BUCKS COUNTY, PENNSYLVANIA

2026

HAZARD MITIGATION PLAN UPDATE

DRAFT FOR REVIEW

PREPARED FOR:
Bucks County Planning Commission
1265 Almshouse Rd
Doylestown, PA 18901

PREPARED BY:
Michael Baker International, Inc.
300 American Metro Blvd.
Hamilton, NJ 08619

Michael Baker
INTERNATIONAL

1.0 INTRODUCTION

1.1 Background

Bucks County Planning Commission in collaboration with Bucks County Emergency Management Agency have taken an all-hazards approach to this Hazard Mitigation Plan Update.

The Bucks County, Pennsylvania Hazard Mitigation Steering Committee (HMSC) and local officials recognize the importance of hazard mitigation and related planning. Members of the HMSC are listed in table 3-2.1. The HMSC is concerned with addressing both natural and human-made hazards throughout the County. Bucks County is considered part of the Greater Philadelphia metropolitan area and includes approximately 64 miles of the Delaware River along its southeastern border. Since 1955, there have been 25 Presidential Major Disaster and Emergency Declarations which affected Bucks County. Of the 25, 2 are related to the COVID-19 pandemic, 17 were related to hurricanes, tropical storms, and flooding, and five were related to winter storms, snow, and blizzards. The emergency management community, citizens, elected officials and other partner agencies in Bucks County, Pennsylvania recognize the impact of disasters on their community and support proactive efforts needed to reduce the impact of natural and human-caused hazards.

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

Hazard mitigation planning has the potential to produce long-term and recurring benefits by breaking the cycle of loss. A core assumption of mitigation is that current dollars invested in mitigation practices will significantly reduce the demand for future dollars by lessening the amount needed for recovery, repair, and reconstruction. These mitigation practices will also enable local residents, businesses, and industries to re-establish themselves in the wake of a disaster, getting the economy back on track sooner and with less interruption. Bucks County has recognized the importance of mitigation and implemented mitigation projects for more than 100 proprieties in Bucks County as of 2017, making the county a leader in Hazard Mitigation Planning in Pennsylvania.

Accordingly, the Bucks County Hazard Mitigation Planning Team (HMPT) composed of government leaders, community organizations, and university representatives from Bucks County and the surrounding counties, in cooperation with elected officials of the County and its municipalities, have prepared this Hazard Mitigation Plan (HMP). The HMP is the result of work by the HMSC and HMPT to develop a pre-disaster, multi-hazard mitigation plan that will not only guide the County towards greater disaster resistance but will also respect the character and needs of the community.

2011 Plan Update

The 2011 Plan Update consisted of a review of the initial Hazard Mitigation Plan developed in 2006. Eighteen hazards were profiled in the 2011 Plan Update – drought, earthquake, extreme temperature, flood/flash flood/ice jam, hailstorm, hurricane/tropical storm/nor'easter, landslide, lightning strike, subsidence/sinkhole, tornado/windstorm, wildfire, winter storm, structure collapse, dam failure, environmental hazards, transportation accident, urban fire and explosion, and utility interruption. The Plan Update included a review of the original plan's hazards, mitigation goals, and actions, which all were revised, deleted, or modified to address the priorities of Bucks County.

2016 Plan Update

The 2016 Plan Update consisted of a review of the 2011 Plan, which was used as a base document. Each chapter in the 2016 HMP was updated as necessary. A summary was included at the beginning of each chapter to indicate how this Plan was updated from the 2011 version. The Plan Update involved the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity: twenty-one hazards were profiled in the 2016 Plan Update – drought, earthquake, extreme temperature, flood/flash flood/ice jam, hailstorm, hurricane/tropical storm/nor'easter, landslide, lightning strike, pandemic and infectious disease, radon exposure, subsidence/sinkhole, tornado/windstorm, wildfire, winter storm, structure collapse (infrastructure), dam failure, environmental hazards, terrorism, transportation accident, urban fire and explosion, and utility interruption. Pandemic and infectious disease, radon exposure, and terrorism were all new hazard profiles included in the 2016 Plan Update. The Plan Update included a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards as well as a Plan Maintenance section.

2021 Plan Update

The 2021 Plan Update is intended to enable the County and its municipalities to effectively reduce the potential risks of identified hazards to the health, safety and property of the residents, business owners, and visitors to the County. The Plan Update will also allow Bucks County municipalities to be eligible for a range of grants and financial assistance following hazard events.

The 2021 Plan Update includes a thorough review and evaluation of the 2016 Plan. Each chapter in the 2021 HMP has been updated where applicable. A summary is included at the beginning of each chapter to indicate how this Plan was updated from the 2016 version. The Plan Update involves the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity; one additional hazard was added to the risk assessment: gas and liquid pipelines. The pandemic profile was also expanded based on the impacts and experiences of COVID-19. The Plan Update includes a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards as well as a Plan Maintenance section that describes how the Plan will be updated and maintained during the next five-year cycle.

