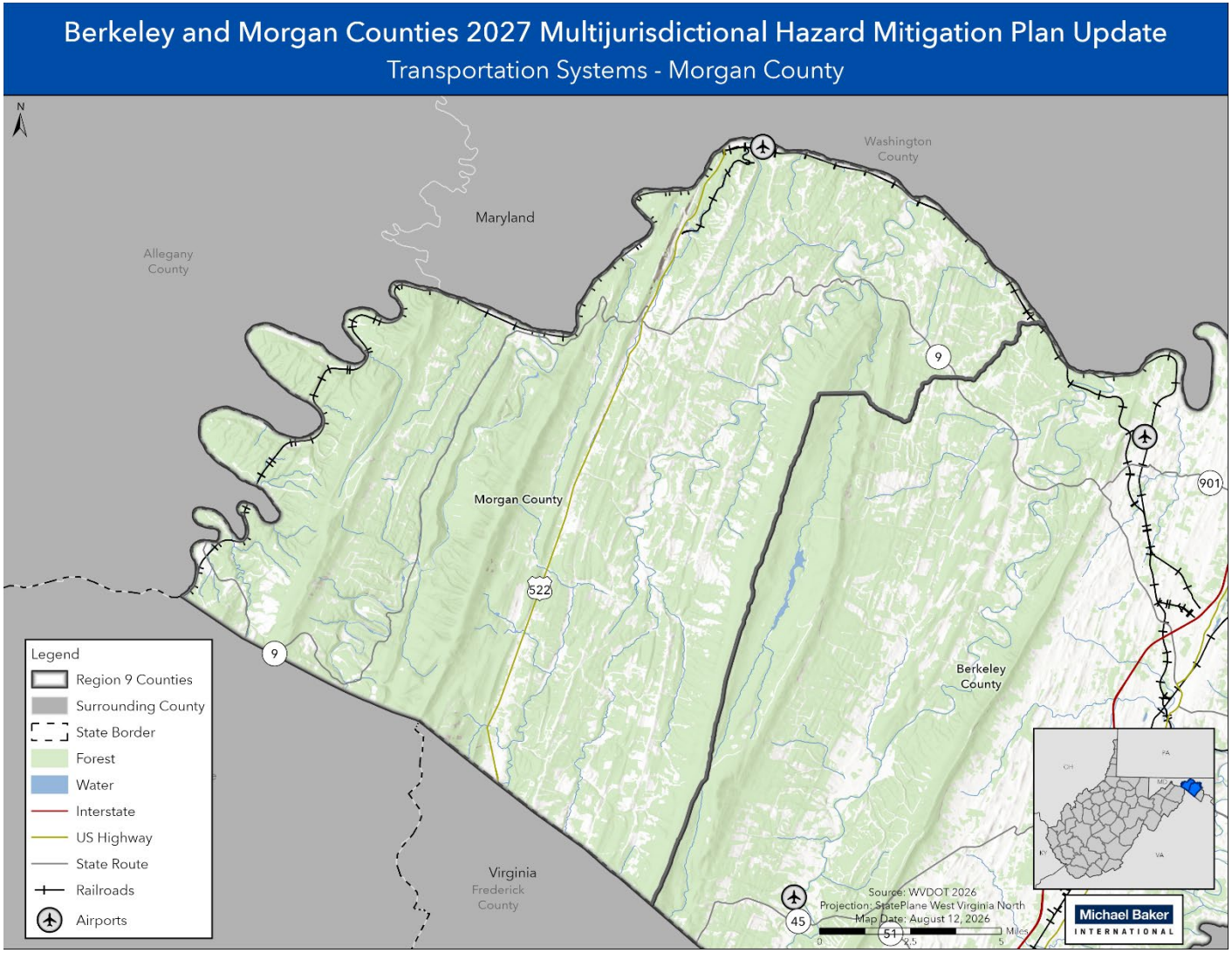


Figure 4.3.22-3: The Average Annual Daily Traffic (AADT) for Berkeley and Morgan Counties.

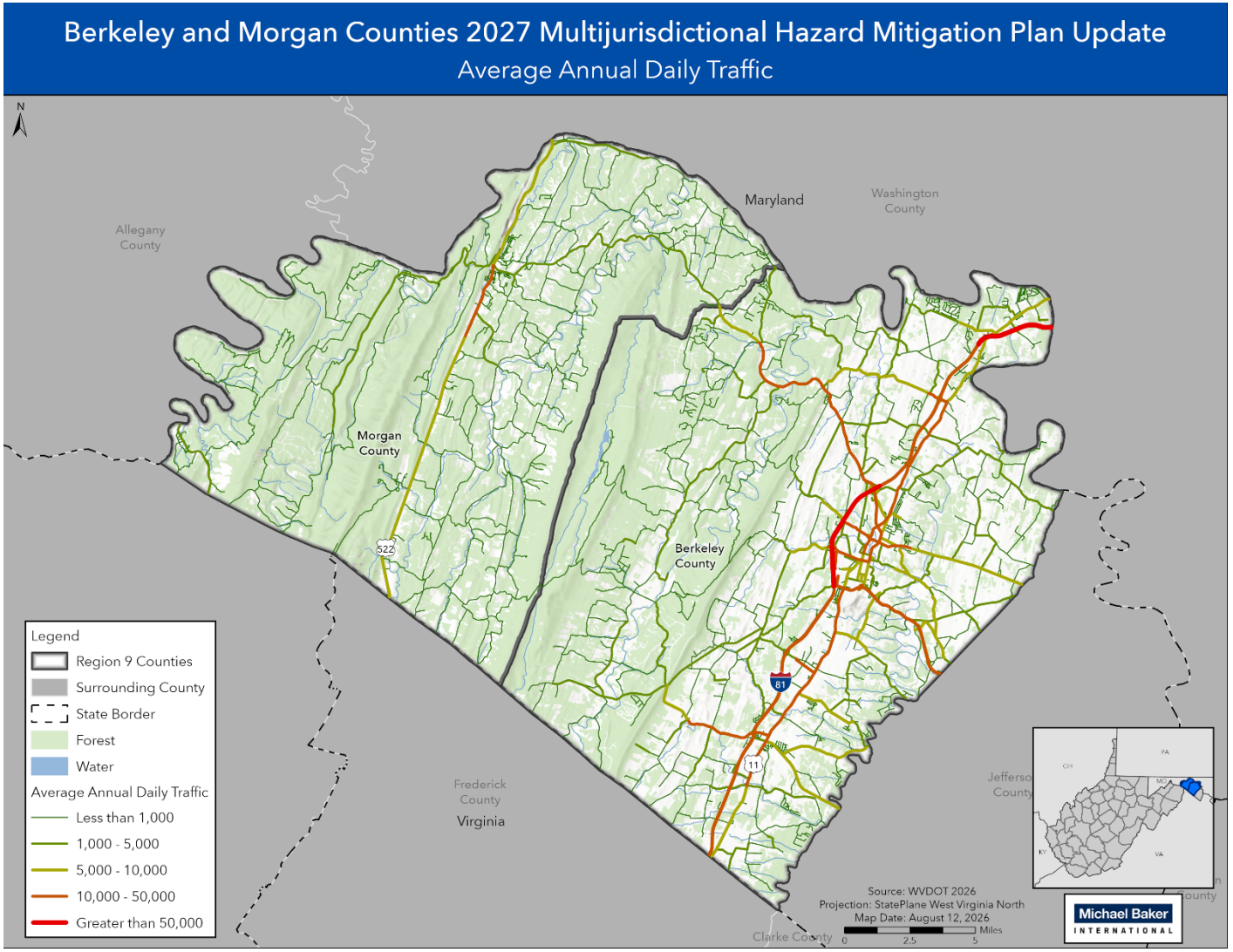
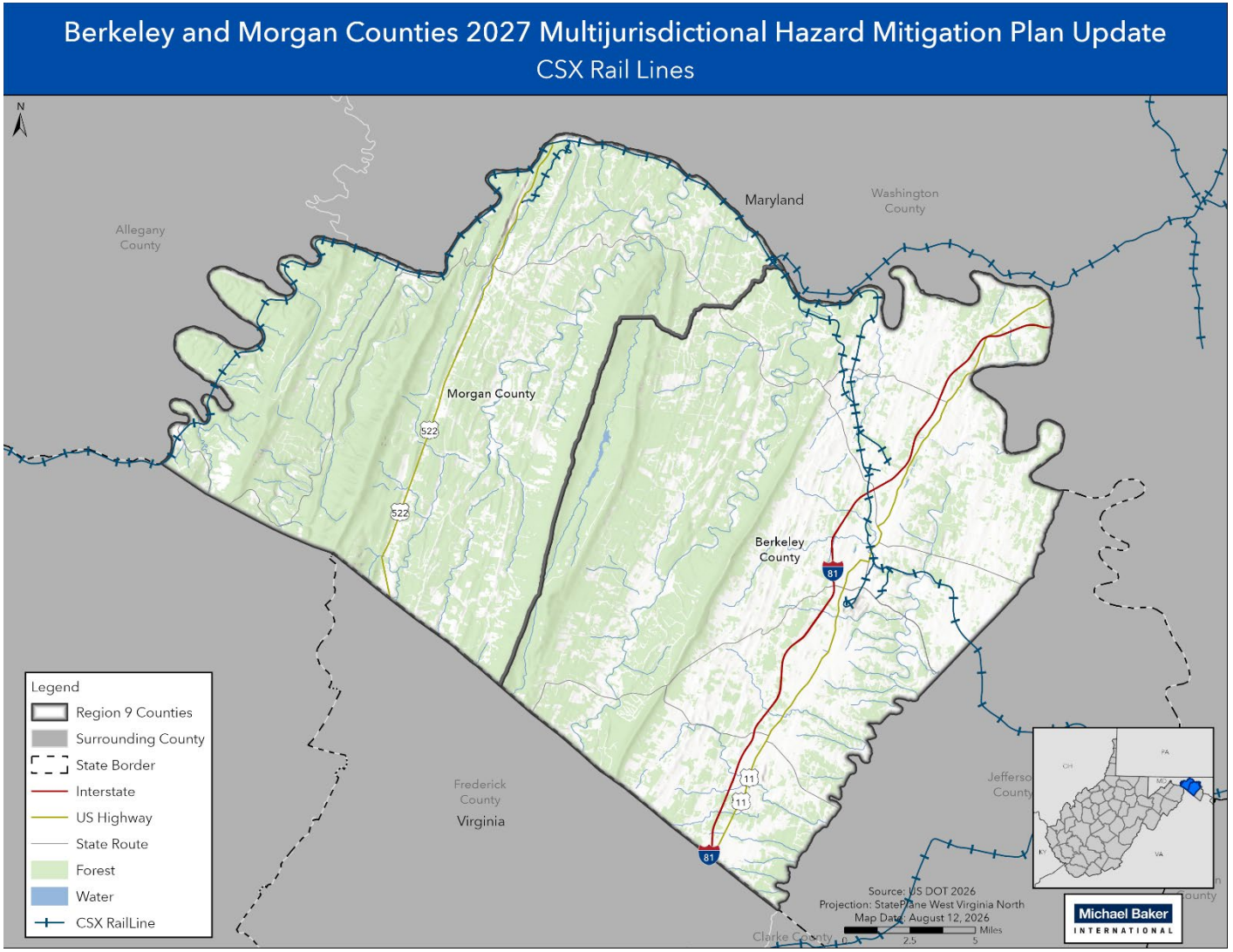


Figure 4.3.22-4: CSX Rail Lines Located Throughout Berkeley and Morgan Counties.



There is also one public airport in Berkeley County. This airport is the Eastern WV Regional Airport, which is a joint public and military use airport, located south of Martinsburg. It is used for general aviation and by the WV Air National Guard. Numerous major air traffic routes for the northern United States also pass over Berkeley and Morgan Counties.

4.3.22.2. Range of Magnitude

At a minimum, transportation incidents can result in damage to roadway infrastructure (like guard rails), the vehicle(s) involved, and minor injuries to passengers and drivers. At worst, significant transportation incidents can result in death or serious injury and property damage, coupled with business interruptions and hours of congestion. They can also result in environmental damage if the vehicle(s) involved are transporting hazardous materials, whether by truck or rail. The expected impacts of transportation incidents are amplified by the fact that there is often little warning beforehand.

A growing concern is the size and weight of cars and trucks has been increasing, which has led to a deadlier environment for pedestrians even though they are safer for the driver and any passengers (Insurance Institute for Highway Safety, 2021b). The environmental impacts of transportation incidents can vary greatly. In the case of a simple motor vehicle crash, train derailment, or aviation incident, the environmental impact is minimal. However, if the incident involves any type of vehicle moving chemicals or other hazardous materials, the impact will be considerably larger and may include an explosion or the release of potentially hazardous material. Railway and roadway incidents have the potential to result in hazardous materials release. As described in Section 4.3.18, weather conditions, micro-meteorological effects of buildings and terrain, and non-compliance with applicable codes can exacerbate these releases. Response time and quantity and type of material release also impact the severity of an accident.

The worst-case scenario for a transportation incidents impacting Berkeley and Morgan Counties would be a road accident which results in a hazardous material spill in a dense population area, such as in or near Martinsburg. Such an event would constitute an immediate health hazard to the local population and require a community evacuation. It could disrupt businesses, snarl commutes, and potentially cause long-term environmental damage.

The potential impacts of transportation incidents on community lifelines are as follows:

Table 4.3.22-1: Most Likely Lifelines Impacted by Transportation Incidents.

Lifeline	Notes
Safety and Security	Direct harm to community safety, including drivers, bicyclists, and pedestrians. Depending on the location and magnitude of the incident, this can also disrupt law enforcement operations and fire and emergency services' ability to navigate to where they are needed.

	Medical personnel might be needed due to the significant risk of injury and death that transportation incidents represent. Large-scale traffic accidents causing downstream congestion can hinder patient movement and prevent people from getting to medical care, often on short notice.
	Potential negative consequences of incidents occurring while transporting these materials.
	Potential for disruption to telecommunication service if the transportation incident involves damage to communication infrastructure. This is often a short-term impact.
	Potential for disrupted power around a transportation incident if it involves damage to power lines or other utility infrastructure. This is often a short-term impact.

4.3.22.3. Past Occurrence

The most common transportation incidents in the region are highway incidents involving motor vehicles. The region's most serious road transportation concerns involve U.S. 522, I-81, and WV 9. These routes have the highest annual average traffic counts in the region. Additionally, there is a temporal aspect to highway transportation incidents; in the spring and early summer, when construction and narrowed lanes are commonplace, the incidence of large-scale transportation incidents increases. On a smaller time scale, rush hour periods will see much higher volume of traffic than other times of the day depending on the location.

Vehicle crashes continue to be a risk throughout both counties. The National Highway Traffic Safety Administration (NHTSA) statistics for reportable vehicle accidents in Berkeley and Morgan Counties are shown in Tables 4.3.22-2 and 4.3.22-3. Data was not available for Morgan County for the years 2011, 2012, and 2015.

Table 4.3.22-3: Fatal Motor Vehicle Crashes For Berkeley County From 2010-2024 (NHTSA, 2026).

Year	Crash Type			
	Single-Vehicle Crash	Two-Vehicle Crash	More Than Two-Vehicle Crash	Total
2010	4	5	0	9
2011	12	6	0	18
2012	7	7	2	16
2013	15	3	0	18
2014	3	4	2	9

Table 4.3.22-3: Fatal Motor Vehicle Crashes For Berkeley County From 2010-2024 (NHTSA, 2026).				
Year	Crash Type			
	Single-Vehicle Crash	Two-Vehicle Crash	More Than Two-Vehicle Crash	Total
2015	4	5	0	9
2016	11	2	1	14
2017	7	2	1	10
2018	6	6	2	14
2019	10	3	2	15
2020	8	8	1	17
2021	10	7	2	19
2022	10	1	0	11
2023	4	3	1	8
2024	12	6	1	19
Total	**123**	**68**	**15**	**206**

Table 4.3.22-4: Fatal Motor Vehicle Crashes For Morgan County From 2010-2024 (NHTSA, 2026).				
Year	Crash Type			
	Single-Vehicle Crash	Two-Vehicle Crash	More Than Two-Vehicle Crash	Total
2010	2	0	0	2
2011	N/A	N/A	N/A	N/A
2012	N/A	N/A	N/A	N/A
2013	0	0	1	1
2014	0	3	0	3
2015	N/A	N/A	N/A	N/A
2016	2	1	1	4
2017	1	0	0	1
2018	1	0	0	1
2019	2	2	0	4
2020	1	2	0	3
2021	2	1	0	3
2022	1	0	0	1
2023	2	1	0	3
2024	1	0	0	1
Total	**15**	**10**	**2**	**27**

I-81 continues to be an issue for Berkeley County and has the highest traffic incident account rate of the region, with accidents occurring regularly. A common incident type for this roadway would be similar to an occurrence on June 15, 2021: Berkeley County Sheriff's Office responded to the area of I-81 southbound between the one and half mile marker near the West Virginia and Virginia State line.

Officials reported at least one fatality on the scene (Mphofe, 2021). Or: On February 18, 2021, I-81 closed following a crash involving over ten tractor trailers, due to ice on the road. More recently, a crash between a pick-up truck and tractor trailer resulted in one 5-year-old fatality and several injuries on January 4, 2026. I-81 was closed for several hours following the crash to process evidence and clear the wreckage (WVNews, 2026a).

While there have been no serious incidents of train derailments or accidents in Berkeley or Morgan County, in 2019 a CSX train derailment occurred in nearby Harpers Ferry, Jefferson County. Seven cars were derailed both on and off the tracks with some falling into the river, causing structural damage to the bridge and railcars (Wilt, 2020).

Crashes involving aircrafts have also occurred in the region, although not very recently. The Bureau of Aircraft Accidents Archives (BAAA) lists one 1992 incident that resulted in six fatalities in Berkeley Springs; and one incident that resulted in one fatality in Martinsburg, in 1958 (BAAA, 2021).

4.3.22.4. Future Occurrence

While transportation incidents cannot be accurately predicted, areas with incident-prone characteristics, such as poor visibility and unprotected left turns, and areas with known crashes and speeding issues can be identified and documented. The number of transportation related incidents is expected to increase with growing populations and increased traffic volumes. The population of Berkeley County increased by 20.68% between 2014 and 2024, while Morgan County's population remained relatively the same with a slight decline (-0.14%). New residents have limited knowledge of detour routes and alternate routes around accidents, contributing to the possibility of incident-related congestion. The continued or elevated numbers of tractor-trailers on the county's road system could also contribute to incidences of transportation incidents.

Further, Berkeley County has an average commute time of 30.7 minutes with 78.6% of residents driving alone to work. Similarly, Morgan County has an average commute time of 38.2 minutes with 80.8% of citizens driving alone to work (U.S. Census Bureau, 2024, 5-Year ACS). These factors can indicate more individuals on the road, and for longer, increasing the risk of roadway vehicular incidents. Along with this, the transportation, warehousing, and utility industry account for 8.2% for Berkeley County and 5.6% for Morgan County of overall employment (U.S. Census Bureau, 2024, 5-Year ACS). Any growth of the transportation and warehousing economic sector will put greater demand on the counties roadways and will likely result in the continued occurrence of transportation incidents. If this growth is dependent on and results in an increase in rail transportation, rail incidents could increase in turn.

Changes to West Virginia's climate will also have an impact on future occurrences of transportation incidents due to changes impacting the condition of the infrastructure both long-term and in severe weather events. Changes in precipitation, extreme weather events, and heat pose risks to transportation infrastructure, affecting performance, safety, and reliability. According to Climate

Central (2026b), the main effects of climate change on transportation systems (road, rail, and air) are the following:

- Extreme heat can warp materials and increase maintenance costs.
- Wildfires damage roads, including essential ones used for evacuation.
- Heavy rainfall causes flooding and structural damage.
- Stronger hurricanes and higher storm surge damage roads and bridges.

Additionally, future aviation incidents are expected to continue to be rare. The probability of aviation incidents nationwide in 2024 was estimated to be 0.68 incidents per 100,000 flight hours. This incident rate has decreased each year since 2017 when it was 0.83 incidents per 100,000 flight hours (FAA, 2025). Therefore, the likelihood of an aviation incident in either county is considered low.

Recognizing the changing transportation network within each county and the fluctuating transportation volume, number of accidents, injuries and deaths from accidents, environmental impacts, and property damages is important when addressing and mitigating this hazard. Mitigation should focus on creating climate-resilient transportation systems. The probability of the future occurrence of transportation incidents can be considered *likely* (between 50% & 90% annual probability) across the region according to the Risk Factor Methodology (see Table 4.4.1-1).

Specific transportation related concerns voiced by stakeholders include the Berkeley Springs 522-Bypass, increased traffic along I-81, and overall, more transportation incidents throughout both Counties with construction identified as a potential cause. The Berkeley Springs Bypass Project was completed in June 2025, with the goal to ease congestion around Berkeley Springs (WV DOT, 2025). Several people noted concerns with increased traffic as a result. Additionally, increased commercial and residential growth around the I-81 corridor will likely continue to cause regular traffic incidents.

4.3.22.5. *Vulnerability Assessment*

A transportation-related incident can occur on any stretch of road in Berkeley or Morgan County. However, severe accidents are more likely to occur on the highways, such as I-81, U.S. 11, and W.V. 9, which experience heavier traffic volumes including heavy freight vehicles. The combination of high traffic volume, severe winter weather, and large numbers of hazardous materials haulers increase the chances of traffic accidents occurring. Accidents may also occur on any rail line or air flight path.

Like highway incidents, rail incidents can impact populations living near rail lines. Crude oil shipping across the United States greatly increased in the mid-2010s; delivering 9,500 carloads in 2008 compared to 435,560 carloads of crude oil in 2013. Crude imports by rail from Canada increased more than 20-fold since 2011 (Frittelli et al., 2014). Bakken crude oil is more volatile than regular crude oil, leading to an increase of possible safety hazards during transportation, and the possibility of an even

more catastrophic event if a derailment were to occur (Frittelli et al., 2014).

Freight transportation through the region is facilitated through highways, freight railroads, and air service. The 2023 West Virginia State Freight Plan estimates by 2050, domestic freight flows within the State are expected to decrease to 285 million tons, a 12.7% decrease from 2019's 326 million tons of freight. Over the same time horizon, the total value of goods moved is projected to increase to $224 billion, a 76.4% increase from the 2019 value of $127 billion due to an increase in high-value products like pharmaceuticals (WVDOT, 2023). Continued increases in freight transportation require planning and regulatory efforts to help keep transportation routes safe.

Table 4.3.22-5: Community Vulnerability to Roadway Accidents for Berkeley and Morgan Counties.

Jurisdiction	Total Structures	Total Structures within 0.25 Miles of Major Road	Percent of Structures within 0.25 Miles of Major Road	Total Population	Population within 0.25 Miles of Major Road	Percent of Population within 0.25 Miles of Major Road	Total Critical Facilities	Critical Facilities in within 0.25 Miles of Major Road	Percent of Critical Facilities within 0.25 Miles of Major Road
Bath	504	504	100%	753	753	100%	3	3	100%
Berkeley Unincorporated	104,115	30,017	29%	102,999	27,284	26%	52	31	60%
Hedgesville	276	276	100%	300	300	100%	0	0	0%
Martinsburg	10,342	5,577	54%	18,777	10,304	55%	16	12	75%
Morgan Unincorporated	22,977	5,865	26%	15,900	2,350	15%	11	5	45%
Paw Paw	481	442	92%	410	377	92%	4	4	100%
TOTAL	138,695	42,681	31%	139,139	41,368	30%	86	55	64%

Table 4.3.22-5 estimates vulnerable population, structure, and critical facilities to transportation incidents. Those that are within 0.25 miles of a major roadway are considered vulnerable to possible consequences of a transportation incident. Major roadways include interstates, US highways, and state routes. Both Bath and Hedgesville are 100% vulnerable as a major roadway runs through the center of town, with Paw Paw also at a high percentage of 92%. Berkeley and Morgan Counties together have about 31% of their structures, 30% of their population, and 64% of critical facilities within 0.25 miles of a major roadway.

Table 4.3.22-6: Community Vulnerability to Rail Accidents for Berkeley and Morgan Counties.

Jurisdiction	Total Structures	Total Structures within 0.25 Miles of Railroad	Percent of Structures within 0.25 Miles of Railroad	Total Population	Population within 0.25 Miles of Railroad	Percent of Population within 0.25 Miles of Railroad	Total Critical Facilities	Critical Facilities in within 0.25 Miles of Railroad	Percent of Critical Facilities within 0.25 Miles of Railroad
Bath	504	0	0%	753	0	0%	3	0	0%
Berkeley Unincorporated	104,115	16,071	15%	102,999	19,216	19%	52	18	35%
Hedgesville	276	0	0%	300	0	0%	0	0	0%
Martinsburg	10,342	4,530	44%	18,777	8,894	47%	16	9	56%
Morgan Unincorporated	22,977	1,663	7%	15,900	410	3%	11	1	9%
Paw Paw	481	440	91%	410	349	85%	4	3	75%
TOTAL	138,695	22,704	16%	139,139	28,869	21%	86	31	36%

Table 4.3.22-7 estimates vulnerable population, structure, and critical facilities to transportation incidents. Those that are within 0.25 miles of a railroad are considered vulnerable to possible consequences of a rail-related transportation incidents. Paw Paw has the highest percentage of vulnerability as 91% of the structures, 85% of the population, and 75% of the critical facilities are within 0.25 of a railroad. Berkeley and Morgan Counties all together have about 16% of their structures, 21% of their population, and 36% of critical facilities within 0.25 miles of a railroad.

Table 4.3.22-8: Community Vulnerability to Air Accidents for Berkeley and Morgan Counties.

Jurisdiction	Total Structures	Total Structures within 5 Miles of Airport	Percent of Structures within 5 Miles of Airport	Total Population	Population within 5 Miles of Airport	Percent of Population within 5 Miles of Airport	Total Critical Facilities	Critical Facilities in within 5 Miles of Airport	Percent of Critical Facilities within 5 Miles of Airport
Bath	504	0	0.0%	753	0	0.0%	3	0	0.0%

Berkeley Unincorporated	104,115	73,733	70.8%	102,999	74,730	72.6%	52	41	78.8%
Hedgesville	276	276	100.0%	300	300	100.0%	0	0	0.0%
Martinsburg	10,342	9,704	93.8%	18,777	16,851	89.7%	16	13	81.3%
Morgan Unincorporated	22,977	4,470	19.5%	15,900	3,554	22.4%	11	3	27.3%
Paw Paw	481	0	0.0%	410	0	0.0%	4	0	0.0%
TOTAL	504	0	0.0%	753	0	0.0%	3	0	0.0%

Table 4.3.22-8 estimates vulnerable population, structure, and critical facilities to transportation incidents. Those that are within 5 miles of an airport are considered vulnerable to possible consequences of air-related transportation incidents. The Town of Hedgesville has the highest percentage of vulnerability as 100% of the structures and 100% of the population are within 5 miles of an airport. Similarly, the City of Martinsburg also has a high vulnerability with 93.8% of its structures, 89.7% of its population, and 81.3% of its critical facilities are within 5 miles of an airport. Berkeley and Morgan Counties all together have about 90.3% of their structures, 95% of their population, and 106.1% of critical facilities within 5 miles of an airport.

Berkeley and Morgan Counties future population growth and land use will be significantly impacted by the safety and capacity of the transportation systems traversing the region. Most residents, visitors, and tourists will use automobiles as their primary transportation throughout the community. Immigration and commercial development are also largely dependent on motor vehicle transportation systems.

All critical infrastructure within Berkeley and Morgan Counties is vulnerable to traffic incidents, in that facility operators may be injured or delayed in performing their duties due to traffic incidents. Transportation infrastructure may be directly affected by being damaged during the incident.

Given the importance of motor vehicle traffic to the future of Berkeley and Morgan Counties, traffic and road infrastructure planning must be a high priority for community planners and development officials. Given the opportunity to establish long-term traffic planning programs and mitigate incidents by improving safety at dangerous intersections, the region can greatly enhance the safety of its residents and visitors alike. Furthermore, taking the opportunity to learn from other high-growth areas, the region can take steps now to promote the proper balance between development and road infrastructure growth, to mitigate future problems.

4.3.22.6. Populations at Risk

The National Safety Council, a national organization focused on promoting safety, including transportation safety, cites many research-backed issues related to equity in transportation

nationwide:

- Older adults and drivers under the age of 25 have a higher fatality rate in vehicular crashes than other age groups.
- Nationally, 43% of all highway fatalities happen on rural roads.
- Pedestrian fatalities stemming from vehicular incidents are higher for low-income communities, with lower income neighborhoods seeing more than twice as many pedestrian fatalities than highest income neighborhoods.
- Lower income neighborhoods are more likely to have more dangerous roadways with characteristics that increase fatalities in crashes, like higher speeds. If hit by a vehicle traveling just 40 miles per hour, only one in ten pedestrians will survive (National Safety Council, 2023).

While these are national statistics, they provide some indication of how equity issues may manifest in the Counties when it comes to transportation incidents. Zero-car households and individuals dependent on walking or biking are more vulnerable in traffic accidents. More rural areas in both Counties may also have disproportionate effects due to their secluded locations which could affect the access to timely and effective emergency response services.

4.3.23. Utility Interruption

4.3.23.1. Location and Extent



Utility interruptions include any impairment of the functioning of telecommunication, gas, electric, water, or waste networks. Interruptions or outages occur because of geomagnetic storms, fuel or resource shortages, electromagnetic pulses, information technology failures, transmission facility or linear utility accidents, and major energy, power, or utility failures. The focus of utility interruptions as a hazard lies in fuel, energy, or utility failure. These kinds of interruptions rarely spontaneously occur on their own; this hazard is often secondary to other natural hazard events, particularly transportation crashes and incidents, lightning strikes, extreme heat or cold events, and coastal and winter storms. The causes for outages are usually downed power wires or utility poles as a result of inclement weather or vehicle incidents. Additionally, outages can be caused by blown transformers or tripped circuit breakers. Most often, there is no cause reported and power is restored within the hour.

Utility interruptions in Berkeley and Morgan Counties occur regularly but are usually small-scale, localized incidents. Utility interruptions are possible anywhere there is utility service. Table 4.3.23-1 lists the major utility companies in the region. Utility interruptions and power failures can take place throughout the region.

Table 4.3.23 -1: Major Utility Companies in Berkeley and Morgan Counties (Berkeley County Comprehensive Plan, 2016).

Company Name	Type of Utility
First Energy, Potomac Edison	Electricity
Mountaineer Gas Company	Natural Gas
Blueflame, Inc. – Morgan County	Propane Gas
Thompson Gas – Morgan County	Propane Gas
Verizon	Telecom
Frontier Communications	
Comcast Cable	

According to the 2024 5-year American Community Survey, in Berkeley County, 76.5 percent of occupied housing units use electricity as their heat source, followed by 10.1 percent of homes using gas for heat. In Morgan County, 67.0 percent of housing units use electricity as their heat source, followed by 10.1 percent of homes using fuel oil for heat, and 5.3 percent using bottled, tank, or LP gas (ACS 2019-2024). As a result, an interruption in any of those utilities could affect a significant number of residents. In addition, an increasing reliance on internet access and telecommunications could also impact many residents at any given time.

4.3.23.2. Range of Magnitude

The most severe utility interruptions will be regional or widespread power and telecommunications outages. With the loss of power, electrically powered equipment and systems will not be operational. Examples may include lighting; HVAC and ancillary support equipment; communication (i.e. public address systems, telephone, computer servers, and peripherals); ventilation systems; fire and security systems; refrigerators, sterilizers, trash compactors, office equipment; and medical equipment. This can cause food spoilage, loss of heat or air conditions, basement flooding (sump pump failure), lack of light, loss of water (well pump failure), lack of phone service, or lack of internet service. However, this is most often a short-term nuisance rather than a catastrophic hazard.