The 2021 Hazard Mitigation Plan Update comprises seven chapters. Chapter 1 includes the prerequisites of the Plan including letters of adoption by the County Commission and the individual municipalities. 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 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 damage 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 Bucks County and its municipalities will implement the Plan once it is adopted and ways to monitor progress and ensure continued public involvement.

2026 Plan Update

The 2026 Plan Update consisted of a review of the 2021 Plan, which was used as a base document. Each chapter in the 2026 HMP was updated to reflect the PEMA Standard Operating Guide and the FEMA Local Mitigation Plan Review Guide 2025. The Plan Update involved the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity: twenty-four hazards were profiled in the 2026 Plan Update – drought, earthquake, extreme temperature, flood/flash flood/ice jam, hailstorm, hurricane/tropical storm/nor'easter, landslide, lightning strike, pandemic and infectious disease, radon exposure, subsidence/sinkhole, tornado/windstorm, wildfire, winter storm, structure collapse (infrastructure), cyberterrorism, dam failure, environmental hazards (gas and liquid pipelines) environmental hazards (hazardous materials release), substance use disorder, terrorism, transportation accident, urban fire and explosion, and utility interruption. Substance Use Disorder and Cyberterrorism were new hazard profiles included in the 2016 Plan Update. The Plan Update included a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards as well as a Plan Maintenance section.

1.2 Purpose

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 man-made disasters in Bucks County;
- Qualifying the County for pre-disaster and post-disaster grant funding;
- Complying with state and federal legislative requirements related to local hazard mitigation planning;
- Demonstrating a firm local commitment to hazard mitigation principles; and
- Improving community resiliency following a disaster event.

The Disaster Mitigation Act of 2000 (DMA 2000), Section 322 requires that local governments (communities/counties), as a condition of receiving federal disaster mitigation funds, have a mitigation plan that describes the process for identifying hazards, creating a risk assessment and vulnerability analysis, identifying and prioritizing mitigation strategies, and developing an implementation schedule for the County and each of the municipalities.

Congress authorized the establishment of a Federal grant program to provide financial assistance to States and communities for flood mitigation planning and activities. The Federal Emergency Management Agency (FEMA) has designated this Flood Mitigation Assistance (FMA).

1.3 Scope

The Bucks County 2026 HMP Update has been prepared to meet requirements set forth by the FEMA and the Pennsylvania Emergency Management Agency (PEMA) in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. The original plan is being updated in order to continually address both natural and human-made hazards determined to be of significant risk to the County and/or its local municipalities. Updates will take place following significant disasters and/or after a review each year and/or when other plan updates impact the HMP.

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.
- CFR, Title 44, Parts 60, 77, 201 and 206.
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended.
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 *et seq*.
- National Dam Safety Program Act (Pub. L. 92-367), as amended.

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

- Pennsylvania Emergency Management Services Code. Title 35, Pa C.S. Section 101.
- Pennsylvania Municipalities Planning Code of 1968, Act 247 as reenacted and amended by Act 170 of 1988.
- Pennsylvania Stormwater Management Act of October 4, 1978. P.L. 864, No. 167.
- Pennsylvania Floodplain Management Act of 1978. P.L. 851, No. 166.
- Pennsylvania Hazardous Material Emergency Planning and Response Act of 1990 (Act 165).

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

- 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: *Local Mitigation Planning Handbook*. May 2023.
- FEMA: *Local Mitigation Planning Policy Guide*. 2025.
- FEMA. *Region 3 High Hazard Potential Dams: Local and Tribal Mitigation Planning Tips*. July 2024.
- FEMA. *Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program FAQ*. June 2020.

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

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type; A Mitigation Planning Tool for Communities*. March 2009.
- PEMA. *Administrative Processes*. December 20, 2019.
- PEMA: *Pennsylvania's Hazard Mitigation Planning Standard Operating Guide*. August 2025.
- PEMA: *Pennsylvania State Hazard Mitigation Plan, 2023 Update*.

2.0 COMMUNITY PROFILE

This Community Profile provides an overview of Bucks County and its 54 municipalities. This section provides key information about geography, climate, land use, built environment, and demographics to help illustrate potential exposure and vulnerability to future events. This section also allows for plan integration by incorporating data and information from County planning documents and strategies. The 2026 update includes the latest U.S. Census American Community Survey (ACS, 2019-2023), the Delaware Valley Regional Planning Commission (DVRPC) long-range projections, and information from the Bucks2040 Vision Plan, adopted January 3, 2024.

2.1 Geography and Environment

Bucks County covers 622 square miles and is located in the southeastern portion of the Commonwealth of Pennsylvania. Figure 2.1-1 illustrates the characteristics and geography of Bucks County. The county consists of 54 municipalities – 31 townships and 23 boroughs. It is bounded by Lehigh and Northampton Counties to the north, Montgomery and Philadelphia Counties to the west/south, and the Delaware River (and New Jersey) to the east.

Bucks County lies wholly within the Delaware River Basin, including the Middle Delaware-Musconetcong, Crosswicks-Neshaminy, Schuylkill, and Lower Delaware watersheds. The county also has a small portion of the Lehigh Watershed which crosses borders of northern Springfield Township. The southeastern portion of the County falls within the Neshaminy Creek watershed, as well as lands draining to the Pennypack Creek and Poquessing Creek. In the north, the water drains into the Tohickon Creek along with the Perkiomen and Saucon creeks, as seen in Figure 2.1-2.