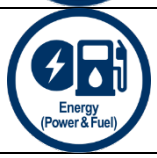
The severity of a utility interruption can be compounded with extreme weather events, especially winter weather events. Interruptions can also be more severe for special needs populations that are dependent on electronic medical equipment. Utility interruptions can significantly hamper first responders in their efforts to provide aid in a compound disaster situation, especially with losses of telecommunications and wireless capabilities. Telecommunications interruptions will also hinder first responders' efforts. Additionally, an internet outage could be crippling to the economy, as many companies and government entities process payments and invoices electronically rather than with cash or physical checks.

In a possible worst-case scenario for Berkeley and Morgan Counties, a winter storm event could cause widespread power outages, leaving citizens without heat in the midst of subzero temperatures for several days. The power outage would also put elderly populations or others at risk of health problems due to the lack of heat and the inability to call for assistance or leave their homes. Power lines could also be difficult to repair depending on the magnitude of the storm. A power outage during the summer could also have serious consequences for much the same reason. During the summer the temperatures in Berkeley and Morgan Counties can occasionally exceed 100°F, and with no air conditioning this can put elderly and other vulnerable populations in danger of dehydration, heat exhaustion, or heat stroke.

The potential impacts of utility interruption on the community lifelines are as follows:

Table 4.3.23-2: Most Likely Lifelines Impacted by Utility Interruption.

Lifelines	Notes
	Government facilities may be impacted directly and the capability to administer services diminished. Impacts to certain facilities will require additional public outreach from the county and authorities (e.g., interruption in water supply).
	Water and electrical utilities in homes and potentially different aspects of the food supply chain will be impacted.

	Healthcare facilities may be impacted directly and therefore the capacity to deal with patients is diminished. Outages may impact the storage and handling of vaccines.
	Fuel usage may increase as a result of electricity no longer being available for an extended period of time.

4.3.23.3. Past Occurrence

Berkeley and Morgan Counties do have a history of regular utility interruptions. Table 4.3.23-3 shows a sample of power outage events in the area reported by local news media. It is not a comprehensive list, but it does represent the magnitude and impact of recent utility interruptions.

Table 4.3.23-3: Recent Utility Interruptions in Berkeley and Morgan Counties.

Date	Cause	Location	Area Customers Impacted	Source
9/25/2009	Vehicle Collision with Utility Pole	Hedgesville Elementary School	Limited to School	Your4State, 2009b
2/25/2011	Damage from Strong Winds	Maryland and West Virginia	600+	Armstrong, 2011
10/30/2012	Damage from Hurricane Sandy	Maryland and West Virginia	12,002	The Journal, 2012
11/27/2013	Transmission Station Transformer Malfunction	Western Morgan County	1,800	Clark, 2013
4/29/2014	Crossbeam Damage	Morgan County	2,271	MorganCountyUSA, 2014
7/9/2014	Severe Thunderstorm Damage	Eastern Panhandle	14,379	Marshall, 2014
8/18/2014	Transformer Fire	Apple Harvest Drive, Martinsburg	Limited to Road Only	Herald-Mail Media, 2014
3/26/2016	Transformer Fire (See Figure 4.3.20-1)	Berkeley County	3,500+	Agnir, 2016
4/26/2016	Falling Tree Damaged Substation	Martinsburg	3,000+	Emke, 2016
2/12/2019	Snow, Ice, and Rain	Great Cacapon	700	The Morgan Messenger 2019
2/17/2019	High Winds	Morgan County	2,000+	Rudder & Shunney, 2019
7/18/2022	Thunderstorm Wind	Berkley County	Limited to Blair Street	NOAA Storm Events Database,

Table 4.3.23-3: Recent Utility Interruptions in Berkeley and Morgan Counties.				
Date	**Cause**	**Location**	**Area Customers Impacted**	**Source**
			and Hanshew Intersection	2022
1/10/2024	Severe Thunderstorm Damage	DMV Area	816	Luzader, 2024
4/19/2025	Thunderstorm	Berkeley and Morgan Counties	3,000+	The Morgan Messenger 2025
7/21/2026	Flooding, Thunderstorm, Windstorm	West Virginia	25,000+	Upchurch, 2026

Figure 4.3.23-1 Crew Repairs Damage from Transformer Fire in Berkeley County 3/26/16 (Agnir, 2016)



4.3.23.4. Future Occurrence

Utility interruptions will continue to occur annually with minimal impact. Widespread utility interruption events usually occur approximately once every five years, usually as a secondary effect of an extreme weather event. These interruptions should be anticipated, and first responders should be prepared during severe weather events. Research by the National Oceanic and Atmospheric Administration (NOAA) suggests that climate change may cause more extreme storms in West Virginia (Climate.gov, 2021).

Power outages can be expected at any time of year, on a nearly monthly basis. Iced power lines; falling tree limbs due to ice, wind, or lightning strikes; and vehicle incidents damaging power lines, or their support poles can all be reasons for power outages.

The region around Berkeley and Morgan Counties is expected to see large increases in precipitation and numbers of very hot and very cold days (Climate Central, 2026a). These factors can increase the occurrence of hazards such as flooding, hurricanes and tropical storms, landslides, tornados and windstorms, wildfires, and winter storms. Impacts from any of these hazards can lead to utility interruption on a range of scales. Overall, the probability of future utility outages impacting the region can be considered *likely* (between 50% & 90% annual probability) according to the Risk Factor Methodology (see Table 4.4.1-1).

Aging infrastructure also brings risk in the form of potential utility interruptions, particularly for places like Berkeley and Morgan Counties with aging infrastructure. In many utility systems, significant portions of the equipment and facilities date from the growth periods of the 1950s and 1960s that followed World War II. As this equipment ages, it deteriorates from the constant wear and tear of service. Eventually the equipment reaches a point at which it will either fail on its own or because of outside forces (storms, loads it was designed to handle but no longer can, etc.). These failures cause service interruptions and can require expensive emergency repairs. In addition, as repairs have taken place along transmission routes, there is often a mix of new and old equipment along the line, as repair and not replacement is generally the choice made to resolve an issue.

The wholesale replacement of a system is not a feasible solution for utility companies. This would require the interruption of services while the replacement occurs, as well as accessing the existing system (which may lay under roads, private property, or other inconvenient places). Utility companies face the challenge of managing the issue of the aging infrastructure. They are tasked with reducing the effects of aging equipment while also controlling the deterioration of the existing system as much as possible. This balance will be tenuous as transmission equipment continues to age and break down. These breakdowns will likely lead to more frequent utility disruptions as time goes by.

4.3.23.5. Vulnerability Assessment

All jurisdictions are vulnerable on some level to utility interruptions, but because this hazard often occurs in conjunction with other hazards, jurisdictions that have been identified as more vulnerable to winter storms, windstorms, tornado, flooding, and other natural hazard events may be more vulnerable to a utility interruption.

Emergency medical facilities, including retirement homes and senior centers, are particularly vulnerable to power outages. While back-up power generators are often used at these facilities, loss of electricity may result in hot or cold temperatures for which elderly populations are particularly vulnerable. Conservation and improved technology have resulted in more efficient use of energy sources. The increasing use of alternative fuel supplies, such as kerosene heaters, wood burning

stoves, coal burners, etc., has also decreased our vulnerability to future shortages. However, severe weather extremes, accidents, labor strikes, terrorism, or nationwide shortages could cause significant energy shortage problems. Emergency management officials can reduce vulnerability to utility interruption through training and exercises, such as the "Dark Grid" exercise conducted by the Local Emergency Planning Committee of Berkeley County, which prepare emergency responders and community leaders for a coordinated response to widespread utility interruptions (Rossbach, 2016).

The region is also well known to have many areas with limited cellular and broadband access. Areas of concern are the rural portions of Berkeley and Morgan Counties. The West Virginia Broadband Council provides Broadband Mapping Data and Resources (https://broadband.wv.gov/broadband-development-hub/). The West Virginia Broadband Enhancement Council was established in code during the 2017 Regular Legislative Session with the passage of House Bill 3093 and signed into law by Governor Jim Justice. The Code sets the many directives for the Council with the primary emphasis being on the development of broadband infrastructure in unserved and underserved areas of the State (WV Broadband Enhancement Council, 2026). Stakeholders and community members have noted concern about broadband and cellular interruption in receiving and sending of emergency communications.

Since implementing an enhanced vegetation management program in 2014, Potomac Edison infrastructure has experienced significantly fewer tree-related outages in areas where tree trimming has been conducted to the new standards. The company services 1,550 miles of lines in its territory in the Eastern Panhandle. In 2020, the company saw a 45 percent reduction in tree-related outages compared to 2019, and the amount of time customers experienced service interruptions due to trees dropped by 75 percent. Actions like this can be taken by utility providers to reduce an area's utility interruption vulnerability (PRNewsWire, 2021).

4.3.23.6. Populations at Risk

Utility interruptions can disproportionately affect vulnerable populations, including the elderly, individuals with disabilities, and those with chronic health issues who rely on electricity for medical equipment. Prioritizing adequate preparedness for these groups can help make sure that backup power systems, such as generators, are in place. Morgan County has a higher risk due to a larger percentage (25.2%) of its population being aged 65 or older. Furthermore, the Town of Bath may be especially vulnerable to utility interruptions due to 22.6% of its population having a disability. Additionally, low-income communities often face challenges related to aging or poorly maintained infrastructure, which can increase the likelihood and duration of utility interruptions. Adequate mitigation efforts should focus on improving infrastructure resilience.

4.4. Hazard Vulnerability Summary

4.4.1. Methodology

Ranking hazards helps communities prioritize mitigation based on their vulnerabilities. A Risk Factor (RF) is a tool used to assess the degree of risk for identified hazards in a particular planning area. The RF aids local officials in ranking and prioritizing hazards that pose the most significant threats to the planning area using a mix of qualitative and quantitative data deemed important by the planning team and other stakeholders. The RF system relies mainly on historical data, local knowledge, consensus from the planning team, and information collected through development of the hazard profiles in **Section 4.3**. The RF approach produces numerical values to rank hazards against one another; the higher the RF value, the greater the hazard risk.

RF values are determined by assigning varying degrees of risk to five categories for each of the hazards profiled in the HMP Update: probability, impact, spatial extent, warning time, and duration. Each degree of risk was assigned a value from one to four. The weighting factor is shown in Table 4.4.1-1. 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:

Risk Factor Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Table 4.4.1-1 summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Table 4.4.1-1: Summary of Risk Factor approach used to rank hazard risk				
Risk Assessment Category	**Degree of Risk**			**Weight Value**
	Level	**Criteria**	**Index**	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILTY	**4**	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	**MINOR**	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**	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts*	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	**3**	

Table 4.4.1-1: Summary of Risk Factor approach used to rank hazard risk				
Risk Assessment Category	**Degree of Risk**			**Weight Value**
	Level	**Criteria**	**Index**	
localized or regional?	**LARGE**	GREATER THAN 25% OF AREA AFFECTED	**4**	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	**MORE THAN 24 HRS**	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	**1**	**10%**
	12 TO 24 HRS	SELF-DEFINED	**2**	
	6 TO 12 HRS	SELF-DEFINED	**3**	
	LESS THAN 6 HRS	SELF-DEFINED	**4**	
DURATION *How long does the hazard event usually last?*	**LESS THAN 6 HRS**	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	**1**	**10%**
	LESS THAN 24 HRS	SELF-DEFINED	**2**	
	LESS THAN 1 WEEK	SELF-DEFINED	**3**	
	MORE THAN 1 WEEK	SELF-DEFINED	**4**	

4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, Table 4.4.2-1 lists the Risk Factor calculated for each of the 23 hazards identified in the 2027 HMP Update. Hazards identified as *high risk* have risk factors of 2.3 or greater. Risk Factors ranging from 2.0 to 2.2 were deemed *moderate* risk hazards. Hazards with Risk Factors 1.9 and less are considered *low* risk. The Counties and jurisdictions ranking results were combined due to the similarities in the hazard results. Based on the results, there are eight high risk hazards, four moderate risk hazards and eleven low risk hazards for Berkeley and Morgan Counties. Mitigation actions were developed for all high, moderate, and low risk hazards (see Section 6.4).

Table 4.4.2-1: Berkeley and Morgan Counties Ranking of Hazard Types Based on Risk Factor Methodology							
Risk Class	**Hazard**	**Risk Assessment Category (1 = least severe, 4 = most severe)**					**Calculated Risk Factor**
		Probability (1-4)	**Severity (1-4)**	**Spatial Extent (1-4)**	**Warning Time (1-4)**	**Duration (1-4)**	
H	**Flooding**	3	2	3	2	3	**2.5**

Table 4.4.2-1: Berkeley and Morgan Counties Ranking of Hazard Types Based on Risk Factor Methodology							
Risk Class	Hazard	Risk Assessment Category (1 = least severe, 4 = most severe)					Calculated Risk Factor
		Probability (1-4)	Severity (1-4)	Spatial Extent (1-4)	Warning Time (1-4)	Duration (1-4)	
	Utility Interruption	3	2	3	3	2	**2.5**
	Substance Use Disorder	3	2	2	2	3	**2.4**
	Drought	2	2	3	1	3	**2.3**
	Extreme Temperatures	3	2	2	1	3	**2.3**
	Source Water Contamination	2	2	3	3	3	**2.3**
	Thunderstorm, Lightning Strike	3	2	2	3	2	**2.3**
	Transportation Incidents	3	2	2	3	1	**2.3**
Medium	Winter Storm, Nor'easter	2	2	3	1	3	**2.2**
	Hazardous Materials Incident	2	2	2	3	2	**2.1**
	Pandemic and Infectious Disease	2	2	2	1	4	**2.1**
	Windstorm, Tornado	2	2	2	3	2	**2.0**
Low	Cyber Terrorism	2	2	2	3	2	**1.9**
	Wildfire	2	1	2	3	2	**1.8**
	Hailstorm	2	1	2	3	1	**1.7**
	Hurricane and Tropical Storm	2	2	2	1	2	**1.7**
	Terrorism	1	2	2	3	2	**1.7**
	Invasive Species	2	1	2	1	3	**1.6**
	Civil Disturbance	2	1	1	2	1	**1.5**
	Dam Failure	1	1	2	2	2	**1.4**
	Landslide and Land Subsidence	1	1	1	2	2	**1.4**
	Radon Exposure	1	1	1	1	2	**1.3**
	Earthquake	1	1	2	2	2	**1.2**

4.4.3. Potential Loss Estimates

Potential loss estimates for hazard events help a community better understand monetary value of what might be at stake during a hazard event. 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.

Historical losses were able to be determined for flooding, coastal storms (hurricanes/tropical storms/tropical depressions), tornadoes and windstorms, lightning, hail, wildfires, and winter storms from NCEI NOAA. While these historic losses give a glimpse of potential losses in hazard events, they are not reported for all events and should be considered a broad estimate.

NCEI reports include property and crop damage estimates with their incident reports. As noted in many of the hazard profiles, though, many of the events have no damages reported. This does not mean that there were no damages; rather, it indicates that no damages were reported to NCEI. As a result, these should be considered low-end estimates of losses. There were no property or crop damages reported for extreme temperature, wildfires, or coastal storm events in the NCEI database.

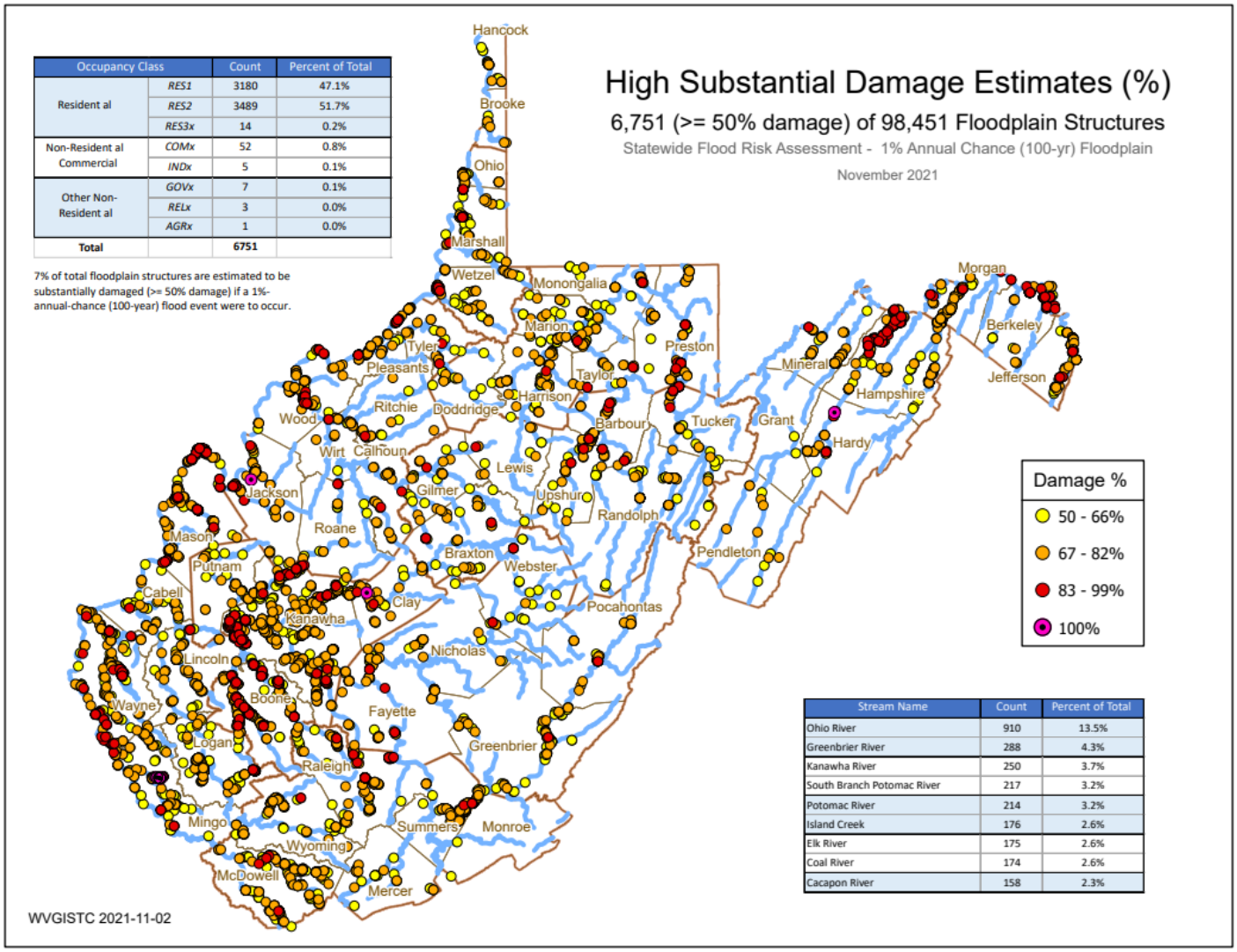
Table 4.4.3-1 Berkeley and Morgan Counties Historic Losses (NOAA NCEI, 2026b).

Event Type	Berkeley County		Morgan County	
	Property Damage ($)	Crop Damage ($)	Property Damage ($)	Crop Damage ($)
Flooding/Flash Floods	$264,500	$50,000	$1,00,000	$25,000
Hail	$12,500	$3,000	$750,500	$5,000
Lightning	$29,000	$0	$75,000	$0
Windstorm, Tornado	$2,600,000	$192,000	$1,300,000	$41,000
Winter Storms	$27,000	$7,000	$7,000	$0

West Virginia University (WVU) conducted a statewide building-level risk assessment study for flood and landslide hazards in all 55 counties in WV. The study was also known as the Total Exposure in Floodplain (TEIF) and Total Exposure Area Landslides (TEAL) Project. Table 4.4.3-2 below displays the substantial damage estimates for the communities from the study. This study uses FEMA's Hazus flood loss software program for a 1%-annual-chance (100-year) flood event. Figure 4.4.3-1 displays the substantial damage estimates for Berkeley and Morgan Counties and WV.

Table 4.4.3-2 Substantial Damage Estimate (WVGISTC, 2021).								
Community	Count Total	Value Total	TEIF Loss Total	TEIF Loss Ratio Total	Median Percent Damage	Median Dollar Damage	Debris Damage Total	High Damage Count
Berkeley County	635	$52,931K	$5,729K	11%	65%	$15K	6,172	188
Martinsburg	75	$62,324K	$14,105K	23%	9%	$4K	136	8
Morgan County	484	$69,867K	$7,057K	10%	41%	$16K	4,368	166
Bath	129	$35,224K	$2,621K	7%	10%	$11K	698	44
Paw Paw	30	$2,770K	$16K	1%	6%	$3K	19	0

Figure 4.4.3-1 Substantial Damage Estimates for Berkeley and Morgan Counties and WV (WVGISTC, 2021).



Occupancy Class		Count	Percent of Total
Resident al	*RES1*	3180	47.1%
	RES2	3489	51.7%
	RES3x	14	0.2%
Non-Resident al Commercial	*COMx*	52	0.8%
	INDx	5	0.1%
Other Non-Resident al	*GOVx*	7	0.1%
	RELx	3	0.0%
	AGRx	1	0.0%
Total		**6751**	

Stream Name	Count	Percent of Total
Ohio River	910	13.5%
Greenbrier River	288	4.3%
Kanawha River	250	3.7%
South Branch Potomac River	217	3.2%
Potomac River	214	3.2%
Island Creek	176	2.6%
Elk River	175	2.6%
Coal River	174	2.6%
Cacapon River	158	2.3%

4.4.4. Future Development and Vulnerability

Population change is perhaps the most significant indicator of changes in vulnerability and risk in the future. A rise or decrease in population not only impacts the level of risk (as to how many individuals could be affected), but also foreshadows development and land use changes for a county and its municipalities. Berkeley and Morgan Counties are expected to experience a variety of factors that will, in some areas, increase vulnerability to hazards while in other areas, vulnerability may be reduced.

As discussed in Section 2.3, the total population in the region is expected to increase. However, these changes are not equally distributed across each county. Figure 2.5-2 demonstrates where Berkeley County anticipates and is encouraging future growth within the county. Development can often change the hazard threat level of an area by placing additional critical facilities, businesses, transportation networks, and populations within vulnerable areas. Any development along transportation routes can increase the vulnerability to transportation incidents and hazardous material spills. Most often, development occurs along these transportation networks because of access and increased demand for travel and access to services. Therefore, the impact of these hazards can increase along with their frequency. While it can be difficult to curb development, it is to the municipality's advantage to be aware of development trends in order to successfully mitigate future hazards as risks increase.

Lack of current zoning and development regulations or enforcement abilities allow future development to occur within the Special Flood Hazard Area in some municipalities and unincorporated areas; this suggests that there is potential for additional loss due to flooding in the future. Special Flood Hazard Area development regulations relate to the base flood elevation, which is the estimated level of flooding that has a 1-percent chance of being equaled or exceeded in any given year. Because Special Flood Hazard Area or floodplain development regulations specify that residential structures must be elevated to or above the base flood elevation and commercial structures must either be elevated or flood-proofed to or above this level, the degree to which future structures are exposed to flood damages should be minimal. However, calculations of base flood elevations are based on models that rely upon data about previous flood events; should future floods be greater than those experienced in the past, the base flood elevation may not provide sufficient protection.

Population projections are useful in determining if a given area's population trends will continue. The State of West Virginia produces county population projections to aid county comprehensive planning. Projections developed for the region are shown in Table 4.4.4-1.

Table 4.4.4-1: Population Projections to 2040 (State of West Virginia, 2022).		
Data	Berkeley County	Morgan County
	Forecasted Population	Forecasted Population
2025	136,561	16,832
2030	145,492	16,639
2035	158,333	16,375
2040	170,498	16,152

Roughly 34 percent of Berkeley County's population is over the age of 62, and fifty-two percent of Morgan County's population is over the age of 62. Older residents pose unique challenges when it comes to evacuation and/or mobility during the rescue and recovery processes that typically occur in the case of a hazard event. Officials may consider partnering with human services organizations to specifically plan for this vulnerable population.

The rural nature of the Morgan County and parts of Berkeley County impacts vulnerability because remote and sparsely populated regions also face higher vulnerability to certain hazards because they may not have as easy access to care facilities or response personnel. For example, tele-communications services (high-speed internet cell phone, and 9-1-1), are sparse and non-existent in some parts of Morgan County. These individuals may miss out on critical hazard information and warnings, and they may be unable to call for help. For instance, the less populated municipalities, mainly in Morgan County, face increased vulnerability to winter storms due to isolation, access issues, and longer emergency response times.

Each county also has a Subdivision Development Review Ordinance, and Berkeley County has three zoning ordinances for different areas. The subdivision ordinances include requirements for protecting sensitive areas including streams, sinkholes, springs, floodplain, severe slopes, and significant karst features. These ordinances are detailed in the Capability Assessment Section (5.2.1).

In 2022 the Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) completed a Long-Range Transportation Plan Update (LRTP). The current LRTP was adopted May 18, 2022 (HEMPO, 2022). As of October 2026, the HEMPO LRTP is in the process of being updated. The integration of both plans will influence future development in the region and its concentrated plan for growth. Concentrating growth may help to reduce isolation-based vulnerability of communities with few access routes, no municipal water supply, and low cell phone reception. On the other hand, higher densities mean that more people are likely to be impacted in a hazard event should it strike those more populated areas.

Both counties also have stormwater management plans that focus on encouraging best management practices that help enforce environmentally sensitive development and encourage development that will limit runoff. Encouraging better development practices in relation to stormwater management could help make communities less vulnerable to the impacts of flooding. The Berkeley County 2023

Stormwater Ordinance specifically includes higher standards to meet requirements of CRS Class 7 Rating.

There is one significant development change in the region that has occurred in the last five years and is expected to continue – construction of warehouses and industrial parks. This development is expected to be one of the most influential variables in the region's future vulnerability and risk.

The expansion of industrial parks, mainly in Berkley County along I-81, can have cumulative and longer-lasting environmental impacts, some of which aren't fully known. As discussed in Section 2.4, this development is converting large amounts of land to impervious surface within the past five years. This significant amount of development affects flooding, transportation, hazardous waste spills, as well as water supply, and other environmental concerns.

When planning for future development, there are several measures the region could take to help mitigate the impacts of industrial parks on transportation infrastructure and impervious surfaces. If continued investment and development in the warehousing industry is inevitable, then how the counties regulate new park locations and the industry as whole will become important in shaping Berkeley and Morgan Counties future vulnerabilities and risk, greater care and oversight could be taken to balance future warehouse development with watershed needs and conservation goals.

4.4.5. Public Survey

A community-wide survey was conducted to help understand the on-the-ground conditions and concerns of Berkeley and Morgan Counties residents, therefore supporting the assessment of hazard risk and mitigation opportunities in each county. The survey asked respondents two types of questions: mitigation activities completed within the household and hazard concerns. Over 200 residents from the Counties took the survey with the largest cohort of respondents coming from those who live within Berkeley County (70% of respondents).

Across all respondents, 80% of homeowners said they had adequate basic insurance that should cover hazards that could impact their homes. However, when it comes to insuring homes against any type of flooding, only 4 out of the 16 individuals who live within a floodplain indicated they have flood insurance. When asked to rate the community's ability to handle a hazard event, 44% rated average, 32% rated good, and 14% said poor. Furthermore, half of all respondents said "no" to owning an emergency/disaster response kit. The relatively high volume of responses to the survey indicates that the community is interested in engaging in emergency preparedness activities.

Additionally, respondents were asked if their employer had a plan for disaster recovery. Most respondents that could answer (i.e. weren't retired or self-employed) said yes (37%), while 23% were unsure. Along with this, 62% of respondents said yes to if their employer had a means of getting in touch with them following a disaster.

Respondents were asked if they received information or warnings from local public

officials/emergency management officials during a hazard event, only 58% of respondents said yes. This indicates a gap in communication between community officials and residents and further highlights an area of needed improvement. For information on preparedness and potential hazard risk, text alert (72%), social media (53%), and phone call alert (30%) are the most effective forms of communication according to respondents.

The hazards rated highest concern included source water contamination (38%), transportation incidents (34%), utility interruptions (30%), substance abuse disorder (30%), and thunderstorms (29%). Additionally, respondents were asked how concerned they were following the effects of natural hazards:

- 45% of respondents were somewhat concerned and 44% were extremely concerned about not having electrical power for an extended time.
- 44% of respondents were somewhat concerned and 40% were extremely concerned about not having access to clean water.
- 54% of respondents were somewhat concerned and 17% were extremely concerned about having access to enough food.
- 50% of respondents were somewhat concerned and 27% were extremely concerned about not being able to get warning messages or other information regarding the hazard.

Furthermore, respondents were asked about one action the community could take to reduce the longer impact of disasters. The most answers were; better communication, funding, and planning, more educational events, upgrades to utilities and infrastructure, and to stop/decrease overall building and development.

5. Capability Assessment

5.1. Update Process Summary

The purpose of the Capability Assessment is to identify strengths and weaknesses that will affect the ability of the counties and participating jurisdictions to implement mitigation actions. It is important to perform a capability assessment to develop a comprehensive and implementable mitigation strategy. Capabilities include a variety of regulations, existing planning mechanisms, and administrative capabilities provided through established agencies or authorities.

The capability assessment has three main components:

1. Document Review - an inventory of the counties existing planning and regulatory tools and a review and incorporation of existing plans and other technical information as appropriate;

2. Participation in the National Flood Insurance Program; and
3. Municipal Capability Assessment - an analysis of municipal capacity from a planning, policy, staffing, training, outreach, and political standpoint.

Based on these components as well as the vulnerability analysis identified earlier in the plan, Berkeley and Morgan Counties can assess their current resources and begin to address the legal, regulatory, administrative, financial, and other capabilities which it currently has at its disposal to address the potential hazards which make the counties and its local municipalities vulnerable.

Berkeley and Morgan Counties have several resources they can access to implement hazard mitigation initiatives through 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 mitigation actions taken before, during, and after a hazard event.

In 2022, the counties, municipalities, and stakeholders, identified the suite of resources available in each county to support hazard mitigation, including regulatory, planning, and administrative resources. They also indicated the presence of local plans, ordinances, and codes in applicable municipalities. Finally, the 2022 plan specified each county's staff and training capabilities. For the 2027 plan, the HMPT updated the 2022 capability assessment by distributing a Capability Assessment Survey Form to the counties and municipalities and summarizing responses. This plan includes an analysis of how counties and municipalities have implemented the NFIP in their communities to meet requirements that have changed since the last plan.

The 2027 capability assessment provides an updated inventory of the most critical local planning and regulatory tools available within each municipality, a summary of the fiscal and technical capabilities available through programs and organizations outside of the county and provides an opportunity to discuss any plan integration opportunities with the hazard mitigation plan. It also identifies emergency management capabilities, and the processes used for implementation of the NFIP.

While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

Additionally, a number of documents have been reviewed as part of this plan update. While some reviews have been carried over from past plan updates and revised where applicable, additional documents have been identified and reviewed for purposes of integration into other local planning mechanisms. Several plans and ordinances at the county and municipal level have been reviewed and a summary with options to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms are included.

The Mitigation Strategy, including the goals and actions, is incorporated into relevant planning mechanisms based on their pertinence and relevance to specific plans and ordinances. For example, all structural projects should be included in the Capital Improvements Program. Land use and zoning related projects should be incorporated into the next update of the Community's Comprehensive Plan and Zoning Ordinance through collaboration with the Planning and Zoning departments. Likewise, information from relevant planning documents was used to inform and update the Hazard Mitigation Plan.

5.2. Capability Assessment Findings

Berkeley and Morgan Counties and participating jurisdictions have a wide variety of plans, tools, and resources in place to support the goals of hazard mitigation planning, and the specific mitigation strategy presented in this HMP Update.

5.2.1. Planning and Regulatory Capability

The purpose of a plan/ordinance review as part of this planning process is trifold:

- To identify existing state, regional/county, and local initiatives.
- To provide an inventory and review of sample plans and ordinances and identify sections in these documents that address hazard mitigation-related issues.
- To provide a platform to integrate plans and other documents so recommendations and strategies are not in contradiction with one another (e.g., between the hazard mitigation plan and comprehensive plan).

A review of updated and existing zoning and subdivision ordinances, comprehensive plans, master park plans, stormwater management plans, sediment and erosion control plans, and emergency operations plans, among others, are summarized below by level of administration (state, regional/county, and municipal). Based on the capability assessment survey results received, the county and participating jurisdictions perceive planning and regulatory capability to be mostly limited to moderate, largely due to their ability to develop, maintain, and enforce regulations.

State of West Virginia Document Review

- The 2023 Update of the **West Virginia Statewide Standard Hazard Mitigation Plan** goals that are applicable to this Multi-Jurisdictional Plan update include:
  - Goal 1: Reduce or eliminate the impact of hazards on infrastructure.
  - Goal 2: Align and integrate programs related to reducing long-term vulnerability to hazards.
  - Goal 3: Provide consistent, continual education of the whole community on

reducing long-term vulnerability.

- Goal 4: Enhance and support mitigation programs and activities at the local (regional and county) level to reduce long-term vulnerability with minimal negative impacts to community development efforts.

Hazard identification and risk assessment data for Berkeley and Morgan Counties has been incorporated into the appropriate sections of this plan update from the 2023 WV Statewide Standard Hazard Mitigation Plan.

- The **West Virginia State Building Code (WVSBC)** is a statewide building code that took effect in West Virginia in 1990. The code is administered by the West Virginia State Fire Commission and is based on adopted editions of the International Codes, including the 2018 International Building Code, Residential Code, Plumbing Code, Mechanical Code, and related standards. While local governments historically had discretion regarding code enforcement, recent legislative changes have expanded the statewide applicability of the State Building Code and strengthened requirements for compliance throughout West Virginia.

  The code:

  - Provides uniformity and compliance with minimum standards of building construction and property maintenance;
  - Helps ensure the construction of safe buildings, protecting lives and personal property;
  - Utilizes proven industry standards, including new technologies and commonly accepted construction practices and materials.

- The **West Virginia Statewide Flood Protection Plan** was developed with both short and long-term goals, strategies, and implementation schedules for flood management. It was originally adopted in 2005. Since then, West Virginia has established the West Virginia State Resiliency Office and adopted the **West Virginia Flood Resiliency Plan** in 2024. This plan was updated in 2026 and utilizes the recommendations from the original Flood Protection Plan. Specific goals that continue include:

  - Reduce the unnecessary loss of lives due to flooding;
  - Reduce private and public property damage;
  - Develop technical and legislative tools that will reduce excessive runoff from land conversion activities;
  - Promote technical and legislative tools that will reduce excessive runoff from land conversion activities;
  - Reduce personal and economic loss due to flooding while supporting state economic growth; and

- Protect the state's waterways and floodplain environments.

The current West Virginia Flood Resiliency Plan further emphasizes coordinated statewide resilience efforts, implementation of flood mitigation actions, integration of resilience into local and state planning, enhanced data and mapping resources, and prioritization of actions that reduce flood risk to communities, infrastructure, and critical facilities.

- The **West Virginia Strategic Highway Safety Plan (SHSP)** is a statewide transportation safety plan focused on reducing fatalities and serious injuries on public roads through engineering, education, enforcement, and emergency response improvements. It directly supports mitigation objectives by reducing transportation system vulnerability and improving emergency access.

- The **West Virginia 2050 Multimodal Long-Range Transportation Plan (LRTP)** establishes a statewide framework for transportation investment and system management through 2050. The plan supports hazard mitigation objectives by promoting transportation system safety, infrastructure preservation, resilience to environmental hazards, reliable emergency access, and protection of critical transportation assets. The LRTP encourages long-term investments that reduce transportation vulnerabilities and improve the ability of communities to withstand and recover from natural hazard events.

Regional/County Document Review

Comprehensive Plans

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. Chapter 8A of the West Virginia Code establishes the scope and requirements of community comprehensive plans. A comprehensive plan is required if a governing body wants to enact a zoning ordinance, enact a subdivision and land development ordinance, require plans and plats for land development, or issue improvement location permits for construction. These plans serve as the official policy guide for influencing the location, type, and extent of future development by establishing the basis for decision-making and review processes on zoning matters, subdivision and land development, land uses, public facilities, natural resource protection, cultural resources, and housing needs over time.

With regard to hazard mitigation planning, Section §8A-3-4 of the West Virginia Code requires comprehensive plans to include a plan for future land use, which, among other provisions, suggests that the plan give consideration to flood-prone and subsidence areas during development. The code also requires comprehensive plans to include a plan for community facilities and services and

recommends considering storm drainage and floodplain management.

Berkeley County adopted an update of their 2016 Comprehensive Plan in February 2025. After this adoption, and throughout the development of this plan, the county worked on a 2026 Comprehensive Plan. A draft was published in September 2026 with the goal of adopting by November 2026. The Martinsburg Comprehensive Plan was adopted in December 2018, with a planned update prior to December 2028. The Town of Hedgesville Comprehensive Plan was adopted in December 2025. In addition to the comprehensive plans, the Martinsburg-Berkeley County Parks and Recreation (MBCPR) **Master Plan – 2032: Growing Needs for a Growing Community** examines park and recreation needs and establishes a vision for parks and recreation programs and facilities.

The Morgan County Comprehensive Plan was adopted in 2017. The Town of Paw Paw does not have an adopted comprehensive plan, but plan development was underway in collaboration with WVLL Law as of October 2026. Bath Township's Comprehensive Plan was adopted in March 2017. The township initiated the update process in September 2026.

Zoning Ordinances

Zoning ordinances allow local communities to regulate the use of land to protect the interests and safety of the public. Zoning ordinances can be designed to address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development, and/or require land development to consider specific hazard vulnerabilities. Zoning ordinances contain both a map that delineates zoning districts and text documenting the regulations that apply in each zoning district.

The Berkeley County Planning Commission and Berkeley County Council administer three zoning ordinances: Airport Height, Sound, and Runway Protection Zoning Ordinance (2020), Tuscarora Community Zoning Ordinance (1975), and Windewald Neighborhood Zoning Ordinance (1975). Martinsburg adopted their own zoning ordinance in July 2021.

There are no existing zoning ordinances for Morgan County. Individual jurisdictions may have their own zoning regulations; however, Morgan County lacks the administrative capability to enforce a zoning ordinance. Bath (Berkeley Springs) does not have a separate zoning code but is establishing guidelines through their municipal code.

Building Codes

Building codes are important in mitigation, because codes are developed for regions of the Country in consideration of the hazards present within that region. Consequently, structures that are built to applicable codes are inherently resistant to many hazards such as strong winds, floods, and earthquakes, and can help mitigate regional hazards like wildfires. In 1990, West Virginia adopted the

WV State Building Code. The code protects the public health and promotes the safety, protection, and sanitation of new and existing buildings and structures. It also protects financial investments and property values; if construction does not comply with current recommended codes the structure may be at greater risk for damage and loss.

Berkeley County has adopted the 2018 International Building Code, 2018 International Residential Code, and the 2015 International Energy Conservation Code. Berkeley County has also adopted a Building Code Ordinance, enforced by the Engineering and Permits Department. Any time a structure is proposed in a hazardous area, a review is completed by the engineering and building inspections team, which normally entails added engineering practices and then reviewed against adopted code/ordinance. Martinsburg recognizes the West Virginia State Building Code, while the Town of Hedgesville has adopted their own code.

Morgan County does not have a building code and does not generally complete building inspections. However, the county does conduct inspections in floodplains to comply with NFIP. According to their submitted capability assessment survey, Paw Paw has a building code in place, but enforcement is unclear. Due to the size of the town, Paw Paw generally lacks the administrative and financial capability to create and enforce building code regulations. The municipal code for Bath (Berkeley Springs) includes a building code.

Floodplain Management Ordinances

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

Through participation in the NFIP, Berkeley County, Morgan County, Martinsburg, the Town of Bath (Berkeley Springs), and Paw Paw have floodplain regulations. Hedgesville does not participate in the NFIP and does not have a floodplain management ordinance. It was noted during the plan update that revised floodplain maps are being developed, which will require updated ordinances.

The “Berkeley County Floodplain Ordinance,” was adopted in July 2009, around the same time the FIRM became effective for the county. It is administered by the Planning Director, who is responsible for tracking Letters of Map Changes. The floodplain administrator, or designee within the planning department, also evaluates all proposed development for compliance with the floodplain ordinance. All building permits for structures within the floodplain are evaluated to determine if the proposed construction qualifies as substantially improved by comparing the value of the proposed construction to the assessed value of the structure. If the proposed construction value has the potential to reach

50% of the assessed value, a more detailed estimate for construction costs is requested. The floodplain administrator, or designee, also reviews all floodplain complaints regarding potential violations for compliance with the floodplain ordinance. If a violation is detected, the property owner is sent a letter with instructions on the steps necessary to remedy the violation. To date, there have been no corrective actions to be completed.

The City of Martinsburg most recent floodplain ordinance, "Ordinance 2009-06 City of Martinsburg Floodplain Ordinance", was adopted in June 2009, around the same time the FIRM became effective for the county. It is administered by the Certified Floodplain Manager, who is located in the Planning Department. Services offered include site visits and recommendations for: retrofitting, drainage improvements, flood proofing, elevation, additions, demolition, relocation, stream/creek maintenance, and mitigation options. Certified Floodplain Managers are also available to provide information regarding building code, maps, historical data, basic insurance information, financial assistance advice, and City of Martinsburg Flood Map Availability. The city also has the ability to enact penalties through the floodplain ordinance.

Morgan County's most recent floodplain ordinance, "Flood Plain Area and Improvement Permit Ordinance", was adopted in March 2009, around the same time the FIRM became effective for the county. It is administered by the Planning Director who is responsible for tracking Letters of Map Changes and accepting map updates. The county provides floodplain certificates, conducts inspections and reviews, and enforces penalties through the floodplain ordinance. The NFIP worksheet for Morgan County indicated that the county has had a Community Assistance Visit and needs to address missing elevation certificates. The county is working with the WV GIS Technical Center and other GIS sources to compile a comprehensive database of elevation certificates. Morgan County is also responsible for the administration of the Town of Paw Paw's floodplain management and NFIP program.

Chapter 38: Flood Prevention of The Code of the Town of Bath, West Virginia works as the town's floodplain ordinance. The municipal code was adopted in January 2009. The town currently lacks administrative and finical resources to administer the floodplain ordinance. Based on the NFIP worksheet returned from the town, they do not currently have a floodplain manager and do not enforce the floodplain ordinance. The municipality also does not currently have a permit process for structures in the SFHA. Much of the administrative and finical burden thus falls on Morgan County to administer the floodplain regulations and the NFIP.

The WV Flood Tool is the primary source for updated data and modeling for all jurisdictions. The Advisory Flood Heights available in the expert layer on this tool are used to provide information to property owners regarding best practices for existing structures, new building permits and new subdivisions.

Subdivision and Land Development Ordinances

West Virginia Code Section §8A-4 outlines guidance for creation and enactment of subdivision and land development ordinance (SALDOs). Relating to hazard mitigation, the code states SALDOs must include standards for flood-prone and subsidence areas and standards for setback requirements, lot sizes, streets, sidewalks, walkways, parking, easements, rights-of-way, drainage, utilities, infrastructure, curbs, gutters, streetlights, fire hydrants, storm water management and water and wastewater facilities.

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

Berkeley County, Martinsburg, and Hedgesville have adopted SALDOs, and Morgan County has adopted a subdivision ordinance. Ordinances include requirements for protecting sensitive areas including streams, sinkholes, springs, floodplain, severe slopes, and significant karst features. Due to the size of the town, Paw Paw generally lacks the administrative and financial capability to create and enforce subdivision regulations.

Emergency Management

An Emergency Operations Plan (EOP) is a document upon which the disaster operations of a county are formulated. It is concerned with all types of emergency situations and how they may develop, be prevented, and resolved. Consequently, these plans also account for activities before, during and after emergency operations.

Both Berkeley County and Morgan County have EOPs in place. Berkeley County has a planned update in December 2027, while Morgan County plans to update theirs in 2028 after adopting the latest version in December 2023.

One part of Morgan County's emergency planning capabilities includes an emergency mass notification system launched in 2016. Once residents opt into the program, the system will notify residents living in areas impacted by a hazard and provide them with urgent alerts and information. It can send alerts via home phone, cell phone, email, text message, or smartphone application. The Morgan County OES has also begun an initiative where it is encouraging local businesses to construct emergency business plans and submit them to the county. The county OES will then incorporate these plans into its emergency planning and increase the synergy between the county and local business during an emergency.

Drinking Water

Public water suppliers are required by the State of West Virginia to develop Source Water Protection Plans (SWPPs) in order to identify possible sources of contamination and develop mitigation measures.

- Berkeley County has the following plans in place:
  - PSWD-Potomac River (January 2025)
  - PSWD-Bunker Hill (January 2025)
  - City of Martinsburg (May 2024)
- Morgan County has the following plans in place:
  - Paw Paw Water Works (October 2021)
  - City of Berkeley Springs (December 2021)

The WV Department of Health and Humans Resources conducted Source Water Assessments of water supplier to identify sources of contamination. The WV Source Water Protection Unit published a report for the Berkeley County PSWD-Potomac River groundwater source in September 2014.

Additionally, Berkeley County Public Service Water District has a Drought Contingency Plan in place to document mitigation measures that will be taken during a drought. Martinsburg has adopted a Water Distribution Backflow Prevention Ordinance.

Stormwater Management

The proper management of stormwater runoff can improve conditions and decrease the chance of flooding. Proper stormwater management planning results in sound engineering standards and criteria being incorporated into local codes and ordinances to manage stormwater runoff from new development in a coordinated, watershed-wide approach. Without such planning, stormwater is either not controlled by municipal or county ordinances or is addressed on a site-to-site or municipal boundary basis. Municipalities within the same watershed may require different levels of stormwater control. The result is often the total disregard of downstream impacts or the compounding of existing flooding problems. Stormwater management plans are adopted to mitigate potential negative impacts from future land uses, improve the condition of impaired waterways, and address flooding associated with stormwater runoff. Berkeley County, Morgan County, and Martinsburg all have stormwater management ordinances or regulations. Martinsburg plans to update their ordinance in either late 2026 or early 2027. The stormwater management ordinance is included in the municipal code for Bath (Berkeley Springs).

Transportation Planning

Berkeley County is part of the Hagerstown/Eastern Panhandle Metropolitan Panning Organization (HEPMPO), which serves both Berkeley and Jefferson Counties, along with neighboring jurisdictions in Maryland, Pennsylvania, and Virginia. The **HEPMPO Long-Range Transportation Plan** guides transportation investments throughout the Eastern Panhandle and supports hazard mitigation

objectives through improvements to transportation safety, mobility, infrastructure condition, emergency access, and transportation system resilience. Transportation investments identified through the plan help reduce vulnerabilities associated with flooding, severe weather, infrastructure failures, and emergency response constraints. As of October 2026, the current HEMPO Long-Range Transportation Plan is in the process of being updated.

The Eastern Panhandle Transit Authority (EPTA) provides public transportation services throughout Berkeley, Jefferson, and Morgan Counties and participates in regional transit planning through the MPO process. The **Transit Development Plan** evaluates service needs, future transit investments, accessibility, and operational improvements.

In addition, Morgan County participates in regional transit services through the Potomac Valley Transit Authority (PVTA) and related regional transportation initiatives.

Planning and Regulatory Summary

Table 5.2.1-1 is an overview of local plans and regulations including updates collected during the 2027 HMP process.

5.2.1-1: Summary of Major Plans and Regulations in Region 9.

Community	Comprehensive Land Use Plan	NFIP/FP Regulations	Subdivision Regulations	Zoning Regulations	Stormwater Management Plan/Ordinance	Building Code Ordinance
Berkeley County	X	X	X	X	X	X
Martinsburg	X	X	X	X	X	X
Hedgesville[1]	X	-	-	X	-	X
Morgan County	X	X	X	-	X	X
Bath (Berkeley Springs)	X	X	X	-	X	X
Paw Paw	-	X	-	X	X	-
Region 9	-	-	-	-	-	-

[1]The community does not participate in the NFIP.

5.2.1.4. Participation in the National Flood Insurance Program (NFIP)

Both counties, the Town of Bath (Berkeley Springs), the Town of Paw Paw, and the City of Martinsburg

are participants in the NFIP. The Town of Hedgesville does not participate in the NFIP, as they are located within the low-risk flood zone, Zone X. The Town of Hedgesville is still encouraged to join the NFIP, with support from Region 9 and Berkeley County available. Community participation in the NFIP allows for property owners to obtain flood insurance. Flood insurance provides a means for homeowners, renters and business owners to financially protect themselves. This capability greatly improves resilience after a flood hazard event by allowing residents to repair and rebuild. Table 5.2.1-2 provides details about the participation of Berkeley and Morgan Counties and their municipalities in the NFIP.

Table 5.2.1-2: Berkeley and Morgan Counties Participation in the NFIP (FEMA, 2026a).

Community	Participation Status	CID	Current Effective Map Date
Berkeley County	Participating	540282#	07/07/09
Martinsburg	Participating	540006#	07/07/09
Hedgesville	Not Participating		
Morgan County	Participating	540144#	09/25/09
Bath	Participating	540005#	09/25/09
Paw Paw	Participating	540252#	09/25/09

For a community to participate in the NFIP, it must adopt and enforce floodplain management regulations that meet or exceed the minimum NFIP standards and requirements. These standards are intended to prevent loss of life and property, as well as economic and social hardships that result from flooding. Once FEMA provides communities with flood hazard information upon which floodplain management regulations are based, the community is required to adopt a floodplain ordinance that meets or exceeds the minimum NFIP requirements. All NFIP participating communities in the region have either adopted a stand-alone ordinance or have arranged for county administration of floodplain regulations.

The floodplain administrator is a designated individual responsible for implementing the requirements of the NFIP. Laura Hoffmaster, the Deputy Director of Community Development in Berkeley County, covers Berkeley County and the Town of Hedgesville. The City of Martinsburg has Kaitlyn Snyder, who also serves as a City Planner. The Morgan County Planning Commission Director Alex Moore covers the county and the Towns of Bath and Paw Paw.

The NFIP's Community Rating System (CRS) provides discounts on flood insurance premiums in communities that establish floodplain management programs that go beyond NFIP 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 damage or protect the natural resources and functions in 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 CRS in the NFIP, and 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 CRS, 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:

- Reduce flood losses.
- Reduce damage to property.
- Protect public health and safety.
- Prevent increases in flood damage from new construction.
- Reduce the risk of erosion damage.
- Protect natural and beneficial floodplain functions.
- Facilitate accurate insurance rating.
- Promote the awareness of flood insurance.

There are 10 CRS classes that provide varied reduction in insurance premiums. 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 18 creditable activities that are organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

The City of Martinsburg is the only municipality independently rated under the CRS among these HMP participants (CRS Class 8). Morgan County (Class 9) and Berkeley County (Class 7) also participate in the CRS. Greater municipal action could allow flood mitigation efforts to better address specific local flooding issues. Hedgesville does not participate in the program because the entire community is within a single low risk flood zone, Zone X. This leaves Hedgesville residents without the ability to purchase flood insurance through the NFIP and also limits the availability of flood mitigation resources.

5.2.2. Administrative and Technical Capability

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of

knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise to effectively execute mitigation activities. Common examples of skill sets and technical personnel needed for hazard mitigation include: planners with knowledge of land development/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 administrators, land surveyors, scientists familiar with hazards in the community, staff with the education or expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, and fiscal staff to handle complex grant application processes.

These capabilities can exist at the municipal level, but municipalities are often further supported by county, regional, state, and federal administrative and technical capabilities. It should be noted municipalities in Berkeley and Morgan Counties tend to have limited administrative and technical staff needed to conduct hazard mitigation-activities, except for Martinsburg. Paw Paw, Bath, and Hedgesville all have under 1,000 residents, so correspondingly have few paid staff and a limited supply of available resources compared to municipalities like Martinsburg, which have higher populations, a larger tax base, and more resources. However, each municipality carries out its own daily operations and provides various community services according to their local needs and limitations.

County Administrative and Technical Capabilities

- **Berkeley County Development Authority (BCDA)** and **Morgan County Economic Development Authority** help to plan, implement & coordinate development activities in a structured way.

- **Berkeley County Office of Emergency Management** and **Morgan County Emergency Management Agency** coordinate countywide emergency management efforts. They are responsible for managing activities that aim to reduce the loss and lives and property and protect the environment from the effects of natural or man-made disasters, catastrophes, or terrorist threats through prevention, mitigation, preparedness, response and recovery efforts. The OEM also contains a **Local Emergency Planning Committee (LEPC),** which is a county level planning committee that is responsible for the development and distribution of the chemical emergency preparedness and response plan, to provide training and assist emergency responders, other agencies and organizations with their training programs, for development of a public education program, and to develop and implement a compliance and enforcement program for the district.

- **The Morgan County GIS and Addressing Department** performs mapping and spatial database maintenance work for all of the county (except for parcel data) including, E-911 Communications, Office of Emergency Services, Planning and Addressing. They are responsible for updating the Morgan County portion of the State of WV Mapping and

Addressing Website with all current feature class data as required by State Code. Berkeley County also has their own GIS Coordinator and GIS Mapping Technician. The Counties can assist municipalities with mapping when needed.

- **Berkeley County Planning Commission** and **Morgan County Planning Commission** act as advisory groups to the municipal governing body on issues and policies related to planning, land use regulation, and community development, and other duties as outlined in the West Virginia Code Chapter 8A Article 2.

- Transportation planning in Berkeley County is conducted through the **Hagerstown/Eastern Panhandle Metropolitan Planning Organization** (HEPMPO). One of the primary roles and responsibilities of the HEMPO is the development and update the Long-Range Transportation Plan, as mandated by federal transportation authorization legislation.

- **Berkeley County Department of Emergency Communications** serves residents and businesses across the region with various types of emergency and non-emergency situations. This office acts as the primary contact for those needing police, ambulance, or fire assistance**.**

- **Eastern Panhandle Conservation District** provides local assistance to individuals and organizations that interact with the region's natural resources. Their mission is to work collectively to sustain and improve natural resources in the Eastern Panhandle.

Municipal Administrative and Technical Capabilities

- **Engineers** perform 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 reviews and/or prepares plans, specifications, and estimates of the work undertaken within the jurisdiction. When staff who are responsible for community planning or engineering the structures on which people rely are familiar with the hazards that can impact the community, there is a great potential for synergy. These staff members will design the communities and structures with hazard impacts in mind, resulting in more sustainable communities and stronger structures. The City of Martinsburg reported having an engineering resource. Berkeley County has an Engineering Department that can assist municipalities in need.

- **Floodplain Administrators (FPAs)** are experts in the rules and regulations of development in a floodplain and can provide vast amounts of information on the risks and impacts of building within those hazard areas. They are an integral part of the mitigation planning team and can make recommendations based on the needs and conditions of the community. All municipalities except Hedgesville participate in the NFIP and have a designated FPA. some municipalities floodplain management duties are assigned to a staff position with several roles, which may be a barrier to enforcement of floodplain regulations. Both Counties and the

City of Martinsburg have an FPA. The FPA for Morgan County is also responsible for the Towns of Bath and Paw Paw.

- Few communities have the financial resources required to implement potential mitigation programs. Many rely on grants and other fundraising opportunities to obtain the money necessary to perform mitigation projects. Employing or having access to staff specializing in grant writing and management will help communities leverage grant opportunities. The Towns of Hedgesville and Paw Paw both do not have residing grant administrators or grant writers. The Town of Paw Paw relies on Region 9 for both responsibilities. The City of Martinsburg is the only municipality to have a grant writer and grant administrator.

- Spatial and tabular data can be linked through geographic information system (GIS) software. Spatial visualization is often critical to communicating and understanding projects focused on environmental restoration, land use planning, and infrastructure development. Most jurisdictions reported not having this capability. As mentioned above, Morgan and Berkeley Counties can support geospatial analysis. Furthermore, the WV Flood Tool is available for municipalities to use.

- The **City of Martinsburg Planning and Zoning Department** is responsible for administering the City's Comprehensive Plan, Floodplain Ordinance, Building Codes, Stormwater Ordinance, Zoning Ordinance and Subdivision Ordinance. Further, the Town of Hedgesville, and the Town of Bath have their own planning commissions.

In addition to the institutional capability of the municipal government structure described above, each county itself can engage in mitigation activities. Berkeley and Morgan Counties have their own staff, resources, budget, and objectives, which may or may not be similar to those of its constituent municipalities. Therefore, each county has its own capabilities to mitigate the profiled hazards and can coordinate local mitigation efforts.

Finally, regional organizations can enhance both County's mitigation capabilities. Region 9 encompasses both Berkeley and Morgan Counties and provides a variety of planning and project management services and can assist counties and municipalities in planning or implementation of mitigation projects.

Other local organizations that could act as partners for future mitigation activities include local business development organizations such as the Chamber of Commerce, and historical or cultural societies and agencies. Table 5.2.2-1 provides a summary of administrative capabilities within each jurisdiction. The Town of Bath never returned a capability assessment form, so the information below is from the previous 2022 HMP.

Table 5.2.2-1: Berkeley and Morgan Counties Administrative and Technical Capabilities.								
Community	Engineering Department	Code Enforcement Department	Chief Building Officer	Civil Engineer – Construction Project Management	Grant Administrator	Grant Writer	Planning Commission/Planning Department	Floodplain Manager
Berkeley County	X	X	X	-	X	X	X	X
Martinsburg	X	X	X	X	X	X	X	X
Hedgesville	-	X	X	-	-	-	X	-[1]
Morgan County	-	-	N/A	-	-	N/A	X	X
Bath (Berkeley Springs)	-[2]	-[3]		-	X		X	-[4]
Paw Paw	-	X	-	-	X[5]	X[5]	-	-[4]
Region 9	-	-	-	-	X	X	X	-

[1] Does not participate in NFIP.
[2] The municipality outsources this technical capability to consultants or relies on the county
[3] The Town of Bath includes building regulations within their Municipal Code; however, they do not currently have the administrative capability to enforce penalties.
[4] Agreement in place with Morgan County Planning Commission to provide floodplain management.
[5] Region 9 is responsible for this.

5.2.3. Financial Capability

In general, the more financial resources a municipality has, the more technically capable it will be from a resource availability perspective. This is not necessarily the case, however, when analyzing technical capability from a knowledge/skill level perspective. As such, technical capability must be analyzed by each municipality prior to implementing any hazard mitigation activity. It is important to note; however, that much like fiscal capability, shortfalls in technical capability may be overcome by cooperative arrangements, coordinated efforts, and/or resource efficiency.

Financial capability is important to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. During the 1960s and 1970s, state and federal grants-in-aid were available to finance many programs, including street improvements, water and sewer facilities, airports, and 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, resulting in the need to identify alternate means to augment revenue.

Financial status is not the only factor in determining hazard mitigation capability. There are also numerous partnering opportunities and grant programs available to assist in offsetting the expenses of local hazard mitigation efforts. 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 the assessment results received, most municipalities within the Counties perceive fiscal capability to be limited; however, several communities listed their capability to be moderate.

The Town of Hedgesville marked "no" for all financial questions in the capability assessment form. Similarly, the Town of Paw Paw indicated their only financial capability was federal (non-FEMA) funding programs, however, they did not specify what the programs were. Overall, financial capabilities for the municipalities, besides the City of Martinsburg, are extremely limited.

Furthermore, Berkeley County and Region 9 indicated they use federal (non-FEMA) funding programs.

Capital Improvement Program

The most common fiscal tool available to communities was the Capital Improvement Program (CIP). A CIP is a community planning and fiscal management tool used to coordinate the timing and financing of capital improvements over a multi-year period. A CIP includes a prioritized list of improvements to roads, parks, and other facilities that the community plans to undertake in a given period. Berkeley County and the City of Martinsburg noted having a CIP in the capability assessments.

Community Development Block Grants

Morgan and Berkeley County are also eligible for Community Development Block Grant (CDBG) funding from the US Department of Housing and Urban Development (HUD). This federal program is designed to support vulnerable populations by promoting affordable housing, creating employment opportunities, and delivering essential community services. Grant allocations are determined using a formula that considers factors such as poverty levels, population size, housing conditions, and comparative need across jurisdictions.

CDBG funds are distributed annually to states and local governments, categorized as either "entitlement" or "non-entitlement" communities. A significant portion of these funds must be directed toward initiatives that benefit low- and moderate-income residents. Additionally, the program is guided by national objectives, including the mitigation of conditions that threaten public health and safety—such as low-income housing located in flood-prone areas.

The City of Martinsburg noted CDBG and HUD as funding opportunities on the capability assessment survey.

Water and Sewer Authority Fees

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 a municipality is among the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities or to construct, extend, or improve a system. The primary source of revenue is user fees based on metered usage. The cost of constructing 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 directly operated by municipal governments and by privately owned public utilities regulated by the Public Service Commission of West Virginia.

Sewer authorities include multipurpose authorities with sewer projects. The authorities issue bonds to finance acquisition of existing systems or to finance construction, extension, and improvements. 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 or the imposition of liens against real estate. Berkeley County and the City of Martinsburg utilizes sewer and water fees.

Stormwater Utility Fees

Stormwater utility fees are assessed and collected to offset the cost of maintaining and upgrading stormwater management structures such as drains, retention ponds, and culverts. Berkeley County and the City of Martinsburg indicated they used Stormwater Utility Fees

State programs which may provide financial support for mitigation activities include, but are not limited to:

- WV DOC Land & Water Conservation Fund
- WV DEP Abandoned Mine Lands Economic Revitalization (AMLER) Program
- WV DEP Watershed Project Grants/Nonpoint Source Projects
- WV DEP Rehabilitation Environmental Action Plan (REAP) Grants
- WV DOT Transportation Alternatives Program
- WV DOH Recreational Trails Fund Program (RTP)
- WVDO Community Participation Grant Program
- Center for Rural Health Development – WV Rural Health Infrastructure Loan Program
- WV In Lieu Fee (ILF) Program
- Appalachian Regional Commission (ARC) Federal Grant Program
- WVDED Weatherization Assistance Program

Federal programs which may provide financial support for mitigation activities include, but are not limited to:

- Department of Energy Weatherization Assistance Program
- Department of Homeland Security Grant Program (HSGP)
- Department of Transportation/Federal Highway Administration Emergency Relief Program
- DOC/EDA Revolving Loan Fund (ACEDC RLF recipient)
- FEMA Community Assistance Program – State Support Services Element (CAP-SSSE)
- FEMA Community Disaster Loan Program

- FEMA NFIP 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 (IHP)
- FEMA National Dam Safety Program
- FEMA National Flood Insurance Program
- FEMA Pre-Disaster Mitigation Program (PDM)
- FEMA Public Assistance Program (PA)
- FEMA Regional Catastrophic Preparedness Grant Program
- Housing and Urban Development (HUD) 5(H) Homeownership Program
- HUD Community Development Block Grant (CDBG)
- HUD Disaster Housing Assistance Program (DHAP)
- HUD/Federal Housing Administration (FHA) Title I Property Improvement Loans
- HUD/FHA Section 203(h) Mortgage Insurance for Disaster Victims
- HUD/FHA Section 203(k) Rehabilitation Mortgage Insurance
- HUD Section 108 Loan Guarantee Programs
- Internal Revenue Service Casualty Loss-Special Disaster Provisions
- NOAA National Weather Service StormReady® Program
- USDA Natural Resources Conservation Service (NRCS) Easement Programs
- Small Business Administration Disaster Loan Programs
- United States Army Corps of Engineers (USACE) General Investigation (GI)
- 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)
- United States Department of Agriculture (USDA)/Farm Service Agency (FSA) Emergency Conservation Program
- USDA/FSA Emergency Farm Loans
- US EPA Chesapeake Bay Implementation Grant (CBIG) and Chesapeake Bay Regulatory/ Accountability Program (CBRAP)
- USDA/Emergency Forest Restoration Program (EFRP)
- USDA Non-insured Crop Disaster Assistance Program (NAP)
- USDA/NRCS Emergency Watershed Protection Program
- USDA/NRCS Watershed Protection and Flood Prevention Program
- USDA Home Renovation Loans
- USDA/Rural Housing Service (RHS) Community Facilities Loans and Grants
- USDA/RHS Rural Housing Assistance

- USDA/RHS Section 502 Single-Family Housing Direct and Guaranteed Loans
- USDA/RHS Single Family Housing Repair Loans & Grants
- USDA/RHS Mutual Self-Help Housing Technical Assistance Grants
- USDA/Risk Management Agency Federal Crop Insurance Program
- USDA/Rural Development Business & Industry Loan Guarantees

5.2.4. Education and Outreach

Education and outreach programs and methods are used to implement mitigation activities and communicate hazard-related information. Berkeley and Morgan Counties may benefit from greater involvement in educational programs such as fire safety programs that fire departments deliver to students at local schools, participation in community programs, such as Firewise USA® or StormReady®, and activities conducted as part of hazard awareness campaigns, such as Tornado or Flood Awareness Month.