Bucks County is commonly understood as three sub-areas – Upper Bucks, Central Bucks, and Lower Bucks, illustrated in Figure 2.1-3. The northeastern section of the county consists of rocky terrain and rolling hills, while the southern portions of Bucks County consist of more suburban and urban development along the Neshaminy Creek and Delaware River. Major transportation routes through the County include Interstates 95 and 295, US Routes 1, 202, 13, the Pennsylvania Turnpike (I-76), and State Routes 263, 32, 611, 132, 309, and 413.

Figure 2.1-1 Bucks County Base Map

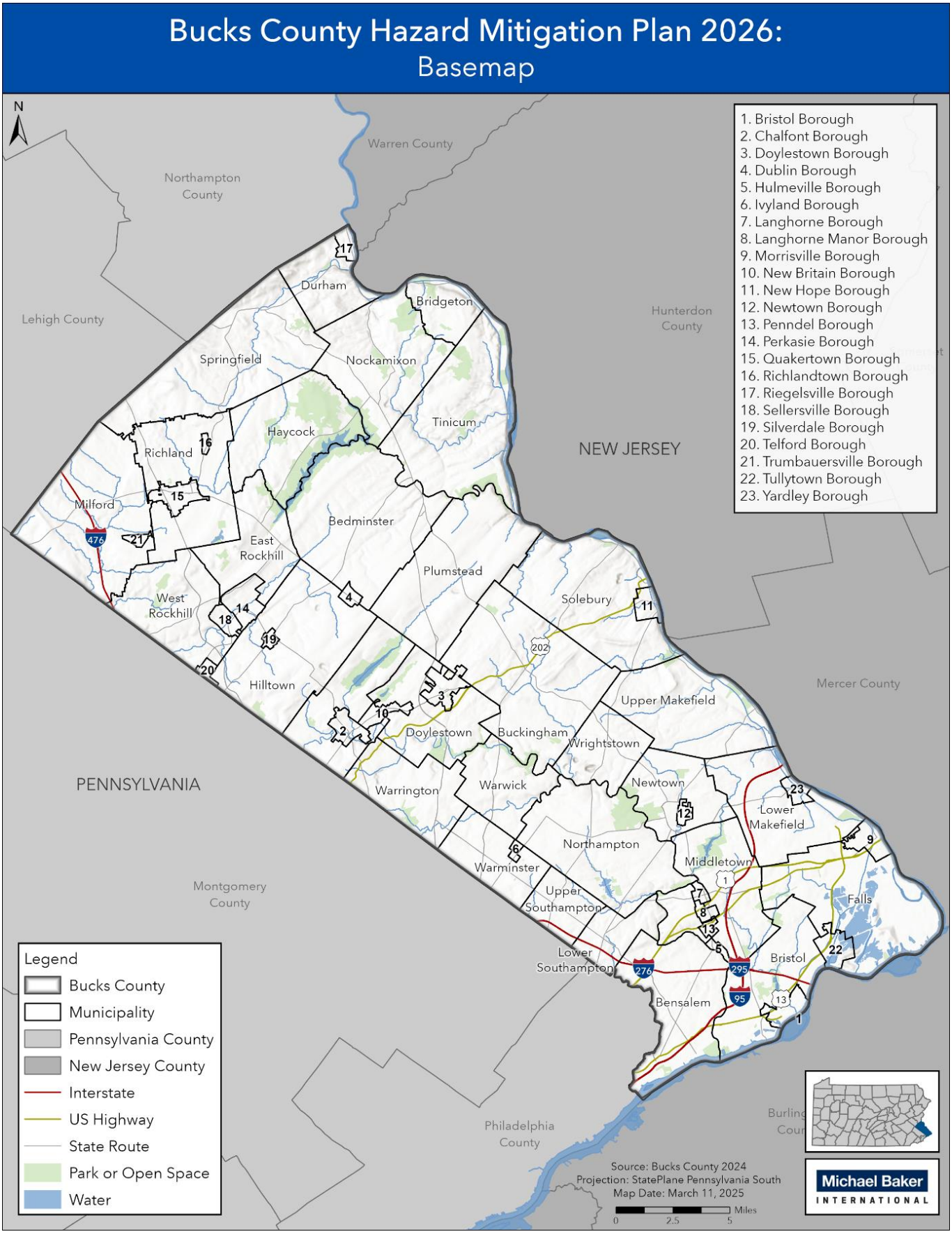


Figure 2.1-2 Bucks County Watersheds

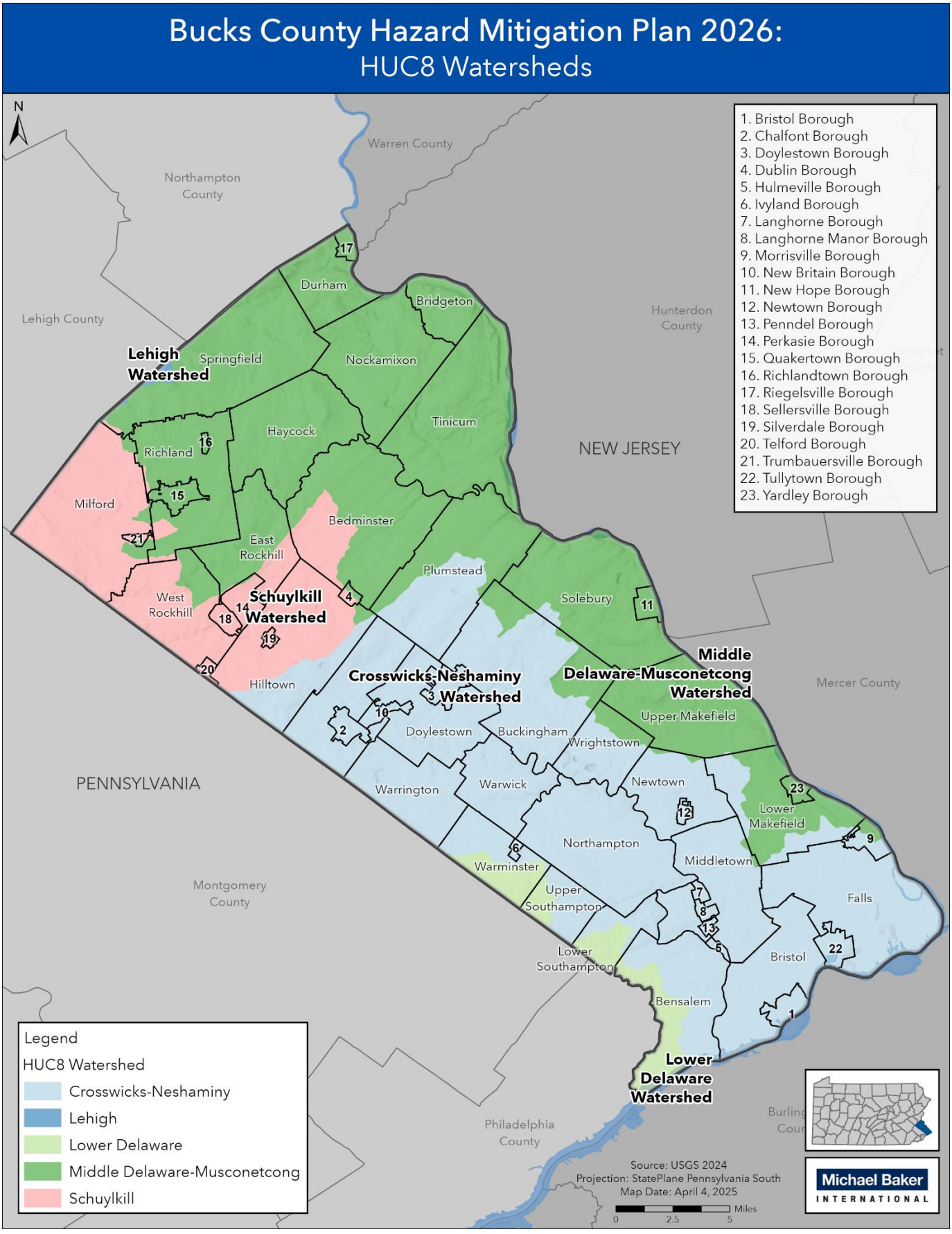
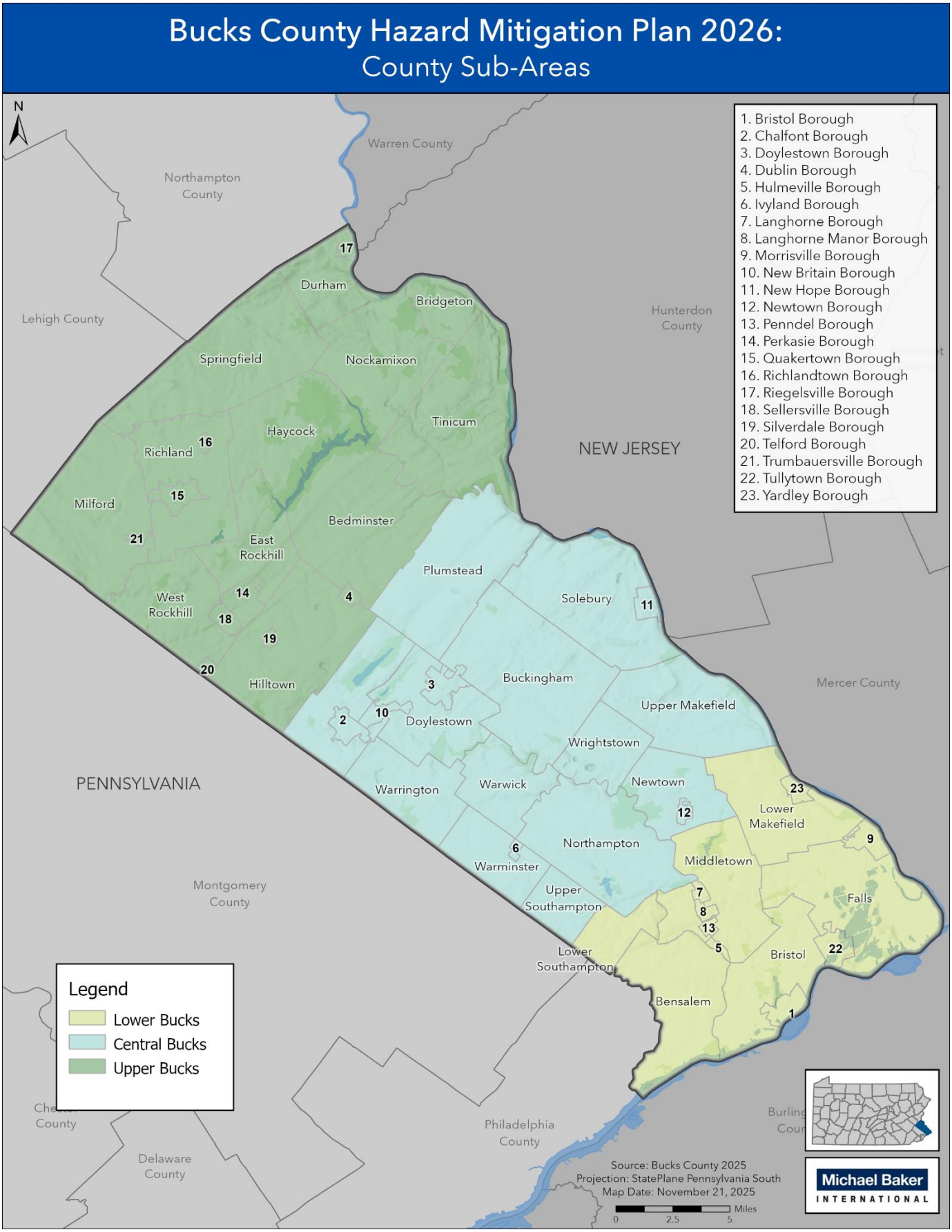