Farmland Preservation

Farmland preservation measures are important to hazard mitigation. Preserved farms protect soil from erosion and prevent the contamination of local surface water. In addition, farms and forest land are important for recharging the community's aquifer and providing habitat for local wildlife. Both Berkeley and Morgan Counties have Farmland Protection Programs.

Seasonal Emergency Management and Mitigation Outreach

Martinsburg noted on the capability assessment form that the City posts social media messages, sends email and text alerts to citizens regarding preventive and active hazard mitigation. Further, Martinsburg Police, Martinsburg Fire and Martinsburg Stormwater actively educate citizens on various hazards.

West Virginia Parcel Viewer

This program allows users to map parcel, floodplain, E-911 addresses, and zoning information among other things, from the State website at https://www.mapwv.gov/parcel/.

The WV Flood Tool, https://www.mapwv.gov/flood/map/, is a tool available for more in-depth information related to flooding and landslide susceptibility. This is a helpful tool for the State's residents to assess their level of flood risk more accurately.

5.2.5. Plan Integration

Plan integration recognizes that hazard mitigation is most effective when it works in concert with other plans, regulations, and programs. Per FEMA, plan integration is described as the regular consideration and management of hazard risks in a community's existing planning framework. Plan integration is the process by which communities critically analyze their existing planning framework and align efforts to build a safer, smarter community. Plan integration involves a two-way exchange

of information and incorporation of ideas and concepts between hazard mitigation plans (state and local) and other community plans. Specifically, plan integration involves the incorporation of hazard mitigation principles and actions into community plans and community planning mechanisms into hazard mitigation plans (FEMA, 2015).

When updating the HMP, comprehensive plans, EOPs, and various land use ordinances and regulations provided key information. These documents are referenced where appropriate throughout the plan. Moving forward, each of these documents should not be treated as unrelated and updated separately. Each county and each participating municipality are responsible for incorporating the specific mitigation actions recommended in this plan into the necessary planning documents, including the appropriate comprehensive plan, EOP, and any land use ordinances and regulations.

For example, zoning and other land use regulations can be amended to reflect the newly identified hazard areas, to ensure that development in those areas is minimized or at least conducted in a way that otherwise mitigates against the effects of hazards (e.g., requiring structures built in the floodplain to be elevated). As proposed changes to building codes are presented, their potential for mitigating damage due to hazards will be examined, and the changes will only be adopted if they are shown to lower risk. Changes to stormwater management plans will incorporate identified mitigation actions and will encourage increased participation in the NFIP.

Berkeley and Morgan Counties will continue to integrate the HMP into each individual jurisdiction's comprehensive plans as it is updated and will ask the comprehensive plan contractor to recommend additional areas for integration. The counties will also communicate with local governments to encourage them to incorporate the HMP into their local plans as applicable.

Plan integration is not only accomplished through planning tools such as comprehensive plans and zoning ordinances, but through capital improvement planning, area plans such as highway corridors and downtown plans, functional plans like stormwater and open space plans, and public and stakeholder outreach and education. This section highlights key opportunities for plan integration in Berkeley and Morgan Counties.

Overall, the administrative and technical capabilities of many of the jurisdictions within the region have been a limiting factor in HMP integration into local documents. Region 9 can provide assistance in the drafting and updating of municipal planning and enforcement documents, to reinforce the integration of the HMP and the improvement of the capabilities outlined above.

Comprehensive Plans

The Berkeley County Council and Berkeley County Planning Commission are responsible for updating and maintaining the County Comprehensive Plan and Subdivision Ordinance. The existing countywide Comprehensive Plan for Berkeley County was updated in February 2026, with a more expansive

update expected by the end of 2026. The Morgan County Commission is responsible for updating and maintaining the County Comprehensive Plan and Subdivision Ordinance. The existing countywide Comprehensive Plan for Berkeley County was updated in 2017. For the next plan update, the county should continue to incorporate hazard mitigation considerations, including information identified throughout this plan document.

The updated Berkeley County Comprehensive Plan integrated findings from the 2022 Hazard Mitigation Plan throughout the plan document, including a focus on floodplain protection, open space preservation and conservation, emergency management coordination, resilience, growth management, and a future land use framework that promotes risk reduction. The plan also references the Region 9 HMP. The following objectives from the comprehensive plan strategy showcase the integration of hazard mitigation within comprehensive planning:

- **Objective 3.1:** Preserve natural areas, forests, ecological cores, surface water, and groundwater recharge areas, and designate forever wild lands.
- **Objective 3.2:** Mitigate environmental hazards and health risks.
- **Objective 3.4:** Establish an enforceable growth management strategy that balances development with natural resource protection.
- **Objective 4.1:** Facilitate residential development that is harmonious with the natural environment while protecting the community from environmental risk.
- **Objective 4.4:** Foster livable neighborhoods that are well-connected to infrastructure, services, and amenities.
- **Objective 5.1:** Include environmental considerations in capital planning processes.
- **Objective 7.1:** Ensure that transportation planning is integrated with intentional, managed growth to protect human and natural resources.
- **Objective 7.2:** Improve the capacity, safety, and efficiency of Berkeley County's road network.
- **Objective 8.2:** Use the Future Land Use Framework and Map to support future investments in infrastructure.
- **Objective 8.5:** Preserve the County's natural and agricultural resources by directing new growth in accordance with the Future Land Use Map and Framework.

In addition to the Berkeley County Comprehensive Plan, the City of Martinsburg has adopted their own local Comprehensive Plan, last updated in 2018. Martinsburg's Comprehensive Plan could incorporate this objective into Chapter 4: Land Use, Chapter 6: Transportation, or Chapter 8: Community Facilities & Services. Similarly to the Morgan County plan, future updates of this plan should continue to incorporate hazard mitigation considerations.

Statements regarding housing plans can recommend not only that the public sector make investments in infrastructure primarily within planned growth areas but also recommend that investments be made primarily in areas which have not been identified as being hazard prone in Chapter 4: Risk

Assessment of the HMP. The data provided in Chapter 4: Risk Assessment of the HMP can also be used to design transportation systems and other critical infrastructure to withstand the effects of known hazards so that they will still function in the event of an emergency or disaster. Components of the County Comprehensive Plan can be incorporated into the HMP and plans can share recommendations related to hazard mitigation. For example, Morgan County's Comprehensive Plan mentions the US Route 522 bypass to address both increased traffic and unsafe traffic conditions in the county. Morgan County also listed the bypass construction as a potential transportation incidents vulnerability due to changing traffic patterns.

In Berkeley and Morgan Counties both the HMP and comprehensive plan are currently used to mutually support integrated content. HMP data is available to update the county and local comprehensive plans and ensures hazard mitigation elements are considered in planning documents, ordinances, and funded development projects.

Berkeley and Morgan Counties should continue to make hazard data available when the 2027 HMP update is complete. The updated hazard data can be used to help update the county and local comprehensive plans and other planning documents. Additionally, hazard related data from consistency reviews should be transmitted annually to be used as part of the Region's annual HMP review. This data can be used to help track plans and projects not only for the annual HMP review but for the 2032 HMP update.

Emergency Operations Plan

West Virginia Code §15-5 requires that state and local jurisdictions develop and maintain current emergency operations plans (EOPs) in order to be prepared for a variety of natural and human-caused hazards. Both county's EOPs are administered by the county's respective Office of Emergency Management.

Berkeley and Morgan Counties EOPs are all-hazards plans that comply with the National Incident Management System (NIMS) and are the basis for a coordinated and effective response to any disaster that may affect lives and property in Berkeley or Morgan Counties. The EOP, or portions thereof, would be implemented when emergency circumstances warrant it.

Evacuation Plan

Evacuation is one of the most widely used methods of protecting the public from hazard impacts. The easiest way to minimize death and injury due to a hazard event is to remove as many people as possible from its path. Evacuation plans include descriptions of the area(s) being evacuated, the demographics and characteristics of people within those areas(s), transportation routes to safe areas, and how the community will support those individuals who do not have access to their own transportation. The county's EOPs notes above addresses various evacuation situations, such as evacuation plans for hazardous material spills and flooding. Emergency Action Plans developed for

dams also contain evacuation.

Drought Planning

Under management of the Berkeley County Public Service District, Berkeley County maintains a Drought Contingency Plan to deal with drought emergencies. Included in the document is the outlined graduated stages of response to the onset of drought conditions. As this plan continues to be updated, information from the 2027 HMP can be utilized to inform analysis and identified strategies.

Transportation Planning

While the counties themselves do not develop their own transportation plans at the moment, they still participate in transportation planning at the regional level. Counties and municipalities can place greater emphasis on resilience and risk reduction as they participate in planning processes, increasing recognition of the impacts of flooding, severe storms, landslides, drought, extreme heat, and infrastructure failures. Both counties can leverage their involvement in regional planning organizations, state transportation planning efforts, and hazard mitigation planning processes to ensure transportation investments support long-term community resilience.

6. Mitigation Strategy

6.1. Update Process Summary

The mitigation strategy serves as the long-term road map to reduce the potential losses, vulnerabilities, and gaps identified in the risk and capability assessments. A typical mitigation strategy includes a list of goals and objectives, with mitigation actions to address the goals and objectives, that are then prioritized, based on the community's need.

- ✓ **Goals** are long-term aspirations about the resiliency of the community given the potential effects of hazards.
- ✓ **Objectives** are measurable strategies that the Counties and their communities and partners have determined will be necessary to move closer to attaining each goal.
- ✓ **Actions** are the tasks that are proposed for realizing each objective.

A list of goals and objectives from the 2022 HMP is provided in Table 6.1-1. The Steering Committee reviewed the goals and objectives and determined that the goals and objectives are still appropriate for the HMP update. A new goal was added for the 2027 HMP update specifically for HHPDs.

Table 6.1-1: List of 2022 Mitigation Strategy Goals and Objectives and Review.	
Region 9 Planning and Development Council Goals and Objectives	
Goals & Objectives	**Review**
Goal 1R: Support communities in lessening flood risk by encouraging them to maintain compliance with the National Flood Insurance Program (NFIP) and undertaking buyout projects when funding is available; Perform annual checks regarding NFIP compliance.	
Objective 1A: Assist communities in maintaining compliance with the NFIP.	**Keep.**
Goal 2R: Support counties in performing annual HMP strategies review.	
Objective 2A: Assist counties in ensuring compliance with FEMA guidelines regarding plan maintenance.	**Keep.**
Berkeley County Goals and Objectives	
Goal 1B: Protect surface water and groundwater sources by limiting future development in floodplains and flood damage, effectively managing stormwater, and reducing the possibility of source water contamination.	
Objective 1A: Minimize future flood damage in municipal areas through effective stormwater management.	**Keep.**
Objective 1B: Minimize future flood damage throughout county by increasing control over development in the floodplain.	**Keep.**
Objective 1C: Minimize future flood damage in county through structural projects.	**Keep.**
Objective 1D: Participate in the Community Rating System (CRS) to help monitor hazard mitigation efforts and to improve the affordability of flood insurance for citizens.	**Keep.**
Objective 1E: Reduce the potential for injury or loss of life due to severe flooding events.	**Keep.**
Objective 1F: Coordinate with other federal, state, and county agencies to facilitate flood mitigation activities.	**Keep.**
Objective 1G: Flood Mitigation Reconstruction- Seek Hazard Mitigation Assistance funds for the mitigation reconstruction of eligible at-risk, repetitive or non-repetitive loss, damaged or destroyed properties.	**Keep.**
Objective 1H: Construct upgrades to water supply infrastructure and increase awareness about how to reduce water contamination and pollution	**Keep.**
Objective 1I: Protect local watersheds and the greater Chesapeake Bay Watershed.	**Keep.**
Goal 2B: Reduce the current and future risks from hazards in Berkeley County.	
Objective 2A: Reduce or eliminate the effects of drought by undertaking public water infrastructure upgrades or extensions.	**Keep.**
Objective 2B: Reduce landslide occurrences through structural projects.	**Keep.**
Objective 2C: Minimize future damage from landslides throughout Berkeley County by increasing control over construction activities.	**Keep.**
Objective 2D: Minimize effects of extreme power outages on community.	**Keep.**
Objective 2E: Minimize future damage from severe wind or tornadoes throughout the county by increasing control over construction activities.	**Keep.**
Objective 2F: Minimize future damage from severe winter storms and nor'easters throughout Berkeley County by increasing control over construction activities.	**Keep.**

Table 6.1-1: List of 2022 Mitigation Strategy Goals and Objectives and Review.	
Objective 2G: Reduce the potential for transportation incidents in the county.	**Keep.**
Objective 2H: Identify and control hazardous materials within the county.	**Keep.**
Objective 2I*: Work with municipalities to create, update, and enforce land use regulations, plans, models, maps, and databases to support hazard mitigation.	**Keep.**
Objective 2J*: Modify existing structures and infrastructure or construct new structures to reduce hazard vulnerability.	**Keep.**
Objective 2K: Protect natural systems such as streams, wetlands, and forests.	**Keep.**
Objective 2L: Take measures to counteract civil disturbance, terrorism, and cyber terrorism.	**Keep.**
Objective 2M: Maintain and expand Substance Use Disorder support services.	**Keep.**
Goal 3B: Improve emergency preparedness and response in Berkeley County, Martinsburg, and Hedgesville.	
Objective 3A: Provide local residents with more advanced warning of impending hailstorms.	**Keep.**
Objective 3B: Increase public awareness that a severe thunderstorm is imminent.	**Keep.**
Objective 3C: Increase public awareness and knowledge after an epidemic and/or pandemic has been declared.	**Keep.**
Objective 3D: Increase public awareness and knowledge after an invasive species has been discovered.	**Keep.**
Objective 3E: Reduce communication failures (dead spots) in county.	**Keep.**
Objective 3F: Develop relationships and maintain coordination with hazard and hazard mitigation related organizations such as emergency services providers, utilities, Substance Use Disorder organizations, facilities with hazardous materials, and dam owners.	**Keep.**
Goal 4B: Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.	
Objective 4A: Educate the public as to the potential for earthquakes in West Virginia and Berkeley County.	**Keep.**
Objective 4B: Educate the public on how to avoid starting wildfires.	**Keep.**
Objective 4C: Increase public knowledge of protective measures to take during a heat wave.	**Keep.**
Objective 4D: Increase public awareness as to the agricultural effects of drought, as well as the ramifications of drought to the public water supply.	**Keep.**
Objective 4E: Educate citizens, elected officials, and property owners about hazards and hazard mitigation via public outreach, training, and/or participation in national programs.	**Keep.**
Objective 4F: Coordinate with High-Hazard Potential Dam owners and affected officials on dam rehabilitation and funding.	**Remove.**
Morgan County Goals and Objectives	
Goal 1M: Minimize flood damages and risks from flood hazards in Morgan County.	

Table 6.1-1: List of 2022 Mitigation Strategy Goals and Objectives and Review.	
Objective 1A: Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards.	**Keep.**
Objective 1B: Flood Mitigation Reconstruction- Seek Hazard Mitigation Assistance funds for the mitigation reconstruction of eligible at-risk, repetitive or non-repetitive loss, damaged or destroyed properties.	**Keep.**
Objective 1C: Coordinate with High-Hazard Potential Dam owners and affected officials on dam rehabilitation and funding.	**Keep.**
Goal 2M: Reduce the current and future risks from hazards in Morgan County.	
Objective 2A: Identify all repetitive loss structures throughout the county.	**Keep.**
Objective 2B: Direct new development away from hazard areas.	**Keep.**
Objective 2C: Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards.	**Keep.**
Objective 2D: Improve the enforcement of existing floodplain regulations.	**Keep.**
Objective 2E: Ensure that flood insurance policies remain affordable through the county and municipal government programs.	**Keep.**
Objective 2F: Update flood hazard mapping.	**Keep.**
Objective 2G: Assess vulnerability of transportation systems and assets located in hazard areas.	**Keep.**
Objective 2H: Conduct a Hazardous Materials Survey to better understand the nature and extent of hazardous material risks throughout the county.	**Keep.**
Objective 2I: Work with municipalities to create, update, and enforce land use regulations, plans, models, maps, and databases to support hazard mitigation.	**Keep.**
Objective 2J: Modify existing structures and infrastructure or construct new structures to reduce hazard vulnerability.	**Keep.**
Objective 2K: Protect natural systems such as streams, wetlands, and forests.	**Keep.**
Objective 2L: Educate citizens, elected officials, and property owners about hazards and hazard mitigation via public outreach, training, and/or participation in national programs.	**Keep.**
Objective 2M: Take measures to counteract civil disturbance, terrorism, and cyber terrorism.	**Keep.**
Objective 2N: Maintain and expand Substance Use Disorder support services.	**Keep.**
Goal 3M: Improve emergency preparedness in Morgan County, Bath, and Paw Paw.	
Objective 3A: Update Emergency Operations Plans (EOP).	**Keep.**
Objective 3B: Equipment assessment at the 911 Communications Center.	**Keep.**
Objective 3C: Develop relationships and maintain coordination with hazard and hazard mitigation related organizations such as emergency services providers, utilities, Substance Use Disorder organizations, facilities with hazardous materials, and dam owners.	**Keep.**
Objective 3D: Improve coordination of mitigation efforts between the National Park Service and the Town of Paw Paw.	**Keep.**
Objective 3E: Coordinate with High-Hazard Potential Dam owners and affected officials on dam rehabilitation and funding.	**Remove.**
Goal 4M: Reduce the potential impact of natural and man-made disasters on private property.	

Table 6.1-1: List of 2022 Mitigation Strategy Goals and Objectives and Review.	
Objective 4A: Encourage participation in the National Flood Insurance Program.	**Keep.**
Objective 4B: Develop public/private partnerships toward the protection of private properties.	**Keep.**
Goal 5M: Reduce the potential impact of natural disasters on the county's historic treasures.	
Objective 5A: Identify and protect other historic structures throughout the county that are at risk of hazards.	**Keep.**

The HMP is a long-term strategy, and not everything will be complete in the five-year period between plans. This section reviews the status of all mitigation actions from the 2022 plan.

Counties and municipal actions in the 2022 plan were shared via email as appropriate, for review and update. Each action has been assigned one of the following categories:

- ✓ "Completed" – Actions that were completed since the adoption of the 2021 plan.
- ✓ "Cancelled" – Actions that were terminated and would not be carried into the 2026 HMP.
- ✓ "Deferred" – Actions that had not been started since the adoption of the 2021 plan.
- ✓ "On-Going" – Actions that are performed on a regular and continuous basis by the county or community.

Most existing mitigation actions have been carried over into the 2027 Hazard Mitigation Plan as they are continuous actions or actions that were not completed. A list of all 2022 actions as well as their status is included in Table 6.1-2. Actions were evaluated by the HMPT and municipal officials with the intent of producing a usable mitigation action plan in 2026 with actions and projects that could be completed over the next five years. Appendix C contains a summary of responses provided by municipalities to the Mitigation Action Progress Report Form.

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.

Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
Region 9 Planning and Development Council Actions							
1R	Flooding	Perform annual review to ensure communities are maintaining compliance with the National Flood Insurance Program (NFIP) at the jurisdictional level by attending training, monitoring development, and ensuring that local floodplain regulations are as current and applicable as possible.	Compliance with NFIP has been handed over to lead jurisdiction agencies; no R9 involvement.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
2R	Flooding	Perform annual review to ensure communities are undertaking buyout, elevation, and/or relocation projects in the Region IX Planning and Development Council area when and if funding is available.	Handed over to lead agencies; R9 will help with funding requested.				X
3R	Dam Failure	Coordinate, as appropriate, with partners throughout the region to identify the location and contact information of privately-owned dams.	BC Emergency Mgmt, MC Emergency Mgmt, and R9 worked to complete.	X			
4R	Dam Failure	Collaborate with WVEMD, West Virginia Department of Environmental Protection (Dam Safety Section), and HHPD owners to better document location and size of populations at risk and impacts to institutions and critical infrastructure/facilities/lifelines from dam breach or failure. This may include digitization of inundation mapping if available.	Should be reallocated to Emergency Mgmt and state partners.			X	
5R	Dam Failure	Collaborate with WVEMD, West Virginia Department of Environmental Protection (Dam Safety Section), to educate HHPD dam owners on the USACE NID update and work with the State to add additional information to the database.	Should be reallocated to Emergency Mgmt and state partners.			X	
Berkeley County							
1B	Drought, Source Water Contamination	Construct upgrades to the public water system that would reduce or eliminate the effects of drought. Conduct a survey of residential wells and public water customers to evaluate the status of residential drinking water in the county and identify trends.	Berkeley Water is in the process of upgrading the Potomac River WTP and building a new Bunker Hill WTP. Both plants, as part of the upgrade, will have Source Water monitoring equipment. Two tanks are under construction now; both will be two-million-gallon elevated				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.

Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
			tanks in the county distribution system. One on Ridge Rd to replace an undersized tank and the other on Development Drive in the middle of the county.				
2B	Flooding	Develop stringent stormwater management codes for future development.	Stormwater Management Ordinance was updated in 2023 and continue to enforce 2009 Floodplain Ordinance.				X
3B	Flooding	Conduct acquisition and relocation projects (buyouts) in flood-prone areas. This includes repetitive, severe repetitive loss and non-repetitive and severe repetitive loss structures.	Berkeley County will continue with qualifying buyouts depending on funding resources.				X
4B	Transportation Incidents	Work with airport safety officials to determine how best to respond to a crash involving larger planes.	BCOEM, Berkeley County Fire Department and the volunteer fire departments continue to train and exercise with the 167th Air Wing Fire Department.	X			
5B	Flooding	Continue coordinating county efforts to meet the requirements of participation in the CRS.	Continue to participate in the CRS program.				X
6B	Source Water Contamination	Maintain county Source Water protection Plan (SWPP) according to state regulatory requirements.	West Virginia Source Water Protection Plan is due every 3 years. Berkeley County Water will be due again in 2027.				X
7B	Substance Use Disorder	Maintain and expand programs offered through Berkeley County Recovery Resource Center, Berkeley County Day	Began providing services to Jefferson County after the abrupt closure of the				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.

Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
		Report Center, and Berkeley County Home Confinement Program.	Jefferson County DRC in June of 2025. Roughly 50% increase of active program participants over last 5 years. 21% recidivism rate for program graduates for 5 years post-graduation. National average is 76%.				
29B	Flooding	Continue coordinating county efforts to meet the requirements of participation in the CRS.	Continue to participate in the CRS program.				X
30B	Invasive Species	Develop an informational brochure to distribute to local farmers and residents concerning the potential effects of an infestation.	BCOEM has been provided with many informational brochures that we have available freely and distribute at public events.	X			
31B	Landslides and Land Subsidence	Construct a stabilization wall or safety fence along roadways which pass through areas that are prone to landslides.	Not a priority for Berkeley County.		X		
32B	Transportation Incidents	Coordinate with railroad companies to provide more emergency access to railroad rights-of-way for emergency response activities in the event of a train wreck.	Rights-of-way for emergency response has not been a concern for BCOEM.		X		
33B	Flooding	Berkeley County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations or acquisitions of identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within Berkeley County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the	Dependent on available funding.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
		regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. Berkeley County will comply with all acquisition, elevation, relocation and mitigation reconstruction requirements, as per the HMA Guidance.					
34B	Flooding	Complete Sportsman's Paradise Park acquisition of area within floodplain and turn it into a green space park.	Berkeley County will continue with qualifying buyouts depending on funding resources.				X
35B	Flooding	Develop repetitive loss area maps and publicize through the WV Flood Tool.	No parties responsible in Berkeley County identified at this time.		X		
44B	Dam Failure	Coordinate with partners throughout the region to identify the location and contact information of privately owned dams.	BCOEM continues to attempt to contact privately owned dam owners.				X
46B	Terrorism	Create an informational brochure and/or digital media as to how to prepare for a terrorism event and what to do if a terrorism event occurs.	BCOEM has been provided with many informational brochures that we have available freely and distribute at public events We also promote the WV See/Send app that is available on mobile devices freely.	X			
48B	Dam Failure	Provide notice of funding opportunity to HHPD owners to promote rehabilitation and safety.	BCOEM continues to attempt to contact dam owners.				X
49B	Dam Failure	Evaluate and prioritize actions and efforts related to HHPD that are cost effective and reduce risks from HHPDs.	BCOEM continues to stay in contact, receive emergency action plans and exercise with HHPD owners.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
50B	Dam Failure	Collect information on and conduct a thorough review of all dam assets within Berkeley County in order to assess their status, vulnerabilities, potential losses (financial, social, and lifeline related), and prioritize specific dams for the Rehabilitation of High Hazard Potential Dams (HHPD) grant and other funding streams.	BCOEM continues to stay on contact, receive emergency action plans and exercise with HHPD owners.				X
51B	Dam Failure	Create an alternatives analysis to identify a preferred plan for eligible HHPD rehabilitation and the estimated cost for design and construction.					X
52B	Dam Failure	Work to develop conceptual, preliminary, or final design plans and specifications for eligible HHPD rehabilitation projects that have been planned using an alternative evaluation process that complies with National Environmental Policy Act (NEPA) requirements.					X
	Dam Failure	Assist eligible HHPDs in identifying preferred plans for rehabilitation.	Dependent on availability of assessment funding.				X
	Dam Failure	Work to develop conceptual, preliminary, or final design plans and specifications for eligible HHPD rehabilitation projects that have been planned using an alternative evaluation process in compliance with NEPA.	Dependent on availability of implementation funds.				X
	Flooding	Conduct a comprehensive review and evaluation of the Flood Hazus analysis information and communicate any deficiencies/inaccuracies to the West Virginia GIS Technical Center. This includes obtaining and providing flood elevation certificates to the Technical	No parties responsible in Berkeley County identified at this time.		X		

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
		Center for incorporation into the WV Flood Tool.					
	Flooding	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.	Berkeley County OEM has started tracking repetitive flooding areas in the county.				X
City of Martinsburg							
9B	Flooding, Landslides and Land Subsidence	Prohibit new facilities for persons with special needs or mobility concerns in hazard areas.	Planning and zoning review continues to apply land-use, building-code and floodplain requirements to proposed facilities. No new qualifying facility in a mapped hazard area was identified in the records reviewed.				X
10B	Cyber Terrorism	Prohibit or block cyber terrorism on public facilities by transitioning to Microsoft 365 and continuing routine server backups.	Completed core implementation: Microsoft 365, off-site backups, multifactor authentication and contracted third-party IT support. Cybersecurity maintenance and backups remain ongoing.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
11B	Drought	Update Martinsburg Water Model in order to ensure redundancy remains between Martinsburg's water plans and to continue inflow and infiltration reduction efforts.	System-wide water model completed. The City has contracted for leak detection of water mains. Water-system planning, leak detection and inflow/infiltration reduction remain ongoing.				X
12B	Drought	Educate residents about benefits of conserving water and where Martinsburg's water resources come from.	Stormwater public education and outreach continue under the MS4 program, including information on water resources, pollution prevention and responsible water use.				X
13B	Flooding	Reduce impact of flooding by enforcing floodplain ordinance and Martinsburg Stormwater Ordinance.	The City continues to enforce floodplain and stormwater requirements. The stormwater program maintains flood-response procedures, records flooding reports and maintains stormwater infrastructure and regulatory programs.				X
14B	Flooding	Ensure current and newly constructed critical facilities are out of the floodplain.	Site-plan, zoning, building-code and floodplain reviews continue for new or substantially improved critical facilities.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
15B	Windstorm, Flooding, Earthquake, Hurricane, Radon, Winter Storm, Nor'easter	Enforce building code to ensure structural stability during hazard events.	The City continues building-plan review, permitting and inspections under the adopted state building code to support structural safety and code compliance.				X
16B	Land subsidence	Identify areas prone to land subsidence to better inform building decisions.	Development review continues to use available mapping, site information and technical review. A comprehensive City-specific land-subsidence inventory was not located and should remain an ongoing action. City awarded $20,8 million Raise/Build Grant to construct Martinsburg Greenway Trail – but part of this grant will also provide funds to Tuscroara Creek Stream Restoration through downtown Martinsburg for about 1 mile of stream.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
17B	Pandemic and Infection Disease	Invest and strengthen core public health infrastructure, including water and sanitation systems; increasing situational awareness; and rapidly extinguishing sparks that could lead to pandemics.	The City continues operation and maintenance of water, wastewater and sanitation infrastructure and coordinates with public-health and emergency-management partners as needed.				X
18B	Pandemic and Infectious Disease	Coordinate with governmental partners, medical providers and private sector with the focus on maintenance of situational awareness, public health messaging, reduction of transmission, and care for and treatment of the ill.	Interagency coordination and public messaging remain continuing responsibilities during public-health incidents.				X
19B	Source Water Contamination	Update the City's existing Well Head Protection Plan to address growth, land use, and contamination threats, and be correlated with development regulations, including the Zoning Ordinance, to ensure the safety of local drinking water.	Source-water protection, land-use review and water-quality compliance remain ongoing. Well head protection plan updated in 2024 and due again in 2027.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
20B	Substance Use Disorder	Reduce consequences and impacts of Substance Use Disorder through continued partnership in the Martinsburg Initiative, participation in Eastern Panhandle Violent Crimes Task Force, utilization of Martinsburg Drug House Ordinance, police enforcement against distribution chains, and continued participation and partnership with schools and school children.	The City continues the Martinsburg Initiative, law-enforcement partnerships, nuisance-abatement tools and prevention work with schools and community partners. City has added imbedded social workers to police and fire department; provided seed money for EastRidge Sobering Center; and Cold Weather Shelter.				X
21B	Transportation Incidents	Work towards a complete network that allows convenient pedestrian and/or bicycle travel to all areas of the City by increased road and sidewalk maintenance and increased access to Downtown and West End redevelopment zones.	Transportation, trail, gateway, sidewalk and corridor planning remains active. Construction is planned to begin in 2027 on a 6.2 mile trail system using a Raise/Build $20 million grant. The City also received SS4A funding for a Comprehensive Safety Action Plan and related planning and demonstration activities.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.

Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
22B	Transportation Incidents	Explore increased public transit, addressing convenience, efficiency, and user-friendly accessibility, improve Ride-Share and Park & Ride solutions for commuters, and ensure Public Safety Agencies has appropriate equipment and staffing to respond.	Mobility and transportation-safety planning are ongoing. Public-safety equipment and staffing are reviewed through annual operations and budgeting. EPTA currently constructing $20 million multi-modal facility in downtown Martinsburg for public transit.				X
23B	Utility Interruption	Continually monitor, maintain, and upgrade lines, tanks, and other system infrastructure to avoid leaks that water and wastewater could potentially cause damage to City infrastructure or private property.	Routine maintenance, capital improvements, leak detection and regulatory compliance continue for water and wastewater systems.				X
24B	Utility Interruption, Windstorm/Tornado, Hurricane, Tropical Storm	Reduce impacts of windstorms and tornados by coordinating with power companies to ensure trees adjacent to power lines are properly trimmed and encourage/requiring undergrounding of new or replaced utilities.	Coordination with utilities and review of utility placement occur as projects arise. New developments require underground utilities.				X
25B	Utility Interruption, Winter Storm, Nor'easter	Establish official Memorandums of Agreement between the City and electric/utility companies to ensure utilities are winter ready and preventative maintenance has occurred.	Routine coordination occurs, but executed hazard-specific memorandums of agreement were not identified in the records reviewed. Retain as a future action unless agreements can be documented.			X	

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
26B	Hazardous Materials	Eliminate or reduce risk due to either accidental releases of hazardous materials or exposure to toxic substances by promoting compliance with safety codes, regulations, and statutes and enforcing land-use plans that regulate the location of sites with hazardous chemicals.	The City continues zoning, building, fire and property-code enforcement and coordinates with emergency-management partners for hazardous-material concerns.				X
37B	Earthquake	Continue to educate the public as to the potential for earthquakes in West Virginia, specifically Berkeley County.	Emergency-preparedness messaging remains an available outreach function.				X
38B	Extreme Temperatures	Maintain and continue to plant shade trees to reduce urban heat island effect.	Tree maintenance and planting continue through public-space, streetscape and development activities. Annual plantings are documented and are conducted by Shade Tree Commission.				*X*
39B	Extreme Temperatures	Coordinate and ensure heating and cooling shelters when appropriate.	The City coordinates emergency public information and works with county and community partners when warming or cooling sheltering is needed. City has funded Cold Weather Shelter for last 2 years through the Martinsburg Initiative.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
40B	Thunderstorm, Lightning Strike	Ensure public facilities have backup power and are properly grounded.	Tree maintenance and planting continue through public-space, streetscape and development activities. Annual plantings are documented and are conducted by Shade Tree Commission.				X
41B	Wildfire	Prohibit and reduce impacts of wildfire by developing a Fire Inspection Program with newly hired Fire Inspector, and ensuring Department has adequate equipment and staffing.	Generators have been installed at Martinsburg City Hall, Martinsburg Fire, Martinsburg Police and Martinsburg Public Works. Kilmer Springs and Big Springs Water Plants need generators.				X
42B	Terrorism	Reduce impacts of terrorism through ensuring public buildings and facilities are well-lit and secure, and critical offices and facilities are away from uncontrolled public areas. Also locate critical assets (people, activities, systems) away from entrances, vehicle circulation and parking, and loading and maintenance areas.	City has created an in-house fire inspector position for fire inspection, prevention and code enforcement.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
43B	Invasive Species	Work with subject matter experts to create or share an already created informational brochure and/or digital media to inform/educate local farmers and residents on the potential effects of an infestation.	Facility security, access control, lighting and placement of critical functions have been reviewed through maintenance, renovation and operational planning. Access control and cameras have been installed at critical City facilities. Additional security measures will continue.			X	
47B	Civil Disturbance	Prohibit and reduce impacts of civil disturbance by providing pertinent and timely information to the public so public is engaged and educated about issues affect local community, and maintain intelligence and law enforcement relationships with local, state, and federal agencies. Continue to encourage “See Something; Say Something.”	No City-produced or formally distributed invasive-species brochure was identified.				X
27B	Flooding	Conduct a comprehensive review and evaluation of the Flood Hazus analysis information and communicate any deficiencies/inaccuracies to the West Virginia GIS Technical Center. This includes obtaining and providing flood elevation certificates to the Technical Center for incorporation into the WV Flood Tool.	No completed comprehensive Hazus review was identified. Continue collecting elevation certificates and mapping corrections and coordinate with the WV GIS Technical Center.			X	

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
28B	Flooding	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.	The City maintains infrastructure, stormwater and project records. Stormwater has engaged in extensive mapping since 2022.				X
Town of Hedgesville							
8B	Radon Exposure	Assist Berkeley County in educating the public regarding radon systems and home testing available.	BCOEM provides informational brochures that we have available freely and distribute at public events.	X			
36B	Source Water Contamination	Work with area school/libraries/public facilities to include source water protection curriculum/classroom events/public education events.	BCOEM and Berkeley County Public Service Water District provides informational brochures that we have available freely and distribute at public events.	X			
28B	Flooding	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.	Berkeley County OEM has started tracking repetitive flooding areas in the county.				X
Morgan County							
1M	All hazards	Review all existing regulations to ensure adequacy in reducing impacts in hazard areas.					*X*
2M	All Hazards	Expand the mission and membership of the Morgan County Local Emergency Planning Committee to act as a countywide disaster task force.					X
3M	All Hazards	Develop adequate emergency shelter and evacuation plans for citizens and animals (domestic pets, livestock and wildlife).					*X*

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.

Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
4M	Transportation Incidents	Construct a bypass along US Route 522 to improve safety and ease of access.					X
5M	Utility Interruption	Establish official Memorandums of Agreement between individual jurisdictions and electric/utility companies for maintenance regarding tree trimming to reduce power outages from storm events, burying power lines, and installing redundancies and loop feeds.					*X*
6M	Source Water Contamination	Educate water system operators and workers about the importance of safe available water and SWPPs and update the SWPP as necessary.					*X*
7M	Source Water Contamination	Curtail pollution and sediment runoff in Sleepy Creek by continuing to work with partners to identify non-point sources of pollution and coordinate funding and other assistance to curtail these sources from entering Sleepy Creek. Such contaminant sources include home septic systems, farm animals, farm cultivation practices, flooding, and high-water streambank erosion.					*X*
8M	Flooding	Use floodplain ordinances, NFIP, CRS participation, public education, and property acquisition to remove existing developed properties from flood hazard areas and limit new development.					*X*
9M	Flooding	Enhance Warm Springs Run channel mitigation and urbanized flow obstruction.					*X*
10M	Hazardous Materials	Increase awareness of key hazardous material transportation routes and storage areas and conduct drills with local agencies focusing on high- risk areas.					*X*

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
11M	Winter Storm, Nor'easter	Assist vulnerable populations and publicize road conditions using news stations, newspapers, and radio during winter storms.	New public information system in place.	X			
12M	Substance Use Disorder	Strengthen community opioid crisis response through support and expansion of the Morgan County Harm Reduction Steering Committee, Chronic Pain Self-Management Program, and Morgan County Harm Reduction Program.					X
18M	Flooding	Support Morgan County's efforts in the CRS program, by providing training to municipalities on the CRS program and encouraging them to participate.					*X*
19M	Flooding	Collect updated information on the number and location of all repetitive loss properties throughout the county and develop a database and maps for storage.					*X*
20M	Flooding	Identify owners of repetitive and severe repetitive loss properties that may be willing to participate in future property acquisition and relocation projects.					X
21M	All hazards	Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.					*X*
22M	Flooding	Work with WV Department of Highways to identify areas of frequent roadway flooding and develop mitigation strategies.					*X*
23M	Transportation Incidents, Hazardous Materials	Identify strategies to mitigate risks from the transportation and/or storage of hazardous materials in Morgan County.	Completed 7/1/2024	X			
24M	All Natural Hazards	Establish a protocol for the sharing of annual shelter survey information between the local Red Cross chapter and the Morgan County Office of Emergency Services.	Completed 7/1/2026	X			

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
25M	All Hazards	Establish a formal process for the city and the Park Service to coordinate disaster related efforts, which will include defining boundaries and establishing responsibilities.					*X*
26M	Multiple Hazards	Conduct training exercises that include representatives from the city and the Park Service to facilitate increased coordination.			X		
27M	Flooding	Continue to enforce ordinances that new structures do not interfere with flood mitigation measures.					*X*
28M	Flooding	Obtain updated information on the number of NFIP policyholders in Morgan County and its municipalities.					*X*
29M	All Natural Hazards	Develop mitigation strategies to protect any at-risk historic properties by conducting a survey of all historic sites that are located in hazard areas.					*X*
30M	Hazardous Materials	Apply for Hazardous Materials Emergency Preparedness (HMEP) grant from WVOES to finance the development of a hazardous materials survey for Morgan County.	Completed in 2024	X			
31M	Flooding, Landslides and Land Subsidence	Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas.					*X*
32M	All Hazards	Continue to support initiatives established under the Morgan County Office of Emergency Services.					*X*

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
33M	Flooding	Morgan County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations or acquisitions of identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within Morgan County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. Morgan County will comply with all acquisition, elevation, relocation and mitigation reconstruction requirements, as per the HMA Guidance.					*X*
34M	Hailstorm	Reinforce structures and infrastructure against hail and increase awareness before hailstorms with public announcements.					*X*
35M	Wildfire	Assess areas vulnerable to wildfires and publicize outdoor burning regulations and wildfire risks using pamphlets, news articles, and the Firewise Program.					*X*
36M	Utility Interruption	FirstEnergy will trim trees on a four-year cycle as well as request permission to cut right-of-way hazard trees from property owners.					*X*
44M	Terrorism	Post and distribute terrorism preparedness information based on current data.					X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
45M	Hurricane, Tropical Storm	Provide NWS sponsored weather-related classes to the public, distribute emergency preparedness information on severe weather hazards, and provide classes on severe weather preparedness to the public.					X
46M	Radon Exposure	Provide pamphlets and educational material to county residents to encourage annual residential radon testing.	Health Department is responsible for this.				X
47M	Drought	Monitor water supply and conserve water through public awareness campaigns conducted using news and radio stations. A survey of residential wells and public water customers should also be conducted to evaluate the status of residential drinking water in the county and identify trends.					X
48M	Dam Failure	Monitor rainfall and conduct annual inspections of berms to protect against structural failures.					X
49M	Extreme Temperatures	Educate the public about the risks associated with extreme temperatures using the county website and local radio stations.					X
50M	Pandemic and Infectious Disease	When a disease reoccurs in a community, use pamphlets, local news media, and online resources to educate the public about mitigation.					X
51M	Landslides and Land Subsidence	Protect roadways and remove buildings in potential landslide and land subsidence hazard areas.					X
52M	Thunderstorm, Lightning Strike	Utilize pamphlets and articles about the warning signs and the potential damages of thunderstorms and lightning strikes.					X
53M	Invasive Species	Conduct control initiatives, such as the Gypsy Moth Spray Program, and conduct public education and awareness campaigns.					X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
54M	Dam Failure	Provide notice of funding opportunity to High-Hazard Potential Dam owners to promote rehabilitation and safety.					X
55M	Dam Failure	Evaluate and prioritize actions and efforts related to High-Hazard Potential Dams that are cost effective and reduce risks from HHPDs.					X
56M	Dam Failure	Collect information on and conduct a thorough review of all dam assets within Morgan County in order to assess their status, vulnerabilities, potential losses (financial, social, and lifeline related), and prioritize specific dams for the Rehabilitation of High Hazard Potential Dams (HHPD) grant and other funding streams.	Will be done annually.				X
57M	Dam Failure	Create an alternatives analysis to identify a preferred plan for Warm Springs No. 1 and other HHPD dam rehabilitation and the estimated cost for design and construction.				X	
58M	Dam Failure	Work to develop conceptual, preliminary, or final design plans and specifications for Warm Springs No. 1 and other HHPD rehabilitation projects that have been planned using an alternative evaluation process that complies with National Environmental Policy Act (NEPA) requirements.				X	
Town of Bath							
13M	Flooding	Review and maintain agreement with Morgan County Planning Commission to provide floodplain management.					X
37M	Flooding	Work with WVDOH to find solutions to flood impacted parts of US Route 522 within town limits, such as S. Washington Street.					X
38M	Utility Interruption	Install generators and other equipment to aid in the continuation of essential services in the event of utility interruption.					X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
39M	All Hazards	Develop a Capital Improvements Program that identifies capital projects and equipment purchases.					X
40M	All Hazards	Develop a Climate Change Adaptation Plan to better help the town in addressing and adapting to climate change.			X		
16M	Flooding	Conduct a comprehensive review and evaluation of the Flood Hazus analysis information and communicate any deficiencies/inaccuracies to the West Virginia GIS Technical Center. This includes obtaining and providing flood elevation certificates to the Technical Center for incorporation into the WV Flood Tool.			X		
17M	Flooding	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.					X
41M	All Natural Hazards	Obtain StormReady Certification.			X		
Town of Paw Paw							
14M	Flooding	Review and maintain agreement with Morgan County Planning Commission to provide floodplain management.					X
15M	Flooding	Apply for TAP grant through DOH to fund the addition and repair of sidewalks within town; include stormwater management practices to reduce flooding events on town/state roads.	Stormwater study was completed. Sidewalk design and funding are in progress.				X

Table 6.1-2: List and Status of 2022 Mitigation Action Plan.							
Action #	Hazard(S) Addressed	Mitigation Action	Comments/ Progress	Status			
				Completed	Canceled	Deferred	Ongoing
16M	Flooding	Conduct a comprehensive review and evaluation of the Flood Hazus analysis information and communicate any deficiencies/inaccuracies to the West Virginia GIS Technical Center. This includes obtaining and providing flood elevation certificates to the Technical Center for incorporation into the WV Flood Tool.	Morgan County handles Paw Paw's flood tool.				X
17M	Flooding	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.					X
42M	All Natural Hazards	Renovate fire hall to be used as shelter, evacuation site, and quarantine site.	Construction has started and should be completed later in 2026				X
43M	Utility Interruption	Install generators and other equipment to aid in the continuation of essential services in the event of utility interruption.	New generators will be installed at sewer station.				X

6.2. Mitigation Goals and Objectives

Based on results of the review of the 2022 HMP mitigation goals and objectives established, a new set of goals and objectives were developed in 2026. Table 6.1-1 explains how goals and objectives were updated and revised. Table 6.2-1 lists the mitigation goals and objectives established for the 2027 plan.

Table 6.2-1: List of 2027 Mitigation Strategy Goals and Objectives.	
Region 9 Planning and Development Council Goals	
Goal	**Objective(s)**
Goal 1R: Support communities in lessening flood risk by encouraging them to maintain compliance with the National Flood Insurance Program (NFIP) and undertaking buyout projects when funding is available; Perform annual checks regarding NFIP compliance.	**Objective 1A:** Assist communities in maintaining compliance with the NFIP.
Goal 2R: Support counties in performing annual HMP strategies review.	**Objective 2A:** Assist counties in ensuring compliance with FEMA guidelines regarding plan maintenance.
Berkeley County Goals	
Goal 1B: Protect surface water and groundwater sources by limiting future development in floodplains and flood damage, effectively managing stormwater, and reducing the possibility of source water contamination.	**Objective 1A:** Minimize future flood damage in municipal areas through effective stormwater management.
	Objective 1B: Minimize future flood damage throughout county by increasing control over development in the floodplain.
	Objective 1C: Minimize future flood damage in county through structural projects.
	Objective 1D: Participate in the Community Rating System (CRS) to help monitor hazard mitigation efforts and to improve the affordability of flood insurance for citizens.
	Objective 1E: Reduce the potential for injury or loss of life due to severe flooding events.
	Objective 1F: Coordinate with other federal, state, and county agencies to facilitate flood mitigation activities.
	Objective 1G: Flood Mitigation Reconstruction- Seek Hazard Mitigation Assistance funds for the mitigation reconstruction of eligible at-risk, repetitive or non-repetitive loss, damaged or destroyed properties.
	Objective 1H: Construct upgrades to water supply infrastructure and increase awareness about how to reduce water contamination and pollution
	Objective 1I: Protect local watersheds and the greater Chesapeake Bay Watershed.
Goal 2B: Reduce the current and future risks from hazards in Berkeley County.	**Objective 2A:** Reduce or eliminate the effects of drought by undertaking public water infrastructure upgrades or extensions.
	Objective 2B: Reduce landslide occurrences through structural projects.
	Objective 2C: Minimize future damage from landslides throughout Berkeley County by increasing control over construction activities.
	Objective 2D: Minimize effects of extreme power outages on community.
	Objective 2E: Minimize future damage from severe wind or tornadoes throughout the county by increasing control over construction activities.
	Objective 2F: Minimize future damage from severe winter storms and nor'easters throughout Berkeley County by increasing control over construction activities.
	Objective 2G: Reduce the potential for transportation incidents in the county.
	Objective 2H: Identify and control hazardous materials within the county.

Table 6.2-1: List of 2027 Mitigation Strategy Goals and Objectives.	
Region 9 Planning and Development Council Goals	
Goal	**Objective(s)**
	Objective 2I: Work with municipalities to create, update, and enforce land use regulations, plans, models, maps, and databases to support hazard mitigation.
	Objective 2J: Modify existing structures and infrastructure or construct new structures to reduce hazard vulnerability.
	Objective 2K: Protect natural systems such as streams, wetlands, and forests.
	Objective 2L: Take measures to counteract civil disturbance, terrorism, and cyber terrorism.
	Objective 2M: Maintain and expand Substance Use Disorder support services.
Goal 3B: Improve emergency preparedness and response in Berkeley County, Martinsburg, and Hedgesville.	**Objective 3A:** Provide local residents with more advanced warning of impending hailstorms.
	Objective 3B: Increase public awareness that a severe thunderstorm is imminent.
	Objective 3C: Increase public awareness and knowledge after an epidemic and/or pandemic has been declared.
	Objective 3D: Increase public awareness and knowledge after an invasive species has been discovered.
	Objective 3E: Reduce communication failures (dead spots) in county.
	Objective 3F: Develop relationships and maintain coordination with hazard and hazard mitigation related organizations such as emergency services providers, utilities, Substance Use Disorder organizations, facilities with hazardous materials, and dam owners.
Goal 4B: Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.	**Objective 4A:** Educate the public as to the potential for earthquakes in West Virginia and Berkeley County.
	Objective 4B: Educate the public on how to avoid starting wildfires.
	Objective 4C: Increase public knowledge of protective measures to take during a heat wave.
	Objective 4D: Increase public awareness as to the agricultural effects of drought, as well as the ramifications of drought to the public water supply.
	Objective 4E: Educate citizens, elected officials, and property owners about hazards and hazard mitigation via public outreach, training, and/or participation in national programs.
Goal 5B: Reduce the possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to High Hazard Potential Dams (HHPD).	**Objective 5A:** Promote partnerships among Morgan County, municipalities, WVDEP, state dam owners, federal agencies, and private dam owners to develop a coordinated approach to reducing potential losses from dam failures.
	Objective 5B: Conduct targeted outreach to areas with higher concentrations of population, critical facilities, and structures including manufactured homes.
	Objective 5C: Encourage and facilitate the development or revision of county and municipal comprehensive plans and land use ordinances to limit development in High Hazard dam inundation areas.
Morgan County Goals	

Table 6.2-1: List of 2027 Mitigation Strategy Goals and Objectives.	
Region 9 Planning and Development Council Goals	
Goal	**Objective(s)**
Goal 1M: Minimize flood damages and risks from flood hazards in Morgan County.	**Objective 1A:** Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards.
	Objective 1B: Flood Mitigation Reconstruction- Seek Hazard Mitigation Assistance funds for the mitigation reconstruction of eligible at-risk, repetitive or non-repetitive loss, damaged or destroyed properties.
	Objective 1C: Coordinate with High-Hazard Potential Dam owners and affected officials on dam rehabilitation and funding.
Goal 2M: Reduce the current and future risks from hazards in Morgan County.	**Objective 2A:** Identify all repetitive loss structures throughout the county.
	Objective 2B: Direct new development away from hazard areas.
	Objective 2C: Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards.
	Objective 2D: Improve the enforcement of existing floodplain regulations.
	Objective 2E: Ensure that flood insurance policies remain affordable through the county and municipal government programs.
	Objective 2F: Update flood hazard mapping.
	Objective 2G: Assess vulnerability of transportation systems and assets located in hazard areas.
	Objective 2H: Conduct a Hazardous Materials Survey to better understand the nature and extent of hazardous material risks throughout the county.
	Objective 2I: Work with municipalities to create, update, and enforce land use regulations, plans, models, maps, and databases to support hazard mitigation.
	Objective 2J: Modify existing structures and infrastructure or construct new structures to reduce hazard vulnerability.
	Objective 2K: Protect natural systems such as streams, wetlands, and forests.
	Objective 2L: Educate citizens, elected officials, and property owners about hazards and hazard mitigation via public outreach, training, and/or participation in national programs.
	Objective 2M: Take measures to counteract civil disturbance, terrorism, and cyber terrorism.
	Objective 2N: Maintain and expand Substance Use Disorder support services.
Goal 3M: Improve emergency preparedness in Morgan County, Bath, and Paw Paw.	**Objective 3A:** Update Emergency Operations Plans (EOP).
	Objective 3B: Equipment assessment at the 911 Communications Center.
	Objective 3C: Develop relationships and maintain coordination with hazard and hazard mitigation related organizations such as emergency services providers, utilities, Substance Use Disorder organizations, facilities with hazardous materials, and dam owners.
	Objective 3D: Improve coordination of mitigation efforts between the National Park Service and the Town of Paw Paw.
Goal 4M: Reduce the potential impact of natural and man-made disasters on private property.	**Objective 4A:** Encourage participation in the National Flood Insurance Program.
	Objective 4B: Develop public/private partnerships toward the protection of private properties.

Table 6.2-1: List of 2027 Mitigation Strategy Goals and Objectives.	
Region 9 Planning and Development Council Goals	
Goal	**Objective(s)**
Goal 5M: Reduce the potential impact of natural disasters on the county's historic treasures.	**Objective 5A:** Identify and protect other historic structures throughout the county that are at risk of hazards.
Goal 6M: Reduce the possibility of damage and loss to existing community assets including structures, critical facilities, and infrastructure due to High Hazard Potential Dams (HHPD).	**Objective 6A:** Promote partnerships among Morgan County, municipalities, WVDEP, state dam owners, federal agencies, and private dam owners to develop a coordinated approach to reducing potential losses from dam failures.
	Objective 6B: Conduct targeted outreach to areas with higher concentrations of population, critical facilities, and structures including manufactured homes.
	Objective 6C: Encourage and facilitate the development or revision of county and municipal comprehensive plans and land use ordinances to limit development in High Hazard dam inundation areas.

6.3. Identification and Analysis of Mitigation Techniques

The mitigation strategy in the updated HMP must include analysis of a comprehensive range of specific techniques or actions. FEMA identifies four categories of hazard mitigation techniques in the June 2025 Local Mitigation Handbook. Examples included are not an exhaustive list.

- **Local plans and regulations:** Government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include comprehensive plans, subdivision regulations, building codes and enforcement, and NFIP and CRS.
- **Structure and infrastructure:** Modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. Examples include acquisition and elevation of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.
- **Natural systems protection:** Actions that minimize damage and losses and preserve or restore the functions of natural systems. Examples include sediment and erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.
- **Education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate the hazards and may also include participation in national programs. Examples include radio or television spots, websites with maps and information, information and training, NFIP outreach, StormReady®, and Firewise USA® Communities.

The stakeholders reviewed the four types of mitigation techniques and ensured that all mitigation technique types were applied across hazards. The specific actions associated with these techniques are included in Table 6.4-1.

6.4. Mitigation Action Plan

Some mitigation actions have been carried over from the 2022 Plan and others have been newly developed for the counties and participating jurisdictions. While some actions are more general in nature and could apply to more than one jurisdiction, other actions are specific to individual projects or jurisdictions. Mitigation actions were developed based on issues identified in the risk assessment, gaps identified in the mitigation capability analysis, input from HMSC, and feedback from the HMPT.

During the RAMS meeting held on August 24, 2026, mitigation techniques and actions were discussed. After the meetings, municipalities were provided with their respective Mitigation Action Progress Form, which listed mitigation actions for their municipality from the 2022 HMP for review and update as described in Section 6.1. Actions that have been deferred or ongoing have been carried over to the 2027 Action Plan and are again proposed for implementation.

In addition, each participating jurisdiction was given New Mitigation Action Forms to provide any new actions or projects to be included in the plan update. New Mitigation Action Forms were sent out via e-mail. Meeting participants who were not affiliated with a municipality, organization or agency that had any actions identified in the 2022 plan were provided with New Mitigation Action Forms to include new actions in the 2027 Plan if they wished.

The final list of 135 mitigation actions is contained in Table 6.4-1. This table provides an overview of the strategy that will be utilized in order to implement each of the proposed mitigation actions. For each action listed in Table 6.4-1, the associated strategy identifies the agency or job title that will be responsible for initiating the work and potential sources of funding for the work. Each strategy also indicates a timeframe for when the action will happen. At least one mitigation action was established for each hazard in Berkeley and Morgan Counties, as identified in the Risk Assessment. More than one action is identified for several hazards. Every participating jurisdiction has at least one mitigation action. Region 9 provided one new action. Berkeley County provided four new actions, Berkeley County PSD provided two new actions and the City of Martinsburg provided eight new actions. Morgan County provided 17 new actions, while Warm Springs PSD provided one new mitigation action, the Town of Paw Paw had three new actions, and the Town of Bath had one new action. It should be noted the Town of Hedgesville had no new mitigation actions to include in the 2027 update. Further, several new mitigation actions were created for all these towns. Each mitigation action is intended to address one or more of the goals and objectives identified in Section 6.2.

Table 6.4-1 2027 Berkeley and Morgan Counties Mitigation Action Plan								
Action #	Mitigation Action	Jurisdiction	Category	Hazard(s) Addressed	Lead Agency	Time Frame	Funding Source	Estimated Cost
Region 9								
R-1	Perform annual review to ensure communities are maintaining compliance with the National Flood Insurance Program (NFIP) at the jurisdictional level by attending training, monitoring development, and ensuring that local floodplain regulations are as current and applicable as possible.	Region 9	Plans and Regulations	Flooding	Local Floodplain Coordinators, Local Planning Commissions	5 Years	Hazard Mitigation Grant Program	TBD
R-2	Perform annual review to ensure communities are undertaking buyout, elevation, and/or relocation projects in the Region IX Planning and Development Council area when and if funding is available.	Region 9	Structure and Infrastructure	Flooding	Local Floodplain Coordinators, Local Planning Commissions	5 Years	Hazard Mitigation Grant Program	TBD
R-3	Build local agency capacity ot identify and secure pre-disaster mitigation funding.	Region 9	Plans and Regulations	All Natural Hazards	Region 9	5 Years to Ongoing	FEMA, CDBG, EMPG	TBD
R-4	Support mitigation projects that will result in the protection of public and private property from floods of specific magnitudes. Eligible projects include, but are not limited to: 1) acquisition of hazard-prone structures; 2) elevation of flood-prone structures; 3) minor structural flood-control projects; 4) relocation of structures from hazard-prone areas; 5) retrofitting of existing buildings,	Region 9	Structure and Infrastructure	Dam Failure	Region 9	Ongoing	Federal hazard mitigation assistance funding, including FEMA HHPD and other eligible hazard mitigation assistance programs	TBD

	facilities, and infrastructure; and 6) the rehabilitation or removal of dams.							
R-5	Monitor and track new development in inundation areas.	Region 9	Education and Awareness, Structure and Infrastructure	Dam Failure	Region 9	Ongoing	Region 9 staff time	$0
R-6	Continue to provide technical and financial support for local land use regulation development and enforcement.	Region 9	Education and Awareness, Local Plans and Regulations	Dam Failure	Region 9	Ongoing	Region 9 staff time	$0
Berkeley County and its Municipalities								
AL-1	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.	All	Structure and Infrastructure	Flooding	Local Floodplain Coordinators	Years 2 – 5	Communities General Fund	$0
AL-2	Make FEMA B-526, "Earthquake Safety Checklist" available to homeowners and renters to use to retrofit vulnerable homes and increase preparedness.	All	Education and Awareness	Earthquake	Berkeley County OEM and Local Councils/Planning	1 Year	Staff Time	$0
Berkeley County								

BC-1	Construct upgrades to the public water system that would reduce or eliminate the effects of drought. Conduct a survey of residential wells and public water customers to evaluate the status of residential drinking water in the county and identify trends.	Berkeley County	Structure and Infrastructure	Drought, Source Water Contamination	Local Public Service District	Ongoing	FEMA HMGP	TBD
BC-2	Develop stringent stormwater management codes for future development.	Berkeley County	Plans and Regulations	Flooding	County Commission	Ongoing	Staff Time	$0
BC-3	Conduct acquisition and relocation projects (buyouts) in flood-prone areas. This includes repetitive, severe repetitive loss and non-repetitive and severe repetitive loss structures.	Berkeley County	Structure and Infrastructure	Flooding	County Commission	Ongoing	HMGP, BRIC, FMA, SRL	TBD
BC-4	Continue coordinating county efforts to meet the requirements of participation in the CRS.	Berkeley County	Plans and Regulations	Flooding	County Council and Floodplain Administrator	Ongoing	Staff Time	$0
BC-5	Maintain county Source Water protection Plan (SWPP) according to state regulatory requirements.	Berkeley County	Plans and Regulations, Natural Systems Protection	Source Water Contamination	Berkeley County Public Service Water District	Ongoing - updates every three years	BCPWD Budget	$0
BC-6	Maintain and expand programs offered through Berkeley County Recovery Resource Center, Berkeley County Day Report Center, and Berkeley County Home Confinement Program.	Berkeley County	Education and Awareness	Substance Use Disorder	Berkeley County Council, Berkeley Day Report Center, Berkeley County Recovery Resource Center and Berkeley	Ongoing	Staff Time	$0

					County Home Confinement Program			
BC-7	Berkeley County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations or acquisitions of identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within Berkeley County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. Berkeley County will comply with all acquisition, elevation, relocation and mitigation reconstruction requirements, as per the HMA Guidance.	Berkeley County	Structure and Infrastructure	Flooding	County Commission, Floodplain Coordinators	Ongoing	FEMA HMGP	TBD
BC-8	Complete Sportsman's Paradise Park acquisition of area within floodplain and turn it into a green space park.	Berkeley County	Natural Systems Protection	Flooding	County Council	3 Years	Berkeley County General Fund	TBD

BC-9	Coordinate with partners throughout the region to identify the location and contact information of privately owned dams.	Berkeley County	Education and Awareness	Dam Failure	BCHSEM	1 Year	Staff Time	$0
BC-10	Provide notice of funding opportunity to HHPD owners to promote rehabilitation and safety.	Berkeley County	Education and Awareness	Dam Failure	Berkeley County OEM	Annually by December	Staff Time	$0
BC-11	Evaluate and prioritize actions and efforts related to HHPD that are cost effective and reduce risks from HHPDs.	Berkeley County	Education and Awareness/ Structure and Infrastructure	Dam Failure	Berkeley County OEM	Ongoing	Staff Time	$0
BC-12	Collect information on and conduct a thorough review of all dam assets within Berkeley County in order to assess their status, vulnerabilities, potential losses (financial, social, and lifeline related), and prioritize specific dams for the Rehabilitation of High Hazard Potential Dams (HHPD) grant and other funding streams.	Berkeley County	Structure and Infrastructure	Dam Failure	Berkeley County OEM	2 Years	Berkeley County General Fund	TBD
BC-13	Create an alternatives analysis to identify a preferred plan for eligible HHPD rehabilitation and the estimated cost for design and construction.	Berkeley County	Structure and Infrastructure	Dam Failure	HHPD Owners/Bekrley County OEM	2 Years	HHPD Grant Funding	TBD
BC-14	Work to develop conceptual, preliminary, or final design plans and specifications for eligible HHPD rehabilitation projects that have been planned using an alternative evaluation process that complies with National Environmental Policy Act (NEPA) requirements.	Berkeley County	Structure and Infrastructure	Dam Failure	HHPD Owners/Berkeley County OEM	4 Years	HHPD Grant Funding	TBD

BC-15	Provide comprehensive response plans to assist first responders in the event of a hazardous material release	Berkeley County	Plans and Regulations	Hazardous Material Incidents	Berkeley County OEM	2 Years	Staff Time	$0
BC-16	Purchase and install backup power generator for Health Department.	Berkeley County	Structure and Infrastructure	Utility Interruption	Berkeley County Health Department	Up to 5 Years Depending on Funding	FEMA BRIC, FEMA HMGP	######
BC-17	Provide seasonal education to community members for natural disaster events through community preparedness events	Berkeley County	Education and Awareness	All Natural Hazards	Berkeley County OEM	Ongoing	Staff Time	$0
BC-18	Be officially a NWS StormReady community	Berkeley County	Education and Awareness	Flooding	Berkeley County OEM	1 Year	Staff Time	$0
BC-19	Create a MOU with Martinsburg Regional Airport and 167th Air Wing to provide a staging and distribution area for disaster supplies during a disaster event	Berkeley County	Structure and Infrastructure	All Hazards	Berkeley County OEM	2 Years	Berkeley County General Fund	TBD
BC-20	Identify and address trees and other vegetation that require routine maintenance or removal	Berkeley County	Natural Systems Protection	Hurricane, Tropical Storm; Tornado, Windstorm; Winter Storm, Nor'easter	Berkeley County	5 Years	Staff Time, Utility Companies, and Local Property Owners	TBD
BC-21	Work with local fire departments to conduct education programs in schools.	Berkeley County	Education and Awareness	Wildfire	Berkeley County OEM	Ongoing	Staff Time	$0
BC-22	Include safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	Berkeley County	Education and Awareness	Winter Storm, Transporation Incidents	Berkeley County OEM	3 Years	Staff Time	$0
BC-23	Develop a public education program concerning the hazards associated with invasive species.	Berkeley County	Education and Awareness	Invasive Species	Berkeley County OEM	1-3 years	Staff Time	$0

BC-24	Educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	Berkeley County	Education and Awareness	Extreme Temperatures	Berkeley County OEM	3 Years	Staff Time	$0
BC-25	Provide safety training to outdoor sports leagues, summer lifeguards, and other outdoor occupations.	Berkeley County	Education and Awareness	Hailstorm/Thunderstorm/Lightning	Town of Paw Paw Council	5 Years	Staff Time	$0
BC-26	Conduct tornado drills in schools and public buildings.	Berkeley County	Education and Awareness	Tornado/Windstorm	Berkeley County OEM	Ongoing	Staff Time	$0
BC-27	Enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	Berkeley County	Education and Awareness	Radon Exposure	Berkeley County OEM	2 Years	Staff Time	$0
BC-28	Create a public awareness campaign on how to reduce exposure to epidemics through all available channels.	Berkeley County	Education and Awareness	Pandemic and Infectious Disease	Berkeley County Health Department	5 Years	Staff Time	$0
BC-29	The project footprint incorporates the construction of major water transmission pipelines, pump station upgrades, and multimillion-gallon storage tanks (such as the Industrial Zone, Ridge Road, and South Berkeley tanks) to stabilize water pressure and service delivery.	Berkeley County	Structure and Infrastructure	Source Water Contamination, Utility Interruption	Berkeley County PSD	5 Years	Revenue bonds, infrastructure funds, including state and federal grant sources like ARC, EDA, etc. Region 9 assisting with funding strategy.	######
BC-30	PSD needs to construct a new freestanding water storage tank on a 1.95-acre site along the north side of Hatchery Road in the Mill Creek Tax District to meet drinking water storage capacity needs due to dramatic growth and demand.	Berkeley County	Structure and Infrastructure	All Hazards	Berkeley County PSD	5 Years	Revenue bonds, infrastructure funds, including state and federal grant sources like ARC,	######

							EDA, etc. Region 9 assisting with funding strategy	
BC-31	Maintain a current list of dam owners and their respective contact information.	Berkeley County	Education and Outreach	Dam Failure	Berkeley County emergency management agencies, dam owners	Ongoing	County staff time.	$0
BC-32	Conduct ongoing communications and outreach to dam owners to educate them on their requirements to maintain Emergency Action Plans (EAPs), create spatially formatted inundation maps, and ensure current copies of the plans and inundation maps are provided to Berkeley and Morgan Counties in digital formats.	Berkeley County	Education and Awareness, Local Plans and Regulations	Dam Failure	Berkeley County emergency management agencies	Ongoing	County staff time.	$0
BC-33	Ensure dam owners are aware of available public funding resources, including the FEMA Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program.	Berkeley County	Education and Awareness	Dam Failure	Region 9 and Berkeley County emergency management agencies	1-3 Years	County staff time.	$0
BC-34	Encourage and cooperate with dam owners to complete preventative maintenance projects and removal actions.	Berkeley County	Structure and Infrastructure	Dam Failure	Berkeley County emergency management agencies	Ongoing	County staff time.	$0

BC-35	Support mitigation projects that will result in the protection of public and private property from floods of specific magnitudes. Eligible projects include, but are not limited to: 1) acquisition of hazard-prone structures; 2) elevation of flood-prone structures; 3) minor structural flood-control projects; 4) relocation of structures from hazard-prone areas; 5) retrofitting of existing buildings, facilities, and infrastructure; and 6) the rehabilitation or removal of dams.	Berkeley County	Structure and Infrastructure	Dam Failure	Region 9 and Berkeley County emergency management agencies	Ongoing	Federal hazard mitigation assistance funding, including FEMA HHPD and other eligible hazard mitigation assistance programs	TBD
BC-36	Utilize the dam EAPs and inundation mapping to identify specific impacted populations, critical facilities, structures that are vulnerable to dam failure risks, and conduct communications outreach to the affected populations and owners.	Berkeley County	Education and Awareness, Structure and Infrastructure	Dam Failure	Berkeley County emergency management agencies, dam owners	1-3 Years	County staff time	$0
BC-37	Monitor and track new development in inundation areas.	Berkeley County	Education and Awareness, Structure and Infrastructure	Dam Failure	Region 9 and Berkeley County Planning Departments and Region 9	Ongoing	County staff time	$0
BC-38	Continue to provide technical and financial support for local land use regulation development and enforcement.	Berkeley County	Education and Awareness, Local Plans and Regulations	Dam Failure	Region 9 and Berkeley County	Ongoing	County staff time	$0
City of Martinsburg								
MG-1	Prohibit new facilities for persons with special needs or mobility concerns in hazard areas.	City of Martinsburg	Plans and Regulations	Flooding, Landslides and Land Subsidence	City of Martinsburg Planning and Zoning Department	2 Years	Staff Time	$0

MG-2	Prohibit or block cyber terrorism on public facilities by transitioning to Microsoft 365 and continuing routine server backups.	City of Martinsburg	Structure and Infrastructure	Cyber Terrorism	City of Martinsburg Council	Ongoing	Staff Time	$0
MG-3	Update Martinsburg Water Model in order to ensure redundancy remains between Martinsburg's water plans and to continue inflow and infiltration reduction efforts.	City of Martinsburg	Plans and Regulations	Drought	City of Martinsburg Stormwater Management	5 Years	Staff Time	$0
MG-4	Educate residents about benefits of conserving water and where Martinsburg's water resources come from.	City of Martinsburg	Education and Awareness	Drought	City of Martinsburg Council, Stormwater Management	Ongoing	Staff Time	$0
MG-5	Reduce impact of flooding by enforcing floodplain ordinance and Martinsburg Stormwater Ordinance.	City of Martinsburg	Plans and Regulation	Flooding	City of Martinsburg Stormwater Management, Berkeley County Homeland Security, FEMA, EPA	Ongoing	Staff Time	$0
MG-6	Ensure current and newly constructed critical facilities are out of the floodplain.	City of Martinsburg	Structure and Infrastructure	Flooding	City of Martinsburg Planning and Zoning Department, Berkeley County Homeland Security, FEMA, EPA	Ongoing	City of Martinsburg General Fund	TBD
MG-7	Enforce building code to ensure structural stability during hazard events.	City of Martinsburg	Plans and Regulations, Structure and Infrastructure	Windstorm, Flooding, Earthquake, Hurricane, Radon, Winter	City of Martinsburg Planning and Zoning Department	Ongoing	Staff Time	$0

				Storm, Nor'easter				
MG-8	Identify areas prone to land subsidence to better inform building decisions.	City of Martinsburg	Natural Systems Protection	Land subsidence	City of Martinsburg Planning and Zoning Department, Berkeley County Homeland Security, WVU GIS Technical Center	Ongoing	City of Martinsburg General Fund	TBD
MG-9	Invest and strengthen core public health infrastructure, including water and sanitation systems; increasing situational awareness; and rapidly extinguishing sparks that could lead to pandemics.	City of Martinsburg	Structure and Infrastructure	Pandemic and Infection Disease	City of Martinsburg Department of Public Works, Berkeley County Health Department	Ongoing	City of Martinsburg General Fund	TBD
MG-10	Coordinate with governmental partners, medical providers and private sector with the focus on maintenance of situational awareness, public health messaging, reduction of transmission, and care for and treatment of the ill.	City of Martinsburg	Education and Awareness	Pandemic and Infectious Disease	City of Martinsburg Council, Berkeley County Health Department	Ongoing	Staff Time	$0
MG-11	Update the City's existing Well Head Protection Plan to address growth, land use, and contamination threats, and be correlated with development regulations, including the Zoning Ordinance, to ensure the safety of local drinking water.	City of Martinsburg	Plans and Regulation	Source Water Contamination	City of Martinsburg Stormwater Management, WVDEP, Watershed Associations	Ongoing	Staff Time	$0

MG-12	Reduce consequences and impacts of Substance Use Disorder through continued partnership in the Martinsburg Initiative, participation in Eastern Panhandle Violent Crimes Task Force, utilization of Martinsburg Drug House Ordinance, police enforcement against distribution chains, and continued participation and partnership with schools and school children.	City of Martinsburg	Education and Awareness, Plans and Regulations	Substance Use Disorder	City of Martinsburg Council, Berkeley County Health Department	Ongoing	Staff Time	$0
MG-13	Work towards a complete network that allows convenient pedestrian and/or bicycle travel to all areas of the City by increased road and sidewalk maintenance and increased access to Downtown and West End redevelopment zones.	City of Martinsburg	Structure and Infrastructure	Transportation Accidents	City of Martinsburg Planning and Zoning Department, WVDOT	Ongoing	City of Martinsburg General Fund	TBD
MG-14	Explore increased public transit, addressing convenience, efficiency, and user-friendly accessibility, improve Ride-Share and Park & Ride solutions for commuters, and ensure Public Safety Agencies has appropriate equipment and staffing to respond.	City of Martinsburg	Plans and Regulations, Structure and Infrastructure	Transportation Accidents	City of Martinsburg Planning and Zoning Department, WVDOT	Ongoing	Staff Time	$0
MG-15	Continually monitor, maintain, and upgrade lines, tanks, and other system infrastructure to avoid leaks that water and wastewater could potentially cause damage to City infrastructure or private property.	City of Martinsburg	Structure and Infrastructure	Utility Interruption	City of Martinsburg Public Works, WV PSC	Ongoing	City of Martinsburg General Fund	TBD

MG-16	Reduce impacts of windstorms and tornados by coordinating with power companies to ensure trees adjacent to power lines are properly trimmed and encourage/requiring undergrounding of new or replaced utilities.	City of Martinsburg	Structure and Infrastructure	Utility Interruption, Windstorm/Tornado, Hurricane, Tropical Storm	City of Martinsburg Public Works	Ongoing	Staff Time	$0
MG-17	Establish official Memorandums of Agreement between the City and electric/utility companies to ensure utilities are winter ready and preventative maintenance has occurred.	City of Martinsburg	Structure and Infrastructure	Utility Interruption, Winter Storm, Nor'easter	City of Martinsburg Public Works	Ongoing	Staff Time	$0
MG-18	Eliminate or reduce risk due to either accidental releases of hazardous materials or exposure to toxic substances by promoting compliance with safety codes, regulations, and statutes and enforcing land-use plans that regulate the location of sites with hazardous chemicals.	City of Martinsburg	Plans and Regulations	Hazardous Materials	City of Martinsburg Planning and Zoning Department, Berkeley County Homeland Security	Ongoing	Staff Time	$0
MG-19	Continue to educate the public as to the potential for earthquakes in West Virginia, specifically Berkeley County.	City of Martinsburg	Education and Awareness	Earthquake	City of Martinsburg Council, Berkeley County Homeland Security, FEMA	Ongoing	Staff Time	$0
MG-20	Maintain and continue to plant shade trees to reduce urban heat island effect.	City of Martinsburg	Natural Systems Protection	Extreme Temperatures	City of Martinsburg Planning and Zoning Department, NWS, WVDOF	Ongoing	City of Martinsburg General Fund	TBD

MG-21	Coordinate and ensure heating and cooling shelters when appropriate.	City of Martinsburg	Structure, and Infrastructure	Extreme Temperatures	City of Martinsburg Council, NWS, WVDOF	Ongoing	City of Martinsburg General Fund	TBD
MG-22	Ensure public facilities have backup power and are properly grounded.	City of Martinsburg	Structure and Infrastructure	Thunderstorm, Lightning Strike	City of Martinsburg Public Works	Ongoing	Staff Time	$0
MG-23	Prohibit and reduce impacts of wildfire by developing a Fire Inspection Program with newly hired Fire Inspector, and ensuring Department has adequate equipment and staffing.	City of Martinsburg	Plans and Regulations	Wildfire	City of Martinsburg Fire Department, City Administration	3 Years	Staff Time	$0
MG-24	Reduce impacts of terrorism through ensuring public buildings and facilities are well-lit and secure, and critical offices and facilities are away from uncontrolled public areas. Also locate critical assets (people, activities, systems) away from entrances, vehicle circulation and parking, and loading and maintenance areas.	City of Martinsburg	Structure and Infrastructure	Terrorism	City of Martinsburg Public works, Planning and Zoning, City Administration	5 Years	City of Martinsburg General Fund	TBD
MG-25	Work with subject matter experts to create or share an already created informational brochure and/or digital media to inform/educate local farmers and residents on the potential effects of an infestation.	City of Martinsburg	Education and Awareness	Invasive Species	City of Martinsburg Council, Farm Bureau	1 Year	Staff Time	$0

MG-26	Prohibit and reduce impacts of civil disturbance by providing pertinent and timely information to the public so public is engaged and educated about issues affect local community, and maintain intelligence and law enforcement relationships with local, state, and federal agencies. Continue to encourage "See Something; Say Something."	City of Martinsburg	Education and Awareness/ Plans and Regulations	Civil Disturbance	City of Martinsburg Police, WV State Police	Ongoing	Staff Time	$0
MG-27	Conduct drainage studies and implement targeted stormwater, culvert and detention improvements in repetitive flooding areas.	City of Martinsburg	Plans and Regulations	Flooding, Thunderstorm, Lightning	City of Martinsburg	Ongoing	FEMA, BRIC, CDGB, State	$15 million+
MG-28	Construct a strategically located fire station on the west side of Martinsburg to improve emergency response coverage, reduce response times, enhance firefighter safety, and increase community resilience during natural and human-caused disasters. The facility should be designed to remain operational during severe weather events and extended utility disruptions	City of Martinsburg	Structure and Infrastructure	Flooding, Severe Storms, WInter Storms, Hazardous Materials Incidents, Transportation Accidents	City of Martinsburg	3-7 Years	FEMA BRIC, FEMA Assistance to Firefighters Grants (where eligible), Community Project Funding, State grants, Congressional Direct Spending, local capital funding	$5 million+
MG-29	Install permanent generators and resilient power systems at critical municipal facilities including water treatment facilities, pump stations, emergency operations facilities, and communications infrastructure.	City of Martinsburg	Structure and Infrastructure	Thunderstorm, Lightning Strike, Winterstorms, Nor'easter, Utility Interrruptions, Extreme Temperatures	City of Martinsburg	1-5 Years	FEMA BRIC, FEMA HMGP, USDA Rural Development	$1 to $5 million

MG-30	Conduct a citywide assessment of street lighting and public area lighting to identify deficiencies affecting public safety, transportation safety, emergency response, critical infrastructure security, and community resilience. Develop a prioritized implementation plan for lighting improvements, backup power options, smart controls, and energy-efficient technologies in high-priority areas.	City of Martinsburg	Plans and Regulations	Civil Disturbance, Terrorism, Transportation Accidents, Utility Interruption, Thunderstorms, Lightning Strike	City of Martinsburg	1-5 Years	Congressional earmarks, capital funding, CDBG	$25,000 study; $2 million implementation
MG-31	Evaluate, design, and construct infrastructure necessary to utilize the Potomac River as an emergency and supplemental water source. The project may include water intake facilities, transmission infrastructure, treatment upgrades, storage improvements, interconnections, and emergency operating procedures to ensure a reliable water supply during emergencies and future growth.	City of Martinsburg	Structure and Infrastructure	Drought, Source Water Contamination, Extreme Temperatures	City of Martinsburg	5-15 Years	FEMA BRIC, EPA State Revolving Fund, USDA Rural Development, Economic Development Administration, Infrastructure grants	$20 to $100 million+
MG-32	Implement a comprehensive stream restoration program along Tuscarora Creek to reduce flood risk, improve floodplain connectivity, stabilize streambanks, restore natural stream function, and enhance watershed resilience. The project may include stream restoration, floodplain reconnection, erosion control measures, stormwater management improvements, green infrastructure practices, and associated flood mitigation projects identified through watershed assessments.	City of Martinsburg	Natural Systems Protection	Flooding, Thunderstorm	City of Martinsburg	Pending; 2-3 Years	Build/Raise Grant	$5 Million

MG-33	Conduct a comprehensive assessment of aging water and sewer infrastructure and implement a phased replacement and rehabilitation program. Prioritize assets with a history of failures, flood exposure, or critical service importance. Improvements may include line replacement, manhole rehabilitation, pump station upgrades, redundancy improvements, and flood protection measures.	City of Martinsburg	Plans and Regulations / Structure and Infrastructure	Flooding, Thunderstorms, Drought, Extreme Temperatures, Utility Interruptions, Winter Storms, Nor'easters, Hurricane and Tropical Storms	City of Martinsburg	Ongoing	State Revolving Fund (SRF), FEMA BRIC, FEMA HMGP, USDA Rural Development, Infrastructure Investment and Jobs Act funding, local capital funds	$50 to $100 million
MG-34	Design and construct an elevated water storage tank and associated transmission infrastructure on the west side of the city to provide additional water storage, improve system pressure, increase redundancy, enhance fire protection capabilities, and maintain water service during emergencies and infrastructure disruptions.	City of Martinsburg	Structure and Infrastructure	Drought, Utility Interruptions, Thunderstorms, Extreme Temperatures	City of Martinsburg	3-5 Years	State Revolving Fund (SRF), FEMA BRIC, FEMA HMGP, USDA Rural Development, Water Development Authority	$2.5 to $5 million
Town of Hedgesville								
HV-1	Assist Berkeley County in educating the public regarding radon systems and home testing available.	Town of Hedgesville	Education and Awareness	Radon Exposure	Hedgesville Town Council	Short-term	Staff Time	$0
HV-2	Work with area school/libraries/public facilities to include source water protection curriculum/classroom events/public education events.	Town of Hedgesville	Education and Awareness	Source Water Contamination	Town of Hedgesville Council	Short-term	Staff Time	$0
HV-3	Create a public awareness campaign on how to reduce exposure to epidemics through all available channels.	Town of Hedgesville	Education and Awareness	Pandemic and Infectious Disease	Town of Hedgesville Council	5 Years	Staff Time	$0

HV-4	Develop a drought emergency plan	Town of Hedgesville	Plans and Regulations	Drought	Town of Hedgesville Council	5 Years	Town of Paw Paw General Fund and Staff Time	TBD
HV-5	Develop a public education program concerning the hazards associated with invasive species.	Town of Hedgesville	Education and Awareness	Invasive Species	Town of Hedgesville Council	1-3 years	Staff Time	$0
HV-6	Work with the County and WV Department of Health to increase awareness about treating and preventing substance use disorder.	Town of Hedgesville	Education and Awareness	Substance Use Disorder	Town of Hedgesville Council	Ongoing	Staff Time	$0
HV-7	Include safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	Town of Hedgesville	Education and Awareness	Winter Storm, Transporation Incidents	Town of Hedgesville Council	3 Years	Staff Time	$0
HV-8	Educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	Town of Hedgesville	Education and Awareness	Extreme Temperatures	Town of Hedgesville Council	3 Years	Staff Time	$0
HV-9	Provide safety training to outdoor sports leagues, summer lifeguards, and other outdoor occupations.	Town of Hedgesville	Education and Awareness	Hailstorm/Thunderstorm/Lightning	Town of Hedgesville Council	5 Years	Staff Time	$0
HV-10	Work with local fire departments to conduct education programs in schools.	Town of Hedgesville	Education and Awareness	Wildfire	Town of Hedgesville Council	Ongoing	Staff Time	$0

HV011	Annually distribute landslide and land subsidence risk pamphlets, public service announcements, or brochures to residents within high-risk areas. Ensure that all materials are provided in all languages relevant to the community. Also make sure to utilize outreach methods that can reach a wide variety of audiences, such as social media, print media, and radio.	Town of Hedgesville	Education and Awareness	Landslide and Land Subsidence	Town of Hedgesville Council	2 Years	Staff Time	$0
HV-12	Identify and address trees and other vegetation that require routine maintenance or removal	Town of Hedgesville	Natural Systems Protection	Hurricane, Tropical Storm; Tornado, Windstorm; Winter Storm, Nor'easter	Town of Paw Paw Council	5 Years	Staff Time, Utility Companies, and Local Property Owners	TBD
HV-13	Conduct tornado drills in schools and public buildings.	Town of Hedgesville	Education and Awareness	Tornado/Windstorm	Town of Hedgesville Council	Ongoing	Staff Time	$0
HV-14	Enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	Town of Hedgesville	Education and Awareness	Radon Exposure	Town of Hedgesville Council	2 Years	Staff Time	$0
Morgan County and its Municipalities								
AL-1	Conduct a comprehensive review and evaluation of the Flood Hazus analysis information and communicate any deficiencies/inaccuracies to the West Virginia GIS Technical Center. This includes obtaining and providing flood elevation certificates to the Technical Center for incorporation into the WV Flood Tool.	All	Structure and Infrastructure	Flooding	Local Floodplain Coordinators, WV GIS Tech. Center	1 Year	Staff Time	$0

AL-2	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.	All	Structure and Infrastructure	Flooding	Local Floodplain Coordinators	2-5 Years	Staff Time	$0
AL-3	Work with WVDOH, Town of Paw Paw, and Town of Bath to identify and find solutions to address runoff issues.	All	Plans and Regulations	Flooding	Morgan County OES and WVDOH	3-5 Years	FEMA FMA	Unknonwn
AL-4	Make FEMA B-526, "Earthquake Safety Checklist" available to homeowners and renters to use to retrofit vulnerable homes and increase preparedness.	All	Education and Awareness	Earthquake	Morgan County OES and Local Councils/Planning	1 Year	Staff Time	$0
AL-5	Plan for and maintain adequate road and debris clearing capabilities	All	Plans and Regulations	Winter Storm, Nor'easter	Morgan County and Town of Bath Planning Commissions and Town of Paw Paw Council	Ongoing	Staff Time	$0
AL-6	Conduct tornado drills in schools and public buildings.	All	Education and Awareness	Windstorm/Tornado	Morgan County OES, Town of Paw Paw and Bath Council	Ongoing	Staff Time	$0
AL-7	Identify or develop cyber security awareness training and require all municipal staff to complete yearly. Develop certificate and tracking database to ensure all employees are up to date on trainings.	All	Education and Awareness	CyberTerrorism	Morgan County and Town of Bath Planning Commissions and Town of Paw Paw Council	1-2 Years	Staff Time	$0

Morgan County								
MC-1	Review all existing regulations to ensure adequacy in reducing impacts in hazard areas.	Morgan County	Plans and Regulations	All Hazards	Planning Commission, Floodplain Coordinator, County Commission, OES and FEMA	Ongoing	Staff Time	$0
MC-2	Strengthen community opioid crisis response through support and expansion of the Morgan County Harm Reduction Steering Committee, Chronic Pain Self-Management Program, and Morgan County Harm Reduction Program.	Morgan County	Education and Awareness	Substance Use Disorder	Morgan County Harm Reduction Steering Committee	Ongoing	Morgan County General Fund and Staff Time	TBD
MC-3	Support Morgan County's efforts in the CRS program, by providing training to municipalities on the CRS program and encouraging them to participate.	Morgan County	Education and Awareness	Flooding	Local Floodplain Coordinators	Ongoing	Staff Tine	$0
MC-4	Collect updated information on the number and location of all repetitive loss properties throughout the county and develop a database and maps for storage.	Morgan County	Education and Awareness	Flooding	Local Floodplain Coordinators	Ongoing	Staff Time	$0
MC-5	Identify owners of repetitive and severe repetitive loss properties that may be willing to participate in future property acquisition and relocation projects.	Morgan County	Education and Awareness	Flooding	Local Floodplain Coordinators	5 Years	Staff Time	$0
MC-6	Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.	Morgan County	Plans and Regulations	All hazards	Planning Commission, Local Floodplain Coordinators	Ongoing	Staff Time	$0

MC-7	Work with WV Department of Highways to identify areas of frequent roadway flooding and develop mitigation strategies.	Morgan County	Education and Awareness	Flooding	DOT, OES, Local Floodplain Coordinators	Ongoing	Morgan County General Fund and Staff Time	TBD
MC-8	Establish a formal process for the city and the Park Service to coordinate disaster related efforts, which will include defining boundaries and establishing responsibilities.	Morgan County	Plans and Regulations	All Hazards	OES, County Commission	Ongoing	Staff Time	$0
MC-9	Continue to enforce ordinances that new structures do not interfere with flood mitigation measures.	Morgan County	Plans and Regulations	Flooding	County Commission, Planning Commission	Ongoing	Staff Time	$0
MC-10	Obtain updated information on the number of NFIP policyholders in Morgan County and its municipalities.	Morgan County	Education and Awareness	Flooding	Floodplain Coordinator, OES, FEMA	Ongoing	Staff Time	$0
MC-11	Develop mitigation strategies to protect any at-risk historic properties by conducting a survey of all historic sites that are located in hazard areas.	Morgan County	Structure and Infrastructure	All Natural Hazards	County Historic Society, Floodplain Coordinator	1-5 Years	Staff Time	$0
MC-12	Expand the mission and membership of the Morgan County Local Emergency Planning Committee to act as a countywide disaster task force.	Morgan County	Plans and Regulations	All Hazards	LEPC, OES	Ongoing	Staff Time	$0
MC-13	Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas.	Morgan County	Plans and Regulations	Flooding, Landslides and Land Subsidence	County Commission, Planning Commission	Ongoing	Staff Time	$0
MC-14	Continue to support initiatives established under the Morgan County Office of Emergency Services.	Morgan County	Plans and Regulations	All Hazards	OES, Planning Commission	Ongoing	Staff Time	$0

MC-15	Morgan County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations or acquisitions of identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within Morgan County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. Morgan County will comply with all acquisition, elevation, relocation and mitigation reconstruction requirements, as per the HMA Guidance.	Morgan County	Structure and Infrastructure	Flooding	County Commission, Local Floodplain Coordinators	Ongoing	Hazard Mitigation Assistance	TBD
MC-16	Reinforce structures and infrastructure against hail and increase awareness before hailstorms with public announcements.	Morgan County	Structure and Infrastructure, Education and Awareness	Hailstorm	Morgan County Commission, Insurance Providers	Ongoing	FEMA HMGP and Staff Time	TBD
MC-17	Assess areas vulnerable to wildfires and publicize outdoor burning regulations and wildfire risks using pamphlets, news articles, and the Firewise Program.	Morgan County	Natural Systems Protection, Education and Awareness	Wildfire	Morgan County Commission	Ongoing	Morgan County General Fund and Staff Time	TBD
MC-18	FirstEnergy will trim trees on a four-year cycle as well as request permission to cut right-of-way hazard trees from property owners.	Morgan County	Structure and Infrastructure	Utility Interruption	Potomac Edison	Ongoing	FirstEnergy	TBD

MC-19	Post and distribute terrorism preparedness information based on current data.	Morgan County	Education and Awareness	Terrorism	WVDEM	1 Year	Staff Time	$0
MC-20	Provide NWS sponsored weather-related classes to the public, distribute emergency preparedness information on severe weather hazards, and provide classes on severe weather preparedness to the public.	Morgan County	Education and Awareness	Hurricane, Tropical Storm	WVDEM	Ongoing	Morgan County General Fund and staff Time	$0
MC-21	Provide pamphlets and educational material to county residents to encourage annual residential radon testing.	Morgan County	Education and Awareness	Radon Exposure	County Commission	1 Year	Staff Time	$0
MC-22	Monitor water supply and conserve water through public awareness campaigns conducted using news and radio stations. A survey of residential wells and public water customers should also be conducted to evaluate the status of residential drinking water in the county and identify trends.	Morgan County	Natural System Protection, Education and Awareness	Drought	Local, State, Federal Government	Ongoing	Morgan County General Fund and Staff Time	TBD
MC-23	Develop adequate emergency shelter and evacuation plans for citizens and animals (domestic pets, livestock and wildlife).	Morgan County	Plans and Regulations	All Hazards	County Commission, OES, LEPC, Red Cross, DNR, Humane Society, Sheriff's Office	Ongoing	Morgan County General Fund and Staff Time	TBD
MC-24	Monitor rainfall and conduct annual inspections of berms to protect against structural failures.	Morgan County	Structure and Infrastructure	Dam Failure	Morgan County Commission	Ongoing	Staff Time	$0
MC-25	Educate the public about the risks associated with extreme temperatures using the county website and local radio stations.	Morgan County	Education and Awareness	Extreme Temperatures	Morgan County Commission	Ongoing	Staff Time	$0

MC-26	When a disease reoccurs in a community, use pamphlets, local news media, and online resources to educate the public about mitigation.	Morgan County	Education and Awareness	Pandemic and Infectious Disease	Morgan County Health Department	Ongoing	Staff Time	$0
MC-27	Protect roadways and remove buildings in potential landslide and land subsidence hazard areas.	Morgan County	Structure and Infrastructure	Landslides and Land Subsidence	Morgan County Commission	Ongoing	FEMA HMGP	TBD
MC-28	Utilize pamphlets and articles about the warning signs and the potential damages of thunderstorms and lightning strikes.	Morgan County	Education and Awareness	Thunderstorm, Lightning Strike	County Commission, NOAA, NWS	Ongoing	Staff Time	$0
MC-29	Conduct control initiatives, such as the Gypsy Moth Spray Program, and conduct public education and awareness campaigns.	Morgan County	Education and Awareness, Natural System Protection	Invasive Species	Morgan County Commission, WV Department of Ag	Ongoing	Morgan County General Fund	TBD
MC-30	Ensure dam owners are aware of available public funding resources, including the FEMA Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program.	Morgan County	Education and Awareness	Dam Failure	Region 9 and Morgan County OES	1-3 Years	County staff time.	$0
MC-31	Evaluate and prioritize actions and efforts related to High-Hazard Potential Dams that are cost effective and reduce risks from HHPDs.	Morgan County	Education and Awareness/ Structure and Infrastructure	Dam Failure	Morgan County Commission	Ongoing	Staff Time	$0
MC-32	Collect information on and conduct a thorough review of all dam assets within Morgan County in order to assess their status, vulnerabilities, potential losses (financial, social, and lifeline related), and prioritize specific dams for the Rehabilitation of High Hazard Potential Dams (HHPD) grant and other funding streams.	Morgan County	Structure and Infrastructure	Dam Failure	Morgan County Commission	2 Years	Morgan County General Fund	TBD

MC-33	Construct a bypass along US Route 522 to improve safety and ease of access.	Morgan County	Structure and Infrastructure	Transportation Accidents	WV DOT	3 Years	Grant Funding, FHA	TBD
MC-34	Complete the bidding, selection, and construction of the Warm Springs Dam No. 1 rehabilitation improvements.	Morgan County	Structure and Infrastructure	Dam Failure	HHPD Owners/Morgan County OES	4 Years	HHPD Grant Funding	TBD
MC-35	On several occasions vehicles have attempted to traverse flooded roadways and became trapped in rising floodwaters. This created unnecessary risk to responders attempting rescue. Engineer and install radio activated drop-down access denial gates.	Morgan County	Structure and Infrastructure	Flooding, Thunderstorms, Hurricane and Tropical Storms	Morgan County OES	3-5 Years+	FEMA BRIC or FMA	$50,000 per crossing. $400,000 Total
MC-36	The Morgan County EOC is located in Berkeley Springs at the Morgan County Courthouse Complex. The current EOC sits 1 foot above the 100-year flood plain. An alternate EOC is currently being constructed. This complex also house Morgan County ARES and Morgan County Facilities. A generator would provide needed backup power to infrastructure vital to emergency operation in Morgan County.	Morgan County	Structure and Infrastructure	All Hazards	Morgan County OES	1-2 Years	FEMA HMGP, Non-Disaster Funding	######