Figure 2.1-3 Bucks County Sub-Areas



2.2 Community Facts

Bucks County was founded in 1682 by William Penn and named after his family home, Buckinghamshire, in England. The original purpose in establishing Bucks (formerly Buckingham), Philadelphia, and Chester counties was to provide a home for Quakers to practice their religion freely after a long history of persecution in England. The County was formed along the Delaware River; the river has been an integral part of the development of the county starting as a trade route in the 17th century and continued as a gateway for industry in the post-industrial period. U.S. Steel created Fairless Works on riverfront property in Falls Township, attracting housing, businesses, and shopping centers to develop rapidly in both Levittown and Fairless Hills (Bucks County, 2021a).

The southern portion of the county is most densely populated, but the upper region near Quakertown has increased in population due to its accessibility to major highways and land availability. The county has a rich heritage of art, culture, and history, and is home to several historic sites including Washington Crossing Historic Park and Pennsbury Manor. The riverfront communities north of Yardley include many historic properties while retaining a small-town feel and picturesque scenery, preserving the roots of character and culture of the area.

The educational services, health care, and social assistance sector employs the largest percentage (25.3%) of the workforce in Bucks County. This share has increased since the last HMP update, when 19% of workers in Bucks County were employed in this sector. Table 2.2-1 details the industries in Bucks County as of 2019-2023, according to the U.S. Census American Community Survey (Occupation of Civilian Employed Population Aged 16 Years and Over).

Table 2.2-1 Occupation of Civilian Employed Population Aged 16 Years and Over, Bucks County (2019-2023)

Industry	Count	Share
Agriculture, Forestry, Fishing and Hunting, and Mining	1,553	0.46%
Construction	23,456	6.96%
Manufacturing	41,113	12.21%
Wholesale Trade	9,471	2.81%
Retail Trade	35,816	10.63%
Transportation and Warehousing, and Utilities	15,008	4.46%
Information	6,204	1.84%
Finance and Insurance, and Real Estate Rental and Leasing	25,786	7.66%
Professional, Scientific, and Management, and Administrative and Waste Management Services	46,582	13.83%
Educational Services, and Health Care and Social Assistance	85,082	25.26%
Arts, Entertainment, and Recreation, and Accommodation and Food Services	22,508	6.68%
Other Services, Except Public Administration	13,754	4.08%
Public Administration	10,448	3.10%

2.3 Population and Demographics

According to the U.S. Census American Community Survey, the population of Bucks County grew by 3.13% (an estimated 19,623 residents) over the survey periods between 2014-2018 and 2019-2023. The total estimated population of the county as of 2019-2023 is just under 646,000 residents (645,993). Table 2.3-1 details the two estimate periods (2014-2018 and 2019-2023) along with estimated populations and estimated change over time for each Bucks County municipality. As in the previous plan data, Bensalem Township remains the most populated of

Bucks County's municipalities, with an estimated population of 62,689, a growth of 3.8% over the period between 2014-2018 and 2019-2023. The greatest change in population was seen by Silverdale Borough, which had an estimated increase of 42.2% (growing from 751 residents to 1,068 residents) during these survey periods. Bucks County's population trends, development patterns, and corresponding effects on the county and municipalities' vulnerability to hazards is also addressed in Section 4.4.4.

Table 2.3-1 Population and Housing Characteristics, 2019-2023

Indicator	Bucks County	Pennsylvania
Share of Population Under 5 Years	4.71%	5.28%
Share of Population Under 18 Years	20.11%	20.59%
Share of Population Over Age 65	19.96%	19.07%
Share of Female Population	50.56%	50.71%
Share of Population with High School Graduate or Higher Educational Attainment	94.89%	91.91%
Share of Population Speaking Language Other than English at Home	13.19%	12.05%
Share of Population Living with a Disability	10.95%	14.22%

Source: 2019-2023 Census ACS, Table S0101, Table S1810, Table S1501, Table S1601

The estimated median household income in Bucks County in 2019-2023 was $89,139, about $26,000 greater than the Pennsylvania median, and about $20,000 greater than the national median (U.S. Census, 2019-2023). Table 2.3-2 provides details on the income characteristics in Bucks County as compared to the Commonwealth of Pennsylvania.

Table 2.3-2 Bucks County and Pennsylvania Income Characteristics, 2019-2023

Characteristic	Bucks County	Pennsylvania
Median Household Income	$89,139	$63,463
Per Capita Money Income in Past 12 Months	$47,906	$35,804
Persons Below Poverty Level	5.9%	12.0%

Table 2.3-3 Population and Population Change by Municipality (US Census ACS, 2014-2018 and 2019-2023)

Municipality	2014-2018 Population Estimate	2019-2023 Population Estimate	Percent Change
Bedminster Township	7,098	7,499	5.65%
Bensalem Township	60,370	62,689	3.84%
Bridgeton Township	1,092	1,254	14.84%
Bristol Borough	9,614	9,874	2.70%
Bristol Township	53,803	54,153	0.65%
Buckingham Township	20,270	20,838	2.80%
Chalfont Borough	4,125	4,301	4.27%
Doylestown Borough	8,307	8,322	0.18%
Doylestown Township	17,464	17,957	2.82%
Dublin Borough	2,123	2,113	-0.47%
Durham Township	1,093	1,068	-2.29%
East Rockhill Township	5,734	5,810	1.33%
Falls Township	33,826	34,548	2.13%
Haycock Township	2,088	2,102	0.67%
Hilltown Township	15,321	16,594	8.31%
Hulmeville Borough	965	961	-0.41%
Ivyland Borough	1,179	919	-22.05%
Langhorne Borough	1,553	1,564	0.71%
Langhorne Manor Borough	1,563	1,586	1.47%

Municipality	2014-2018 Population Estimate	2019-2023 Population Estimate	Percent Change
Lower Makefield Township	32,622	33,262	1.96%
Lower Southampton Township	19,101	20,520	7.43%
Middletown Township	45,156	45,860	1.56%
Milford Township	10,046	10,210	1.63%
Morrisville Borough	8,588	9,740	13.41%
New Britain Borough	2,977	2,822	-5.21%
New Britain Township	11,292	12,290	8.84%
New Hope Borough	2,513	2,623	4.38%
Newtown Borough	1,953	2,234	14.39%
Newtown Township	19,606	19,804	1.01%
Nockamixon Township	3,403	3,373	-0.88%
Northampton Township	39,312	39,868	1.41%
Penndel Borough	3,013	2,507	-16.79%
Perkasie Borough	8,502	9,176	7.93%
Plumstead Township	13,694	14,063	2.69%
Quakertown Borough	8,836	9,298	5.23%
Richland Township	13,260	13,958	5.26%
Richlandtown Borough	1,202	1,213	0.92%
Riegelsville Borough	752	823	9.44%
Sellersville Borough	4,255	4,545	6.82%
Silverdale Borough	751	1,068	42.21%
Solebury Township	8,593	8,675	0.95%
Springfield Township	5,048	5,168	2.38%
Telford Borough	2,137	2,098	-1.82%
Tinicum Township	3,948	3,817	-3.32%
Trumbauersville Borough	950	1,036	9.05%
Tullytown Borough	1,922	2,367	23.15%
Upper Makefield Township	8,357	8,829	5.65%
Upper Southampton Township	15,042	15,199	1.04%
Warminster Township	32,454	33,484	3.17%
Warrington Township	24,088	25,782	7.03%
Warwick Township	14,583	14,817	1.60%
West Rockhill Township	5,263	5,437	3.31%
Wrightstown Township	3,091	3,279	6.08%
Yardley Borough	14,583	14,817	1.60%
Bucks County	**626,370**	**645,993**	**3.13%**

When planning to mitigate hazard risk, it is important to consider how different hazards may impact different vulnerable populations. Vulnerable populations to consider include people over 65, children, people financially at risk and more.