MC-37	Morgan County public potable water is supplied by two water sources, Fairfax Springs and the Potomac River in Paw Paw. Both are susceptible to contamination via run off and flooding. Engineer, develop and create multiple alternative water sources independent of current sources. The system would need a water treatment plant and connected back into the current system of water lines.	Morgan County	Structure and Infrastructure	Source Water Contamination	Morgan County Commission, Town of Bath, Town of Paw Paw	3-5 Years+	FEMA HMGP	######
MC-38	Install dry hydrants at 6 locations previously selected.	Morgan County	Structure and Infrastructure	Wildfire	Morgan County Commission	3-5 Years	CDS, request submitted in March 2026.	######
MC-39	Engineer and construct a bridge on Gayle Drive where it crosses Warm Springs Run. The bridge needs to be constructed out of the flood plain.	Morgan County	Structure and Infrastructure	Flooding	Morgan County Commission	5-10 Years	FEMA BRIC or FMA	######
MC-40	Engineer and construct an offline storage (Alternate #2) area as described in the Warm Springs Run Watershed Plan and Environmental Assessment	Morgan County	Structure and Infrastructure	Flooding	Morgan County Commission	5-10 Years	FEMA BRIC or FMA	######
MC-41	Engineer actions to protect the historical property of Johnson' Mill.	Morgan County	Structure and Infrastructure	Flooding	Sleepy Creek Watershed Association	3-5 Years	Chesapeake Bay Trust.	######
MC-42	Design and execute a public awareness campaign aimed at reducing sediment in local streams and rivers.	Morgan County	Natural Systems Protection / Education and Awareness	Flooding	Morgan County OES	6-12 Months	Chesapeake Bay Foundation	$5,000

MC-43	Establish official Memorandums of Agreement between individual jurisdictions and electric/utility companies for maintenance regarding tree trimming to reduce power outages from storm events, burying power lines, and installing redundancies and loop feeds.	Morgan County	Plans and Regulations, Structure and Infrastructure	Utility Interruption	First Energy	Ongoing	Staff Time	$0
MC-44	Engineer the proper size generators and install at two locations: Berkeley Baptist Church gymnasium and Warm Springs Middle School. Both are used as primary shelter locations.	Morgan County	Structure and Infrastructure	All Hazards	Morgan County OES	3-5 Years	FEMA HMGP, Non-Disaster Funding	######
MC-45	Develop a plan to ensure short-term rental locations have appropriate safety information, receive emergency public information, potential shelter locations and have emergency contact numbers.	Morgan County	Plans and Regulations	All Hazards	Morgan County OES	6-12 Months	Morgan County General Fund, Staff Time	$5,000
MC-46	Contract with the WVEMD to have stream gauges installed in specified locations. These would be radio-based gauges that would be independent of cellular or internet systems. Gauges would be part of the WV IFLOWS system.	Morgan County	Structure and Infrastructure	Flooding	Morgan County OES	3-5 Years	FEMA HMGP	$9,000 per gauge, $72,000 total.
MC-47	Develop a plan to regularly inspect and clear Warm Springs Run, Sleepy Creek, and Cacapon River for debris and/or sediment buildup that may block culverts and bridges, reduce water flow, and cause flooding.	Morgan County	Plans and Regulations	Flooding	Morgan County OES	1-2 Years	Non-Disaster Funding	TBD

MC-48	Evaluate and implement improvements to the Warm Springs Public Service District wastewater collection system along Warm Springs Run, generally extending from the wastewater treatment plant toward the Valley Health facility on Valley Road, to reduce stormwater-related inflow and infiltration, sanitary sewer overflows, and sediment-related conveyance issues. Potential improvements may include replacement and upsizing of the existing 8- to 18-inch sewer line, modifications to manholes and related infrastructure, and other measures identified through engineering evaluation to improve system capacity and resilience during high-flow and storm events.	Morgan County	Structure and Infrastructure	Flooding	Warm Springs PSD	3-5 years+	WV Clean Water State Revolving Fund (CWSRF) WV Infrastructure & Jobs Development Council / Water Development Authority USDA Rural Development Water & Waste Disposal Loan & Grant Program FEMA BRIC FEMA Hazard Mitigation Grant Program (HMGP) Appalachian Regional Commission (ARC) Congressional Directed Spending / federal earmark	TBD

MC-49	Water runoff from the area uphill from the Historic Berkeley Springs Castle is causing erosion and land subsidence issues. In 2023, this caused an area of washout further weaking the road bank directly below the castle. This washout caused part of the parking area/entrance road to collapse. Provide engineering services to establish the needs to address the drainage issue and follow the recommended actions.	Morgan County	Structure and Infrastructure	Flooding	Berkeley Springs Castle Foundation	3-5 Years	FEMA HMGP	TBD
MC-50	Educate water system operators and workers about the importance of safe available water and SWPPs and update the SWPP as necessary.	Morgan County	Education and Awareness, Plans and Regulations	Source Water Contamination	Morgan County Commission, Town of Bath and Town of Paw Paw	Ongoing	Staff Time	$0
MC-51	Curtail pollution and sediment runoff in Sleepy Creek by continuing to work with partners to identify non-point sources of pollution and coordinate funding and other assistance to curtail these sources from entering Sleepy Creek. Such contaminant sources include home septic systems, farm animals, farm cultivation practices, flooding, and high-water streambank erosion.	Morgan County	Natural Systems Protection	Source Water Contamination	Sleepy Creek Water Association	Ongoing, Long-term	Federal Chesapeake Bay Program, WV State, Morgan County, landowner and other private contributors	TBD
MC-52	Use floodplain ordinances, NFIP, CRS participation, public education, and property acquisition to remove existing developed properties from flood hazard areas and limit new development.	Morgan County	Plans and Regulations, Education and Awareness	Flooding	Floodplain Coordinators, County Commission	Ongoing	Morgan County General Fund and FEMA HMGP	TBD

MC-53	Enhance Warm Springs Run channel mitigation and urbanized flow obstruction.	Morgan County	Structure and Infrastructure	Flooding	Floodplain Coordinators, County Commission, EPA	Short-term, 2024 implementation	FEMA Flood Mitigation Assistance Program	TBD
MC-54	Increase awareness of key hazardous material transportation routes and storage areas and conduct drills with local agencies focusing on high- risk areas.	Morgan County	Education and Awareness	Hazardous Materials	LEPC, County Commission, WVDOH	Ongoing	Staff Time	$0
MC-55	Develop and execute a public awareness campaign designed to increase the number of participants in Morgan County's Public Warning System.	Morgan County	Education and Awareness	All Hazards	Morgan County OES	6-12 Months	Morgan County Gernal Funds and Staff Time	$3,000
MC-56	Create a special Warm Springs Watershed Zone and strengthen the Morgan County Storm Water Ordinance within that zone.	Morgan County	Plans and Regulations	Flooding	Morgan County Commission	1-3 Years	Morgan County General Fund	TBD
MC-57	Maintain a current list of dam owners and their respective contact information.	Morgan County	Education and Outreach	Dam Failure	Morgan County OES	Ongoing	County staff time.	$0
MC-58	Conduct ongoing communications and outreach to dam owners to educate them on their requirements to maintain Emergency Action Plans (EAPs), create spatially formatted inundation maps, and ensure current copies of the plans and inundation maps are provided to Berkeley and Morgan Counties in digital formats.	Morgan County	Education and Awareness, Local Plans and Regulations	Dam Failure	Morgan County OES	Ongoing	County staff time.	$0
MC-59	Encourage and cooperate with dam owners to complete preventative maintenance projects and removal actions.	Morgan County	Structure and Infrastructure	Dam Failure	Morgan County OES	Ongoing	County staff time.	$0

MC-60	Support mitigation projects that will result in the protection of public and private property from floods of specific magnitudes. Eligible projects include, but are not limited to: 1) acquisition of hazard-prone structures; 2) elevation of flood-prone structures; 3) minor structural flood-control projects; 4) relocation of structures from hazard-prone areas; 5) retrofitting of existing buildings, facilities, and infrastructure; and 6) the rehabilitation or removal of dams.	Morgan County	Structure and Infrastructure	Dam Failure	Region 9 and Morgan County OES	Ongoing	Federal hazard mitigation assistance funding, including FEMA HHPD and other eligible hazard mitigation assistance programs	TBD
MC-61	Utilize the dam EAPs and inundation mapping to identify specific impacted populations, critical facilities, structures that are vulnerable to dam failure risks, and conduct communications outreach to the affected populations and owners.	Morgan County	Education and Awareness, Structure and Infrastructure	Dam Failure	Morgan County OES	1-3 Years	County staff time	$0
MC-62	Monitor and track new development in inundation areas.	Morgan County	Education and Awareness, Structure and Infrastructure	Dam Failure	Region 9 and Morgan County Planning Departments and Region 9	Ongoing	County staff time	$0
MC-63	Continue to provide technical and financial support for local land use regulation development and enforcement.	Morgan County	Education and Awareness, Local Plans and Regulations	Dam Failure	Region 9 and Morgan County	Ongoing	County staff time	$0
MC-64	Support the Morgan County Sheriff's Department with needed training and equipment to address the needs regarding possible civil disturbance in Morgan County.	Morgan County	Education and Awareness	Civil Disturbance	Morgan County Commission	Ongoing	Morgan County General Fund	TBD

Town of Bath								
BH-1	Review and maintain agreement with Morgan County Planning Commission to provide floodplain management.	Town of Bath	Plans and Regulations	Flooding	Town of Bath Council	Ongoing	Staff Time	$0
BH-2	Support local fire department efforts to conduct education programs in schools.	Town of Bath	Education and Awareness	Wildfire	Town of Bath Planning Commission	Ongoing	Staff Time	$0
BH-3	Annually distribute landslide and land subsidence risk pamphlets, public service announcements, or brochures to residents within high-risk areas. Ensure that all materials are provided in all languages relevant to the community. Also make sure to utilize outreach methods that can reach a wide variety of audiences, such as social media, print media, and radio.	Town of Bath	Education and Awareness	Landslide and Land Subsidence	Town of Bath Planning Commission	2 Years	Staff Time	$0
BH-4	Support the Berkeley/Morgan County Health Department and WV Department of Health to increase awareness about treating and preventing substance use disorder.	Town of Bath	Education and Awareness	Substance Use Disorder	Berkeley Springs Police Department	Ongoing	Staff Time	$0
BH-5	Support and relay messaging from MCOES regarding safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	Town of Bath	Education and Awareness	Winter Storm, Transporation Incidents	MCOES	3 Years	Staff Time	$0

BH-6	Support public education programs concerning the hazards associated with invasive species.	Town of Bath	Education and Awareness	Invasive Species	Department of Agriculture	1-3 years	Staff Time	$0
BH-7	Support efforts to enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	Town of Bath	Education and Awareness	Radon Exposure	Berkeley Morgan Health Department	2 Years	Staff Time	$0
BH-8	Develop a drought emergency plan	Town of Bath	Plans and Regulations	Drought	Town of Bath Planning Commission	5 Years	Town of Bath General Fund and Staff Time	TBD
BH-9	Support public awareness campaigns on how to reduce exposure to epidemics through all available channels.	Town of Bath	Education and Awareness	Pandemic and Infectious Disease	Berkeley Morgan Health Department	5 Years	Staff Time	$0
BH-10	Identify and address trees and other vegetation that require routine maintenance or removal	Town of Bath	Natural Systems Protection	Hurricane, Tropical Storm; Tornado, Windstorm; Winter Storm, Nor'easter	Town of Bath Tree Board	5 Years	Staff Time, Utility Companies, and Local Property Owners	TBD
BH-11	Conduct tornado drills in schools and public buildings.	Town of Bath	Education and Awareness	Tornado/Winds torm	Morgan County OES	Ongoing	Staff Time	$0
BH-12	Work with WVDOH to find solutions to flood impacted parts of US Route 522 within town limits, such as S. Washington Street.	Town of Bath	Structure and Infrastructure	Flooding	Town of Bath Council, Local Floodplain Coordinators	Ongoing, Long-term	Local Funding, WVDOH Funding	TBD
BH-13	Install generators and other equipment to aid in the continuation of essential services in the event of utility interruption.	Town of Bath	Structure and Infrastructure	Utility Interruption	Town of Bath Council, BSWW	Ongoing	FEMA HMGP	TBD
BH-14	Develop a Capital Improvements Program that identifies capital projects and equipment purchases.	Town of Bath	Plans and Regulations	All Hazards	Town of Bath Planning Commission, BSWW	Ongoing	Town of Bath General Fund	TBD

BH-15	Research and solicit for a company to design and install a public warning system for the Town of Bath. This would include warning sirens and voice capable systems.	Town of Bath	Structure and Infrastructure	All Hazards	Morgan County OES	3-5 Years	Non-Disaster Funding	$150,00 to $500,000
BH-16	Support efforts to educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	Town of Bath	Education and Awareness	Extreme Temperatures	Morgan County OES	3 Years	Staff Time	$0
BH-17	Provide safety training to outdoor sports leagues, summer lifeguards, and other outdoor occupations.	Town of Bath	Education and Awareness	Hailstorm/Thunderstorm/Lightning	Town of Bath Planning Commission	5 Years	Staff Time	$0
BH-18	Improve water flow in Warm Springs Run through Town to reduce downtown flooding causing damage to property.	Town of Bath	Natural Systems Protection	Flooding	Town of Bath Planning Commission	Ongoing	FEMA HMGP	TBD
Town of Paw Paw								
PW-1	Review and maintain agreement with Morgan County Planning Commission to provide floodplain management.	Town of Paw Paw	Plans and Regulations	Flooding	Town of Paw Paw Council	1 Year	Staff Time	$0
PW-2	Annually distribute landslide and land subsidence risk pamphlets, public service announcements, or brochures to residents within high-risk areas. Ensure that all materials are provided in all languages relevant to the community. Also make sure to utilize outreach methods that can reach a wide variety of audiences, such as social media, print media, and radio.	Town of Paw Paw	Education and Awareness	Landslide and Land Subsidence	Town of Paw Paw Council	2 Years	Staff Time	$0

PW-3	Work with the County and WV Department of Health to increase awareness about treating and preventing substance use disorder.	Town of Paw Paw	Education and Awareness	Substance Use Disorder	Town of Paw Paw Council	Ongoing	Staff Time	$0
PW-4	Include safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	Town of Paw Paw	Education and Awareness	Winter Storm, Transporation Incidents	Town of Paw Paw Council	3 Years	Staff Time	$0
PW-5	Develop a public education program concerning the hazards associated with invasive species.	Town of Paw Paw	Education and Awareness	Invasive Species	Town of Paw Paw Council	1-3 years	Staff Time	$0
PW-6	Enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	Town of Paw Paw	Education and Awareness	Radon Exposure	Town of Paw Paw Council	2 Years	Staff Time	$0
PW-7	Develop a drought emergency plan	Town of Paw Paw	Plans and Regulations	Drought	Town of Paw Paw Council	5 Years	Town of Paw Paw General Fund and Staff Time	TBD
PW-8	Create a public awareness campaign on how to reduce exposure to epidemics through all available channels.	Town of Paw Paw	Education and Awareness	Pandemic and Infectious Disease	Town of Paw Paw Council	5 Years	Staff Time	$0
PW-9	Identify and address trees and other vegetation that require routine maintenance or removal	Town of Paw Paw	Natural Systems Protection	Hurricane, Tropical Storm; Tornado, Windstorm; Winter Storm, Nor'easter	Town of Paw Paw Council	5 Years	Staff Time, Utility Companies, and Local Property Owners	TBD
PW-10	Conduct tornado drills in schools and public buildings.	Town of Paw Paw	Education and Awareness	Tornado/Winds torm	Town of Paw Paw Council	Ongoing	Staff Time	$0
PW-11	Apply for TAP grant through DOH to fund the addition and repair of sidewalks within town; include stormwater management practices to	Town of Paw Paw	Structure and Infrastructure	Flooding	Town of Paw Paw Council, Local Floodplain Coordinators	1-4 Years	TAP Grant	TBD

	reduce flooding events on town/state roads.							
PW-12	Install generators and other equipment to aid in the continuation of essential services in the event of utility interruption.	Town of Paw Paw	Structure and Infrastructure	Utility Interruption	Town of Paw Paw Council	5 Years	WVEMD Funding	TBD
PW-13	Provide back-up generator power to the soon to be completed restoration of the Paw Paw Community Center (original Town fire department building), which will serve as an emergency shelter / reception center. The building's restoration is expected to be completed by January of 2027.	Town of Paw Paw	Structure and Infrastructure	All Natural Hazards	Town of Paw Paw Council	1-3 Years	FEMA HMGP	Estimated cost for a 100kW – 250kW generator providing full back up power with HVAC, kitchen, shelter operations. Typical equipment cost: $45,000 – $120,000. Installed cost range: $75,000 – $200,000+

PW-14	Identify prior stormwater management improvements to advance to the final engineering design, bidding and construction to prevent future flooding issues. The town has completed a preliminary storm water study completed by Potesta & Associates, several recommendations have been made and we are currently working with Region 9 to research funding to implement the recommendations. Continue to address water runoff issues with funding agencies to move forward to implement actions reported from our engineers.	Town of Paw Paw	Plans and Reguations	Flooding	Town of Paw Paw Council	2-5 Years	Chesapeake Bay Trust, WVDEP	$840,000 (Green Infrastructure costs) - $1,821,000 for total project costs
PW-15	Complete the restoration of the Paw Paw Community Center (original Town fire department building) to serve as a meeting place of local business leader to address emergency response needs. The building should be completed on January of 2027, although it does not have a backup power source.	Town of Paw Paw	Structure and Infrastructure	All Natural Hazards	Town of Paw Paw Council	1-3 Years	Town of Paw Paw General Fund	TBD
PW-16	Educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	Town of Paw Paw	Education and Awareness	Extreme Temperatures	Town of Paw Paw Council	3 Years	Staff Time	$0
PW-17	Provide safety training to outdoor employees and business owners.	Town of Paw Paw	Education and Awareness	Hailstorm/Thunderstorm/Lightning	Town of Paw Paw Council	5 Years	Staff Time	$0
PW-18	Work with local fire departments to conduct education programs in schools.	Town of Paw Paw	Education and Awareness	Wildfire	Town of Paw Paw Council	Ongoing	Staff Time	$0

Table 6.4-1 lists 135 mitigation actions, many of which will require substantial time commitments from staff at the county and local municipalities. While all these activities will be pursued over the next five years, the reality of limited time and resources requires the identification of the feasibility and priority level of mitigation actions. Prioritization allows the individuals and organizations involved to focus their energies and ensure progress on mitigation activities.

Evaluating mitigation actions involves judging each action against certain criteria to determine its feasibility and potential impact. Actions evaluated and prioritized by applying the Multi-Objective Mitigation Action Prioritization criteria. For each action, scores were 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.
- **Addresses High Risk Hazard** (weight: 15% of score): The action reduces vulnerability for people and property from a hazard(s) identified as high risk.
- **Addresses 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, data circuits, etc.

Scores of 1, 2, or 3 were assigned for each multi-objective mitigation action prioritization criterion where 1 is a low score and 3 is a high score. The Efficiency criterion, which considers the cost and effort of each action versus its overall vulnerability reduction benefit, is the most highly weighted criterion as part of the total prioritization score. Actions were prioritized using the cumulative score assigned to each. Each mitigation action was then 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

Table 6.4-2 presents the cumulative results of the prioritization of mitigation actions. One Region 9 action is ranked High Priority, while the other two are ranked Medium Priority. In Berkeley County, 16 actions were ranked High Priority, 32 are ranked Medium Priority, while the remaining 14 ranked as Low Priority. In Morgan County, 19 actions were ranked as High Priority, 37 actions were ranked as Medium Priority, and the remaining 14 were ranked as Low Priority.

Table 6.4-2 Mitigation Action Prioritization							
Mitigation Actions		Multi-Objective Mitigation Action Prioritization Criteria					
		Low = 0.0-1.8		Medium = 1.9-2.4		High = 2.5-3.0	
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications / Critical Infrastructure	Total Score
Region 9							
R-1	Perform annual review to ensure communities are maintaining compliance with the National Flood Insurance Program (NFIP) at the jurisdictional level by attending training, monitoring development, and ensuring that local floodplain regulations are as current and applicable as possible.	3	3	1	3	3	2.6
R-2	Perform annual review to ensure communities are undertaking buyout, elevation, and/or relocation projects in the Region IX Planning and Development Council area when and if funding is available.	3	2	1	3	3	2.3

R-3	Build local agency capacity ot identify and secure pre-disaster mitigation funding.	2	1	3	3	1	1.9
R-4	Support mitigation projects that will result in the protection of public and private property from floods of specific magnitudes. Eligible projects include, but are not limited to: 1) acquisition of hazard-prone structures; 2) elevation of flood-prone structures; 3) minor structural flood-control projects; 4) relocation of structures from hazard-prone areas; 5) retrofitting of existing buildings, facilities, and infrastructure; and 6) the rehabilitation or removal of dams.	2	2	3	3	2	2.4
R-5	Monitor and track new development in inundation areas.	2	2	3	3	2	2.4
R-6	Continue to provide technical and financial support for local land use regulation development and enforcement.	2	1	3	3	2	2.1
Berkeley County							

AL-1	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.	3	2	3	3	3	2.7
AL-2	Make FEMA B-526, "Earthquake Safety Checklist" available to homeowners and renters to use to retrofit vulnerable homes and increase preparedness.	1	2	1	1	1	1.3
BC-1	Construct upgrades to the public water system that would reduce or eliminate the effects of drought. Conduct a survey of residential wells and public water customers to evaluate the status of residential drinking water in the county and identify trends.	2	3	1	1	1	1.8

BC-2	Develop stringent stormwater management codes for future development.	3	3	2	3	2	2.7
BC-3	Conduct acquisition and relocation projects (buyouts) in flood-prone areas. This includes repetitive, severe repetitive loss and non-repetitive and severe repetitive loss structures.	3	3	2	3	2	2.7
BC-4	Continue coordinating county efforts to meet the requirements of participation in the CRS.	2	3	1	3	3	2.4
BC-5	Maintain county Source Water protection Plan (SWPP) according to state regulatory requirements.	3	3	1	3	2	2.5
BC-6	Maintain and expand programs offered through Berkeley County Recovery Resource Center, Berkeley County Day Report Center, and Berkeley County Home Confinement Program.	3	3	1	3	1	2.3

BC-7	Berkeley County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations or acquisitions of identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within Berkeley County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. Berkeley County will comply with all acquisition, elevation, relocation and mitigation reconstruction requirements, as per the HMA Guidance.	3	3	2	3	3	2.8
BC-8	Complete Sportsman's Paradise Park acquisition of area within floodplain and turn it into a green space park.	3	3	2	3	3	2.8

BC-9	Coordinate with partners throughout the region to identify the location and contact information of privately owned dams.	1	3	1	1	3	1.9
BC-10	Provide notice of funding opportunity to HHPD owners to promote rehabilitation and safety.	1	3	1	1	3	1.9
BC-11	Evaluate and prioritize actions and efforts related to HHPD that are cost effective and reduce risks from HHPDs.	2	3	1	1	3	2.1
BC-12	Collect information on and conduct a thorough review of all dam assets within Berkeley County in order to assess their status, vulnerabilities, potential losses (financial, social, and lifeline related), and prioritize specific dams for the Rehabilitation of High Hazard Potential Dams (HHPD) grant and other funding streams.	3	2	1	2	3	2.2

BC-13	Create an alternatives analysis to identify a preferred plan for eligible HHPD rehabilitation and the estimated cost for design and construction.	3	2	1	2	3	2.2
BC-14	Work to develop conceptual, preliminary, or final design plans and specifications for eligible HHPD rehabilitation projects that have been planned using an alternative evaluation process that complies with National Environmental Policy Act (NEPA) requirements.	3	3	1	2	3	2.5
BC-15	Provide comprehensive response plans to assist first responders in the event of a hazardous material release	2	3	1	3	3	2.4
BC-16	Purchase and install backup power generator for Health Department.	2	2	2	3	3	2.3
BC-17	Provide seasonal education to community members for natural disaster events through community preparedness events	1	2	1	3	1	1.6

BC-18	Be officially a NWS StormReady community	1	2	1	3	1	1.6
BC-19	Create a MOU with Martinsburg Regional Airport and 167th Air Wing to provide a staging and distribution area for disaster supplies during a disaster event	2	2	2	3	3	2.3
BC-20	Identify and address trees and other vegetation that require routine maintenance or removal	2	2	2	2	2	2.0
BC-21	Work with local fire departments to conduct education programs in schools.	1	2	1	3	1	1.6
BC-22	Include safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	1	2	1	3	2	1.8

BC-23	Develop a public education program concerning the hazards associated with invasive species.	2	2	1	2	1	1.7
BC-24	Educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	2	2	1	3	1	1.8
BC-25	Provide safety training to outdoor sports leagues, summer lifeguards, and other outdoor occupations.	2	2	1	3	1	1.8
BC-26	Conduct tornado drills in schools and public buildings.	2	2	1	3	1	1.8
BC-27	Enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	2	2	1	1	2	1.7

BC-28	Create a public awareness campaign on how to reduce exposure to epidemics through all available channels.	2	2	1	3	1	1.8
BC-29	The project footprint incorporates the construction of major water transmission pipelines, pump station upgrades, and multimillion-gallon storage tanks (such as the Industrial Zone, Ridge Road, and South Berkeley tanks) to stabilize water pressure and service delivery.	3	3	1	3	3	2.6
BC-30	PSD needs to construct a new freestanding water storage tank on a 1.95-acre site along the north side of Hatchery Road in the Mill Creek Tax District to meet drinking water storage capacity needs due to dramatic growth and demand.	3	3	1	3	3	2.6
BC-31	Maintain a current list of dam owners and their respective contact information.	1	2	1	1	2	1.5

BC-32	Conduct ongoing communications and outreach to dam owners to educate them on their requirements to maintain Emergency Action Plans (EAPs), create spatially formatted inundation maps, and ensure current copies of the plans and inundation maps are provided to Berkeley and Morgan Counties in digital formats.	2	2	1	1	2	1.7
BC-33	Ensure dam owners are aware of available public funding resources, including the FEMA Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program.	1	2	1	1	2	1.5
BC-34	Encourage and cooperate with dam owners to complete preventative maintenance projects and removal actions.	2	3	1	1	2	2.0

BC-35	Support mitigation projects that will result in the protection of public and private property from floods of specific magnitudes. Eligible projects include, but are not limited to: 1) acquisition of hazard-prone structures; 2) elevation of flood-prone structures; 3) minor structural flood-control projects; 4) relocation of structures from hazard-prone areas; 5) retrofitting of existing buildings, facilities, and infrastructure; and 6) the rehabilitation or removal of dams.	2	2	3	3	2	2.4
BC-36	Utilize the dam EAPs and inundation mapping to identify specific impacted populations, critical facilities, structures that are vulnerable to dam failure risks, and conduct communications outreach to the affected populations and owners.	1	2	1	3	1	1.6
BC-37	Monitor and track new development in inundation areas.	2	2	3	3	2	2.4

BC-38	Continue to provide technical and financial support for local land use regulation development and enforcement.	2	1	3	3	2	2.1
City of Martinsburg							
MG-1	Prohibit new facilities for persons with special needs or mobility concerns in hazard areas.	3	2	3	3	1	2.4
MG-2	Prohibit or block cyber terrorism on public facilities by transitioning to Microsoft 365 and continuing routine server backups.	3	3	1	3	3	2.6
MG-3	Update Martinsburg Water Model in order to ensure redundancy remains between Martinsburg's water plans and to continue inflow and infiltration reduction efforts.	1	3	1	3	2	2.1

MG-4	Educate residents about benefits of conserving water and where Martinsburg's water resources come from.	1	3	1	1	1	1.6
MG-5	Reduce impact of flooding by enforcing floodplain ordinance and Martinsburg Stormwater Ordinance.	3	2	1	3	3	2.3
MG-6	Ensure current and newly constructed critical facilities are out of the floodplain.	2	2	1	3	3	2.1
MG-7	Enforce building code to ensure structural stability during hazard events.	3	2	3	3	3	2.7
MG-8	Identify areas prone to land subsidence to better inform building decisions.	2	2	1	1	2	1.7

MG-9	Invest and strengthen core public health infrastructure, including water and sanitation systems; increasing situational awareness; and rapidly extinguishing sparks that could lead to pandemics.	3	1	3	3	2	2.3
MG-10	Coordinate with governmental partners, medical providers and private sector with the focus on maintenance of situational awareness, public health messaging, reduction of transmission, and care for and treatment of the ill.	2	2	1	2	1	1.7
MG-11	Update the City's existing Well Head Protection Plan to address growth, land use, and contamination threats, and be correlated with development regulations, including the Zoning Ordinance, to ensure the safety of local drinking water.	2	2	1	3	2	2.0

MG-12	Reduce consequences and impacts of Substance Use Disorder through continued partnership in the Martinsburg Initiative, participation in Eastern Panhandle Violent Crimes Task Force, utilization of Martinsburg Drug House Ordinance, police enforcement against distribution chains, and continued participation and partnership with schools and school children.	3	3	1	3	1	2.3
MG-13	Work towards a complete network that allows convenient pedestrian and/or bicycle travel to all areas of the City by increased road and sidewalk maintenance and increased access to Downtown and West End redevelopment zones.	2	1	2	3	1	1.7

MG-14	Explore increased public transit, addressing convenience, efficiency, and user-friendly accessibility, improve Ride-Share and Park & Ride solutions for commuters, and ensure Public Safety Agencies has appropriate equipment and staffing to respond.	2	1	2	3	1	1.7
MG-15	Continually monitor, maintain, and upgrade lines, tanks, and other system infrastructure to avoid leaks that water and wastewater could potentially cause damage to City infrastructure or private property.	3	2	1	3	2	2.2
MG-16	Reduce impacts of windstorms and tornados by coordinating with power companies to ensure trees adjacent to power lines are properly trimmed and encourage/requiring undergrounding of new or replaced utilities.	3	3	2	3	2	2.7

MG-17	Establish official Memorandums of Agreement between the City and electric/utility companies to ensure utilities are winter ready and preventative maintenance has occurred.	3	2	1	3	3	2.3
MG-18	Eliminate or reduce risk due to either accidental releases of hazardous materials or exposure to toxic substances by promoting compliance with safety codes, regulations, and statutes and enforcing land-use plans that regulate the location of sites with hazardous chemicals.	3	3	3	3	2	2.9
MG-19	Continue to educate the public as to the potential for earthquakes in West Virginia, specifically Berkeley County.	1	1	1	1	3	1.3
MG-20	Maintain and continue to plant shade trees to reduce urban heat island effect.	2	2	1	1	1	1.5

MG-21	Coordinate and ensure heating and cooling shelters when appropriate.	3	2	3	3	1	2.4
MG-22	Ensure public facilities have backup power and are properly grounded.	3	2	3	3	3	2.7
MG-23	Prohibit and reduce impacts of wildfire by developing a Fire Inspection Program with newly hired Fire Inspector, and ensuring Department has adequate equipment and staffing.	2	1	1	1	3	1.5
MG-24	Reduce impacts of terrorism through ensuring public buildings and facilities are well-lit and secure, and critical offices and facilities are away from uncontrolled public areas. Also locate critical assets (people, activities, systems) away from entrances, vehicle circulation and parking, and loading and maintenance areas.	3	2	1	3	3	2.3

MG-25	Work with subject matter experts to create or share an already created informational brochure and/or digital media to inform/educate local farmers and residents on the potential effects of an infestation.	1	3	1	1	1	1.6
MG-26	Prohibit and reduce impacts of civil disturbance by providing pertinent and timely information to the public so public is engaged and educated about issues affect local community, and maintain intelligence and law enforcement relationships with local, state, and federal agencies. Continue to encourage "See Something; Say Something."	2	2	1	3	3	2.1
MG-27	Conduct drainage studies and implement targeted stormwater, culvert and detention improvements in repetitive flooding areas.	2	2	3	2	1	2.1

MG-28	Construct a strategically located fire station on the west side of Martinsburg to improve emergency response coverage, reduce response times, enhance firefighter safety, and increase community resilience during natural and human-caused disasters. The facility should be designed to remain operational during severe weather events and extended utility disruptions	3	3	3	2	3	2.9
MG-29	Install permanent generators and resilient power systems at critical municipal facilities including water treatment facilities, pump stations, emergency operations facilities, and communications infrastructure.	2	2	2	3	3	2.3