In Bucks County, an estimated 20.1% of the population is under age 18, and 4.7% of residents are under the age of 5. An additional 20% (19.96% of Bucks residents) are over age 65. Table 2.3-1 displays population characteristics in Bucks County and provides benchmark comparisons to the Commonwealth of Pennsylvania data. Though these characteristics are somewhat in alignment with Pennsylvania as a whole, Bucks County does have a slightly higher proportion of residents with at least a high school diploma, and a lower share of residents living with a disability than Pennsylvania overall.

According to the Delaware Valley Regional Planning Commission (DVRPC), Bucks County is expected to see an overall population growth of 5.1% over the period between 2015 and 2050. This is a smaller growth rate than the previous DVRPC estimates of an 11.50% population change from 2010 to 2040. The municipalities of Telford, Plumstead, and New Britain are projected to have the highest population growth rates during this time, with

projected growth of 16.1%, 21.8%, and 21.3%, respectively. Langhorne Manor, Riegelsville, and Trumbauersville are projected to decline, slightly, in population during this period.

Based on the thirty-five-year projections, the majority of population influx will be located in the northern and western region of the County known as "Upper Bucks" and "Central Bucks". The lowest population increases are expected to be seen in already densely populated areas of the County that are located in the southeast region, "Lower Bucks," including Bristol Township and Falls Township. Table 2.3-4 below breaks down each municipality's expected population change in the next thirty years.

Table 2.3-4 Bucks County Projected Populations 2025-2050 (DVRPC, 2025)

Municipality	Projected Percent Change	Projected Population Change
Bedminster Township	2.91%	220
Bensalem Township	0.28%	183
Bridgeton Township	-1.05%	-13
Bristol Borough	-0.78%	-77
Bristol Township	-0.27%	-149
Buckingham Township	-0.07%	-15
Chalfont Borough	-0.26%	-11
Doylestown Borough	3.55%	316
Doylestown Township	1.48%	270
Dublin Borough	0.12%	3
Durham Township	-0.37%	-4
East Rockhill Township	-0.14%	-8
Falls Township	-1.09%	-378
Haycock Township	-0.73%	-16
Hilltown Township	-0.09%	-15
Hulmeville Borough	-1.22%	-12
Ivyland Borough	-0.21%	-2
Langhorne Borough	-0.85%	-14
Langhorne Manor Borough	-0.99%	-15
Lower Makefield Township	-0.02%	-7
Lower Southampton Township	-0.50%	-103
Middletown Township	-0.10%	-48
Milford Township	1.37%	141
Morrisville Borough	5.05%	495
New Britain Borough	-0.76%	-24
New Britain Township	1.51%	186
New Hope Borough	-0.50%	-13
Newtown Borough	0.44%	10
Newtown Township	-0.34%	-69
Nockamixon Township	-0.50%	-13
Northampton Township	-0.22%	-88
Penndel Borough	-0.32%	-8
Perkasie Borough	=0.37%	-34
Plumstead Township	4.15%	3,645
Quakertown Borough	-0.56%	-53
Richland Township	1.74%	247
Richlandtown Borough	-1.03%	-14
Riegelsville Borough	-1.30%	-11
Sellersville Borough	0.57%	27
Silverdale Borough	-1.24%	-10
Solebury Township	-0.69%	-60

Municipality	Projected Percent Change	Projected Population Change
Springfield Township	-0.52%	-27
Telford Borough	6.93%	163
Tinicum Township	0.44%	17
Trumbauersville Borough	-0.33%	-3
Tullytown Borough	0.13%	3
Upper Makefield Township	-0.73%	-65
Upper Southampton Township	0.29%	44
Warminster Township	0.53%	177
Warrington Township	0.26%	67
Warwick Township	0.46%	70
West Rockhill Township	2.42%	132
Wrightstown Township	-0.55%	-18
Yardley Borough	-0.65%	-17
Bucks County	**2.40%**	**1,938**

2.4 Land Use and Development

According to Bucks County's 2023 Land Use data published by DVRPC, the county is primarily residential, with 44.4% of its area (over 116,000 acres) dedicated to residential land uses. An additional 29.4% (over 77,000 acres) is agricultural land – the highest density of which is seen in Central and Upper Bucks. The next highest land use in Bucks County is transportation – all of the roadways, highways, airport uses, and associated transit land uses (with various ownership) account for 6.6% of the county's total area, at over 17,000 acres in total. Commercial land uses make up just 4.0% of the land area of Bucks County, with just over 6,700 acres dedicated to commercial use.

The fertile soil along the river as well as in the northern rolling hills of the county is well-suited for agriculture. From its founding, parts of Bucks have retained an agricultural character, and as of 2021, 16% of Bucks County is active or preserved farmland, according to the 2011 Bucks County Comprehensive Plan (BCPC, 2011a). The County also has industrial land use, which varies from chemical plants to landfills. Recently there's been growth in the biotechnology industry in the Greater Philadelphia area into Bucks, and future development of this industry is expected.