MG-30	Conduct a citywide assessment of street lighting and public area lighting to identify deficiencies affecting public safety, transportation safety, emergency response, critical infrastructure security, and community resilience. Develop a prioritized implementation plan for lighting improvements, backup power options, smart controls, and energy-efficient technologies in high-priority areas.	1	2	1	3	3	1.9
MG-31	Evaluate, design, and construct infrastructure necessary to utilize the Potomac River as an emergency and supplemental water source. The project may include water intake facilities, transmission infrastructure, treatment upgrades, storage improvements, interconnections, and emergency operating procedures to ensure a reliable water supply during emergencies and future growth.	2	2	1	3	3	2.1

MG-32	Implement a comprehensive stream restoration program along Tuscarora Creek to reduce flood risk, improve floodplain connectivity, stabilize streambanks, restore natural stream function, and enhance watershed resilience. The project may include stream restoration, floodplain reconnection, erosion control measures, stormwater management improvements, green infrastructure practices, and associated flood mitigation projects identified through watershed assessments.	2	2	2	3	1	2.0
MG-33	Conduct a comprehensive assessment of aging water and sewer infrastructure and implement a phased replacement and rehabilitation program. Prioritize assets with a history of failures, flood exposure, or critical service importance. Improvements may include line replacement, manhole rehabilitation, pump station upgrades, redundancy improvements, and flood protection measures.	2	2	1	3	3	2.1

MG-34	Design and construct an elevated water storage tank and associated transmission infrastructure on the west side of the city to provide additional water storage, improve system pressure, increase redundancy, enhance fire protection capabilities, and maintain water service during emergencies and infrastructure disruptions.	3	3	2	3	3	2.8
Town of Hedgesville							
HV-1	Assist Berkeley County in educating the public regarding radon systems and home testing available.	2	2	1	1	1	1.5
HV-2	Work with area school/libraries/public facilities to include source water protection curriculum/classroom events/public education events.	2	2	1	3	3	2.1
HV-3	Create a public awareness campaign on how to reduce exposure to epidemics through all available channels.	2	2	1	3	1	1.8

HV-4	Develop a drought emergency plan	2	2	1	3	1	1.8
HV-5	Develop a public education program concerning the hazards associated with invasive species.	2	2	1	2	1	1.7
HV-6	Work with the County and WV Department of Health to increase awareness about treating and preventing substance use disorder.	2	2	1	3	1	1.8
HV-7	Include safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	2	2	1	3	2	2.0
HV-8	Educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	2	2	1	3	1	1.8

HV-9	Provide safety training to outdoor sports leagues, summer lifeguards, and other outdoor occupations.	2	2	1	3	1	1.8
HV-10	Work with local fire departments to conduct education programs in schools.	2	2	1	3	1	1.8
HV-11	Annually distribute landslide and land subsidence risk pamphlets, public service announcements, or brochures to residents within high-risk areas. Ensure that all materials are provided in all languages relevant to the community. Also make sure to utilize outreach methods that can reach a wide variety of audiences, such as social media, print media, and radio.	2	2	1	3	1	1.8
HV-12	Identify and address trees and other vegetation that require routine maintenance or removal	3	2	1	3	3	2.3

HV-13	Conduct tornado drills in schools and public buildings.	2	2	1	3	1	1.8
HV-14	Enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	2	2	2	2	2	2.0
Morgan County							
AL-1	Conduct a comprehensive review and evaluation of the Flood Hazus analysis information and communicate any deficiencies/inaccuracies to the West Virginia GIS Technical Center. This includes obtaining and providing flood elevation certificates to the Technical Center for incorporation into the WV Flood Tool.	3	3	2	3	3	2.8

AL-2	Conduct a thorough review of all community assets in order to assess status, vulnerabilities, and prioritization of mitigation funding. This includes compiling a list or database to be referenced in future updates to the Plan.	3	2	1	2	3	2.2
AL-3	Work with WVDOH, Town of Paw Paw, and Town of Bath to identify and find solutions to address runoff issues.	1	1	2	2	1	1.4
AL-4	Make FEMA B-526, "Earthquake Safety Checklist" available to homeowners and renters to use to retrofit vulnerable homes and increase preparedness.	1	2	1	1	1	1.3
AL-5	Plan for and maintain adequate road and debris clearing capabilities	2	2	1	3	3	2.1
AL-6	Conduct tornado drills in schools and public buildings.	2	2	1	3	1	1.8

AL-7	Identify or develop cyber security awareness training and require all municipal staff to complete yearly. Develop certificate and tracking database to ensure all employees are up to date on trainings.	2	2	1	3	1	1.8
MC-1	Review all existing regulations to ensure adequacy in reducing impacts in hazard areas.	3	3	3	3	3	3.0
MC-2	Strengthen community opioid crisis response through support and expansion of the Morgan County Harm Reduction Steering Committee, Chronic Pain Self-Management Program, and Morgan County Harm Reduction Program.	2	3	1	3	1	2.1
MC-3	Support Morgan County's efforts in the CRS program, by providing training to municipalities on the CRS program and encouraging them to participate.	2	2	1	3	2	2.0

MC-4	Collect updated information on the number and location of all repetitive loss properties throughout the county and develop a database and maps for storage.	3	3	1	3	3	2.6
MC-5	Identify owners of repetitive and severe repetitive loss properties that may be willing to participate in future property acquisition and relocation projects.	3	2	1	3	2	2.2
MC-6	Review all comprehensive plans to ensure that designated growth areas are not in hazard areas.	3	3	3	3	3	3.0
MC-7	Work with WV Department of Highways to identify areas of frequent roadway flooding and develop mitigation strategies.	2	3	1	3	2	2.3

MC-8	Establish a formal process for the city and the Park Service to coordinate disaster related efforts, which will include defining boundaries and establishing responsibilities.	3	2	3	3	1	2.4
MC-9	Continue to enforce ordinances that new structures do not interfere with flood mitigation measures.	3	3	1	3	3	2.6
MC-10	Obtain updated information on the number of NFIP policyholders in Morgan County and its municipalities.	3	2	1	3	3	2.3
MC-11	Develop mitigation strategies to protect any at-risk historic properties by conducting a survey of all historic sites that are located in hazard areas.	2	2	3	2	3	2.4
MC-12	Expand the mission and membership of the Morgan County Local Emergency Planning Committee to act as a countywide disaster task force.	3	3	3	3	3	3.0

MC-13	Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas.	3	2	1	1	2	1.9
MC-14	Continue to support initiatives established under the Morgan County Office of Emergency Services.	3	3	3	3	3	3.0

MC-15	Morgan County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations or acquisitions of identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within Morgan County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. Morgan County will comply with all acquisition, elevation, relocation and mitigation reconstruction requirements, as per the HMA Guidance.	3	3	3	3	3	3.0
MC-16	Reinforce structures and infrastructure against hail and increase awareness before hailstorms with public announcements.	3	2	2	3	3	2.5

MC-17	Assess areas vulnerable to wildfires and publicize outdoor burning regulations and wildfire risks using pamphlets, news articles, and the Firewise Program.	3	1	1	1	2	1.6
MC-18	FirstEnergy will trim trees on a four-year cycle as well as request permission to cut right-of-way hazard trees from property owners.	2	2	1	1	2	1.7
MC-19	Post and distribute terrorism preparedness information based on current data.	2	2	3	3	2	2.4
MC-20	Provide NWS sponsored weather-related classes to the public, distribute emergency preparedness information on severe weather hazards, and provide classes on severe weather preparedness to the public.	1	2	1	1	1	1.3

MC-21	Provide pamphlets and educational material to county residents to encourage annual residential radon testing.	3	1	3	3	2	2.3
MC-22	Monitor water supply and conserve water through public awareness campaigns conducted using news and radio stations. A survey of residential wells and public water customers should also be conducted to evaluate the status of residential drinking water in the county and identify trends.	1	2	1	1	1	1.3
MC-23	Develop adequate emergency shelter and evacuation plans for citizens and animals (domestic pets, livestock and wildlife).	3	2	3	3	3	2.7
MC-24	Monitor rainfall and conduct annual inspections of berms to protect against structural failures.	3	2	2	1	1	1.9

MC-25	Educate the public about the risks associated with extreme temperatures using the county website and local radio stations.	3	2	2	1	3	2.2
MC-26	When a disease reoccurs in a community, use pamphlets, local news media, and online resources to educate the public about mitigation.	2	3	1	1	1	1.8
MC-27	Protect roadways and remove buildings in potential landslide and land subsidence hazard areas.	2	3	1	2	1	2.0
MC-28	Utilize pamphlets and articles about the warning signs and the potential damages of thunderstorms and lightning strikes.	3	2	1	1	3	2.0
MC-29	Conduct control initiatives, such as the Gypsy Moth Spray Program, and conduct public education and awareness campaigns.	3	1	2	1	1	1.6

MC-30	Ensure dam owners are aware of available public funding resources, including the FEMA Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program.	1	2	1	1	2	1.5
MC-31	Evaluate and prioritize actions and efforts related to High-Hazard Potential Dams that are cost effective and reduce risks from HHPDs.	1	3	1	1	3	1.9
MC-32	Collect information on and conduct a thorough review of all dam assets within Morgan County in order to assess their status, vulnerabilities, potential losses (financial, social, and lifeline related), and prioritize specific dams for the Rehabilitation of High Hazard Potential Dams (HHPD) grant and other funding streams.	3	2	1	2	3	2.2

MC-33	Construct a bypass along US Route 522 to improve safety and ease of access.	3	3	2	1	2	2.4
MC-34	Complete the bidding, selection, and construction of the Warm Springs Dam No. 1 rehabilitation improvements.	3	3	2	3	3	2.8
MC-35	On several occasions vehicles have attempted to traverse flooded roadways and became trapped in rising floodwaters. This created unnecessary risk to responders attempting rescue. Engineer and install radio activated drop-down access denial gates.	2	2	3	3	3	2.5

MC-36	The Morgan County EOC is located in Berkeley Springs at the Morgan County Courthouse Complex. The current EOC sits 1 foot above the 100-year flood plain. An alternate EOC is currently being constructed. This complex also house Morgan County ARES and Morgan County Facilities. A generator would provide needed backup power to infrastructure vital to emergency operation in Morgan County.	2	2	1	3	3	2.1
MC-37	Morgan County public potable water is supplied by two water sources, Fairfax Springs and the Potomac River in Paw Paw. Both are susceptible to contamination via run off and flooding. Engineer, develop and create multiple alternative water sources independent of current sources. The system would need a water treatment plant and connected back into the current system of water lines.	3	3	3	3	3	3.0

MC-38	Install dry hydrants at 6 locations previously selected.	2	2	1	1	3	1.8
MC-39	Engineer and construct a bridge on Gayle Drive where it crosses Warm Springs Run. The bridge needs to be constructed out of the flood plain.	3	3	2	3	3	2.8
MC-40	Engineer and construct an offline storage (Alternate #2) area as described in the Warm Springs Run Watershed Plan and Environmental Assessment	2	2	2	3	3	2.3
MC-41	Engineer actions to protect the historical property of Johnson' Mill.	2	2	1	3	3	2.1

MC-42	Design and execute a public awareness campaign aimed at reducing sediment in local streams and rivers.	2	2	2	2	1	1.9
MC-43	Establish official Memorandums of Agreement between individual jurisdictions and electric/utility companies for maintenance regarding tree trimming to reduce power outages from storm events, burying power lines, and installing redundancies and loop feeds.	3	3	2	3	3	2.8
MC-44	Engineer the proper size generators and install at two locations: Berkeley Baptist Church gymnasium and Warm Springs Middle School. Both are used as primary shelter locations.	2	2	1	3	3	2.1
MC-45	Develop a plan to ensure short-term rental locations have appropriate safety information, receive emergency public information, potential shelter locations and have emergency contact numbers.	2	2	1	3	1	1.8

MC-46	Contract with the WVEMD to have stream gauges installed in specified locations. These would be radio-based gauges that would be independent of cellular or internet systems. Gauges would be part of the WV IFLOWS system.	1	2	1	3	1	1.6
MC-47	Develop a plan to regularly inspect and clear Warm Springs Run, Sleepy Creek, and Cacapon River for debris and/or sediment buildup that may block culverts and bridges, reduce water flow, and cause flooding.	2	2	1	3	1	1.8

MC-48	Evaluate and implement improvements to the Warm Springs Public Service District wastewater collection system along Warm Springs Run, generally extending from the wastewater treatment plant toward the Valley Health facility on Valley Road, to reduce stormwater-related inflow and infiltration, sanitary sewer overflows, and sediment-related conveyance issues. Potential improvements may include replacement and upsizing of the existing 8- to 18-inch sewer line, modifications to manholes and related infrastructure, and other measures identified through engineering evaluation to improve system capacity and resilience during high-flow and storm events.	2	2	1	3	1	1.8

MC-49	Water runoff from the area uphill from the Historic Berkeley Springs Castle is causing erosion and land subsidence issues. In 2023, this caused an area of washout further weaking the road bank directly below the castle. This washout caused part of the parking area/entrance road to collapse. Provide engineering services to establish the needs to address the drainage issue and follow the recommended actions.	3	3	2	3	3	2.8
MC-50	Educate water system operators and workers about the importance of safe available water and SWPPs and update the SWPP as necessary.	2	2	2	2	2	2.0

MC-51	Curtail pollution and sediment runoff in Sleepy Creek by continuing to work with partners to identify non-point sources of pollution and coordinate funding and other assistance to curtail these sources from entering Sleepy Creek. Such contaminant sources include home septic systems, farm animals, farm cultivation practices, flooding, and high-water streambank erosion.	3	1	1	1	1	1.4
MC-52	Use floodplain ordinances, NFIP, CRS participation, public education, and property acquisition to remove existing developed properties from flood hazard areas and limit new development.	3	1	2	3	3	2.2
MC-53	Enhance Warm Springs Run channel mitigation and urbanized flow obstruction.	2	1	2	3	2	1.9
MC-54	Increase awareness of key hazardous material transportation routes and storage areas and conduct drills with local agencies focusing on high- risk areas.	3	2	2	1	3	2.2

MC-55	Develop and execute a public awareness campaign designed to increase the number of participants in Morgan County's Public Warning System.	1	1	3	1	3	1.7
MC-56	Create a special Warm Springs Watershed Zone and strengthen the Morgan County Storm Water Ordinance within that zone.	2	2	1	3	1	1.8
MC-57	Maintain a current list of dam owners and their respective contact information.	1	2	1	1	2	1.5
MC-58	Conduct ongoing communications and outreach to dam owners to educate them on their requirements to maintain Emergency Action Plans (EAPs), create spatially formatted inundation maps, and ensure current copies of the plans and inundation maps are provided to Berkeley and Morgan Counties in digital formats.	2	2	1	1	2	1.7

MC-59	Encourage and cooperate with dam owners to complete preventative maintenance projects and removal actions.	3	3	2	3	3	2.8
MC-60	Support mitigation projects that will result in the protection of public and private property from floods of specific magnitudes. Eligible projects include, but are not limited to: 1) acquisition of hazard-prone structures; 2) elevation of flood-prone structures; 3) minor structural flood-control projects; 4) relocation of structures from hazard-prone areas; 5) retrofitting of existing buildings, facilities, and infrastructure; and 6) the rehabilitation or removal of dams.	2	2	3	3	2	2.4
MC-61	Utilize the dam EAPs and inundation mapping to identify specific impacted populations, critical facilities, structures that are vulnerable to dam failure risks, and conduct communications outreach to the affected populations and owners.	1	2	1	3	1	1.6

MC-62	Monitor and track new development in inundation areas.	2	2	3	3	2	2.4
MC-63	Continue to provide technical and financial support for local land use regulation development and enforcement.	2	2	2	3	1	2.0
MC-64	Support the Morgan County Sheriff's Department with needed training and equipment to address the needs regarding possible civil disturbance in Morgan County.	2	3	1	2	2	2.1
Town of Bath							
BH-1	Review and maintain agreement with Morgan County Planning Commission to provide floodplain management.	2	3	1	3	3	2.4
BH-2	Support local fire department efforts to conduct education programs in schools.	2	2	1	2	1	1.7

BH-3	Annually distribute landslide and land subsidence risk pamphlets, public service announcements, or brochures to residents within high-risk areas. Ensure that all materials are provided in all languages relevant to the community. Also make sure to utilize outreach methods that can reach a wide variety of audiences, such as social media, print media, and radio.	2	2	1	2	1	1.7
BH-4	Support the Berkeley Morgan County Health Department and WV Department of Health to increase awareness about treating and preventing substance use disorder.	2	2	1	3	1	1.8
BH-5	Support and relay messaging from MCOES regarding safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	2	2	1	3	1	1.8
BH-6	Support public education programs concerning the hazards associated with invasive species.	2	2	1	2	1	1.7

BH-7	Support efforts to enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	2	2	1	1	1	1.5
BH-8	Develop a drought emergency plan	2	2	1	3	2	2.0
BH-9	Support public awareness campaigns on how to reduce exposure to epidemics through all available channels.	2	2	1	1	2	1.7
BH-10	Identify and address trees and other vegetation that require routine maintenance or removal	2	2	2	2	2	2.0
BH-11	Conduct tornado drills in schools and public buildings.	2	2	1	1	2	1.7

BH-12	Work with WVDOH to find solutions to flood impacted parts of US Route 522 within town limits, such as S. Washington Street.	3	3	1	2	2	2.3
BH-13	Install generators and other equipment to aid in the continuation of essential services in the event of utility interruption.	3	2	2	2	2	2.2
BH-14	Develop a Capital Improvements Program that identifies capital projects and equipment purchases.	2	2	3	3	2	2.4
BH-15	Research and solicit for a company to design and install a public warning system for the Town of Bath. This would include warning sirens and voice capable systems.	2	2	3	3	3	2.5
BH-16	Support efforts to educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	2	2	1	3	1	1.8

BH-17	Provide safety training to outdoor employees and business owners.	2	2	1	2	1	1.7
BH-18	Improve water flow in Warm Springs Run through Town to reduce downtown flooding causing damage to property.	2	2	1	1	2	1.7
Town of Paw Paw							
PW-1	Review and maintain agreement with Morgan County Planning Commission to provide floodplain management.	2	3	1	3	3	2.4

PW-2	Annually distribute landslide and land subsidence risk pamphlets, public service announcements, or brochures to residents within high-risk areas. Ensure that all materials are provided in all languages relevant to the community. Also make sure to utilize outreach methods that can reach a wide variety of audiences, such as social media, print media, and radio.	2	2	1	1	2	1.7
PW-3	Work with the County and WV Department of Health to increase awareness about treating and preventing substance use disorder.	2	2	1	3	1	1.8
PW-4	Include safety strategies for severe winter weather in driver education classes and materials. Encourage drivers to have a car safety kit when traveling during the winter season.	1	2	1	3	2	1.8
PW-5	Develop a public education program concerning the hazards associated with invasive species.	2	2	1	2	1	1.7
PW-6	Enhance radon testing capabilities to assist homeowners, renters, or businessowners in analyzing their risk	2	2	1	1	2	1.7

PW-7	Develop a drought emergency plan	2	2	1	3	1	1.8
PW-8	Create a public awareness campaign on how to reduce exposure to epidemics through all available channels.	2	2	1	3	1	1.8
PW-9	Identify and address trees and other vegetation that require routine maintenance or removal	2	2	2	2	2	2.0
PW-10	Conduct tornado drills in schools and public buildings.	2	2	1	3	1	1.8
PW-11	Apply for TAP grant through DOH to fund the addition and repair of sidewalks within town; include stormwater management practices to reduce flooding events on town/state roads.	2	2	2	3	2	2.2
PW-12	Install generators and other equipment to aid in the continuation of essential services in the event of utility interruption.	2	2	2	3	3	2.3

PW-13	Provide back-up generator power to the soon to be completed restoration of the Paw Paw Community Center (original Town fire department building), which will serve as an emergency shelter / reception center. The building's restoration is expected to be completed by January of 2027.	2	2	2	3	3	2.3
PW-14	Identify prior stormwater management improvements to advance to the final engineering design, bidding and construction to prevent future flooding issues. The town has completed a preliminary storm water study completed by Potesta & Associates, several recommendations have been made and we are currently working with Region 9 to research funding to implement the recommendations. Continue to address water runoff issues with funding agencies to move forward to implement actions reported from our engineers.	2	2	2	3	3	2.3

PW-15	Complete the restoration of the Paw Paw Community Center (original Town fire department building) to serve as a meeting place of local business leader to address emergency response needs. The building should be completed on January of 2027, although it does not have a backup power source.	2	2	3	3	3	2.5
PW-16	Educate residents regarding the dangers of extreme heat and cold, including identifying symptoms of heat illness and cold injuries, and the steps they can take to protect themselves when extreme temperatures occur.	2	2	1	3	1	1.8
PW-17	Provide safety training to outdoor sports leagues, summer lifeguards, and other outdoor occupations.	2	2	1	2	1	1.7
PW-18	Work with local fire departments to conduct education programs in schools.	1	2	1	3	1	1.6

7. Plan Maintenance

7.1. Update Process Summary

Once this plan has received approval from WVEMD and FEMA, the plan will be adopted by Berkeley and Morgan Counties and all participating jurisdictions. This HMP Update is intended to be a 'living document.' Plan adoption is not considered the final step in the planning process, but rather as a first step to 'realization.' The plan monitoring and maintenance schedule is a cycle of events that involve periodic review, adjustments, and improvement. Plan monitoring also provides an opportunity to recognize other planning initiatives within the county that may benefit from the incorporation of risk and/or mitigation objectives detailed in this HMP. This section establishes a method to monitor how the plan will be evaluated and maintained in the future.

Monitoring, evaluating, and updating this plan is critical to maintaining its value and success in Berkeley and Morgan Counties' 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. The counties and municipalities will continue to put more emphasis on integrating the mitigation goals, objectives, and actions identified in the Mitigation Strategy into the other ongoing planning efforts to ensure implementation and tracking of actions throughout the five-year plan maintenance process.

7.2. Monitoring, Evaluating and Updating the Plan

Hazard mitigation planning in Berkeley and Morgan Counties is the responsibility of all levels of government (i.e., county and local), as well as the citizens of the counties. As listed in FEMA 386-4, the planning team (the Berkeley County and Morgan County HMSC) must continuously monitor and document the progress of the Plan's recommended actions. The HMSC (listed in Section 3.2), under the direction of the Eastern Panhandle Planning and Development Council, will be responsible for maintaining this Multi-Jurisdictional HMP. Specifically, both the Berkeley County Local Emergency Planning Committee (LEPC) and the Morgan County LEPC will devote at least one annual, publicly advertised meeting to reviewing the HMP and reporting back to the Planning and Development Council on their reviews to report progress on mitigation actions and identification of any new actions that may need to be amended to the plan during each annual review cycle. In addition, the HMSC will meet annually and following each emergency declaration, with the purpose of reviewing the plan. Each year, the counties will solicit new projects from the municipalities by sending out Project

Opportunity Forms and informing the municipalities of the opportunity to update their mitigation measures.

Each review process will ensure that the Hazard Vulnerability Analysis and Risk Assessment reflect current conditions in the counties and the municipalities, the Capability Assessment accurately reflects local circumstances, and the hazard mitigation strategies are updated based on each of the county's damage assessment reports and local mitigation project priorities. Upon each HMP evaluation, the HMSC will consider whether applications should be submitted for existing mitigation grant programs. A decision to apply for funding will be based on appropriate eligibility and financial need requirements. All state and federal mitigation funding provided to the counties or local municipalities will be reported in subsequent plan updates. The HMSC will complete a Progress Report to evaluate the status and accuracy of the HMP and record the Steering Committee's findings. The Eastern Panhandle Planning and Development Council will maintain a copy of these records.

The Disaster Mitigation Act of 2000 requires local mitigation plans to be updated every five years. The 2027 HMP will be updated and approved prior to its expiration. The Counties and Region 9 will initiate and lead the next plan update. Future updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness of the HMP:

- Has the nature or magnitude of hazards affecting the county changed?
- Are there new hazards that have the potential to impact the county?
- Is there updated, or more quantitative, risk assessment data available related to the identified hazards in the plan? Can this data be integrated into the analysis to better assess vulnerabilities and depict the risk of communities to the hazards?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the plan?
- Should additional local resources be committed to address identified hazards?
- Are there current or upcoming planning mechanisms or initiatives in which the mitigation strategy should be considered for integration?

The plan will also be updated following a disaster event, if an event is to occur within the next five years, prior to the next plan update, to reflect current conditions. In addition to conducting an annual review of the plan, the HMPSC will review the plan within 30 days of a disaster. The Risk Assessment and Mitigation Strategy will be evaluated and any changes to community priorities or status will be documented. The HMP will receive a full, detailed update every five years, as required to reflect the current risk, vulnerabilities, development trends and as mitigation actions are implemented. While an annual report will be completed each year, any state and Federal mandates from WVEMD and FEMA

respectively, will be addressed in the five-year update. The municipalities will not be responsible for making any changes to the HMP document as part of annual reviews; their role will consist of information for the review and report only. A copy of each Annual Plan Review will be provided to WVEMD and FEMA and included as official documentation in the next 5-year HMP update.

Additional agencies throughout the region, such as the county-level offices of emergency management and LEPCs, will actively integrate the information contained in this risk assessment into other planning initiatives, such as the maintenance of their jurisdiction- specific Emergency Operations Plans (EOPs). These documents should support the strengthening of capabilities to respond to the hazards identified by the risk assessment. As mitigation projects are implemented and risk is thus reduced, the emergency services community may need to "re-plan" its response to address what has become (thanks to the mitigation project) a more critical risk.

The HMSC will complete a Progress Report to evaluate the status and accuracy of the HMP and record the Steering Committee's findings. As directed by FEMA 386-4, the Progress Report will include the following information: the hazard mitigation action's objectives; who the lead and supporting agencies responsible for implementation are; how long the project should take, including a delineation of the various stages of work along with timelines (milestones should be included); whether the resources needed for implementation, funding, staff time, and technical assistance are available, or if other arrangements must be made to obtain them; the types of permits or approvals necessary to implement the action; details on the ways the actions will be accomplished within the organization, and whether the duties will be assigned to agency staff or contracted out; and the current status of the project, identifying any issues that may hinder implementation.

7.3. Continued Public Involvement

The Eastern Panhandle Planning and Development Council will ensure that the HMP is posted and maintained on the Region 9 website and will continue to encourage public review and comment on the plan through information posted to the website and public notices in the local newspaper.

The citizens of Berkeley and Morgan Counties are encouraged to submit their comments to elected officials and/or members of the Hazard Mitigation Steering Committee. To promote public participation during this plan update process, Region 9 welcomed comments on the HMP for a 30-day period. This offered the public the opportunity to share their comments and observations. All comments received will be maintained and considered by the Hazard Mitigation Steering Committee when updating the HMP. Several comments were received from residents of the Town of Paw Paw regarding the town's mitigations actions.

The Comprehensive Plan; Building Code, Municipal Floodplain Management Regulations, Emergency Operations Plan, and Zoning Ordinance are identified for incorporation of hazard mitigation actions

once the plan is adopted. Each of these mechanisms will continue to be used to meet the intent of this plan, as appropriate. Likewise, as these planning mechanisms are updated, they will be considered for incorporation into the HMP during the annual review process and/or the five-year cycle update.

The region and participating jurisdictions may propose additional mitigation actions for inclusion throughout the five-year cycle but must submit new mitigation actions through the Emergency Management Agency which will request an HMP amendment by contacting the WVEMD State Hazard Mitigation Planner. FEMA must officially approve all additions and will amend the HMP by issuing an HMP Amendment Approval letter.

8. Plan Adoption

The Plan was submitted to the West Virginia Department of Homeland Security and Emergency Management on November 3, 2026, and forwarded to FEMA for final review and approval-pending-adoption on XXXX, 2026. FEMA granted approval-pending-adoption on XXXX, 2026. Full approval from FEMA was received after each jurisdiction adopted the plan.

This section of the plan includes copies of the local adoption resolutions passed by Berkeley County, Morgan County, and their municipal governments. Adoption resolution templates are provided to assist the county and municipal governments with recommended language for future adoption of the HMP.

A completed Mitigation Plan Review Tool can be seen in **Appendix B**.

2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties
County Adoption Resolution

Resolution No. _____
Berkeley County, West Virginia

WHEREAS, the municipalities of Berkeley County, West Virginia are most vulnerable to natural and human-caused hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and
WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and
WHEREAS, Berkeley County acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties has been developed by the Region 9 Eastern Panhandle Regional Planning and Development Council in cooperation with county departments, local municipal officials, institutional stakeholders, and the citizens of Berkeley County, and
WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties recommends mitigation activities that will reduce losses to life and property affected by both natural and human-caused hazards that face the County and its municipal governments,
NOW THEREFORE BE IT RESOLVED by the governing body for the County of Berkeley that:

- The 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties is hereby adopted as the official Hazard Mitigation Plan of the County, and
- The respective officials and agencies identified in the implementation strategy of the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2027

ATTEST: **BERKELEY COUNTY COUNCIL**

_____ By _____
By _____
By _____
By _____
By _____

2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties
Municipal Adoption Resolution

Resolution No. _____
<*Borough/Township of Municipality Name*>, Berkeley County, West Virginia

WHEREAS, the <*Borough/Township of Municipality Name*>, Berkeley County, West Virginia is most vulnerable to natural and human-caused hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and
WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and
WHEREAS, the <*Borough/Township of Municipality Name*> acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties has been developed by the Region 9 Eastern Panhandle Regional Planning and Development Council in cooperation with county departments, local municipal officials, institutional stakeholders, and the citizens of Berkeley County, and
WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties recommends mitigation activities that will reduce losses to life and property affected by both natural and human-caused hazards that face the County and its municipal governments,
NOW THEREFORE BE IT RESOLVED by the governing body for the <*Borough/Township of Municipality Name*>:

- The 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties is hereby adopted as the official Hazard Mitigation Plan of the <*Borough/Township*>, and
- The respective officials and agencies identified in the implementation strategy of the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2027

ATTEST: ***<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>***

_____ By _____

By _____

2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties
County Adoption Resolution

Resolution No. _____
Morgan County, West Virginia

WHEREAS, the municipalities of Morgan County, West Virginia are most vulnerable to natural and human-caused hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and
WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and
WHEREAS, Morgan County acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties has been developed by the Region 9 Eastern Panhandle Regional Planning and Development Council in cooperation with county departments, local municipal officials, institutional stakeholders, and the citizens of Morgan County, and
WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties recommends mitigation activities that will reduce losses to life and property affected by both natural and human-caused hazards that face the County and its municipal governments,
NOW THEREFORE BE IT RESOLVED by the governing body for the County of Morgan that:

- The 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties is hereby adopted as the official Hazard Mitigation Plan of the County, and
- The respective officials and agencies identified in the implementation strategy of the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2027
ATTEST: **MORGAN COUNTY COMMISSION**
_____ By _____
By _____
By _____

2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties
Municipal Adoption Resolution

Resolution No. _____
<*Borough/Township of Municipality Name*>, Morgan County, West Virginia

WHEREAS, the <*Borough/Township of Municipality Name*>, Morgan County, West Virginia is most vulnerable to natural and human-caused hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and
WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and
WHEREAS, the <*Borough/Township of Municipality Name*> acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties has been developed by the Region 9 Eastern Panhandle Regional Planning and Development Council in cooperation with county departments, local municipal officials, institutional stakeholders, and the citizens of Morgan County, and
WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties, and
WHEREAS, the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties recommends mitigation activities that will reduce losses to life and property affected by both natural and human-caused hazards that face the County and its municipal governments,
NOW THEREFORE BE IT RESOLVED by the governing body for the <*Borough/Township of Municipality Name*>:

- The 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties is hereby adopted as the official Hazard Mitigation Plan of the <*Borough/Township*>, and
- The respective officials and agencies identified in the implementation strategy of the 2027 Multi-Jurisdictional Hazard Mitigation Plan Update for Berkeley and Morgan Counties are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2027

ATTEST: ***<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>***

_____ By _____

By _____

9. Appendices

A. Bibliography

B. Mitigation Plan Review Tool

C. Meeting, Adoption, and Other Participation Documentation

D. Flood Vulnerability Maps

E. Critical Facilities and Community Lifelines

F. Dam Failure Hazard Profile