Table 2.4.1 details the land use categories in Bucks County, also shown in Figure 2.4.1

Table 2.4-1 Bucks County Land Use (DVRPC, 2023)

Land Use Type	Total Acres	Percent of County
Residential	116,344.4	44.44%
Agriculture	77,045.65	29.43%
Transportation	17,313.31	6.61%
Undeveloped	14,678.55	5.61%
Recreation	10,858.28	4.15%
Commercial	10,621.25	4.06%
Institutional	6,763.27	2.58%
Industrial	6,681.693	2.55%
Mining	1,488.083	0.57%
Military	18.74457	0.01%

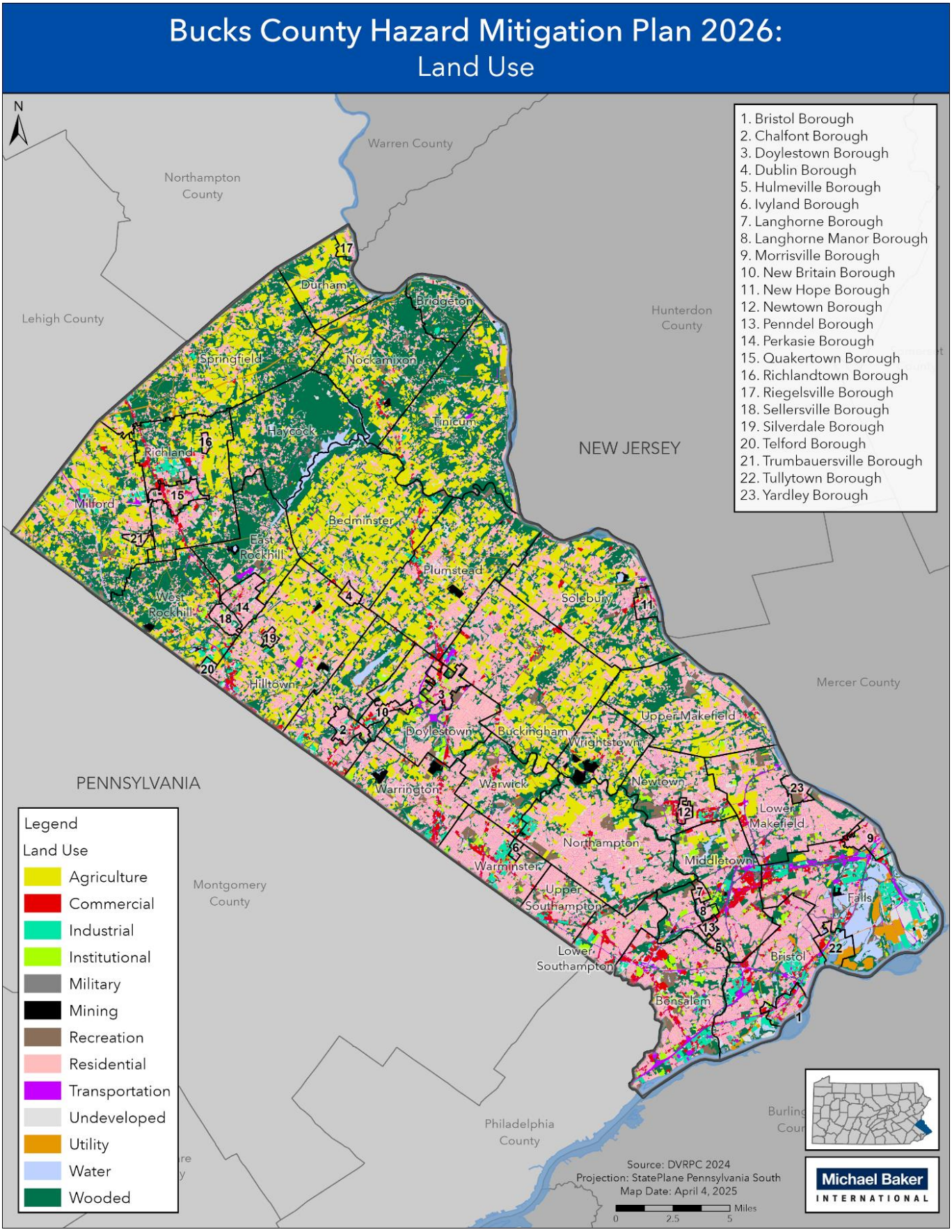
Though Bucks County is home to dense commercial areas and mixed-use development, it retains a suburban feel. Of the 116,344 residential acres within Bucks, 93% are classified as single family – detached. An additional 6% of residential land in the county is allotted to multifamily dwellings. Higher residential population density is seen

around. Future development, and the impact on the county's and municipalities' vulnerability, is also discussed in Section 4.4.4.

The hazard mitigation plan takes assets into consideration. 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.

Figure 2.4-1 Bucks County Land Use



2.5 Current and Future Planning in Bucks County

The Bucks County Comprehensive Plan, adopted in 2011, describes current and future land use planning throughout the county, emphasizing a value on the wealth of natural resources and farmland, historic, scenic, and recreational amenities throughout Bucks. The Comprehensive Plan reemphasizes county municipalities' concerted efforts to plan for and adapt to the demand for new development throughout the county, and highlights successes in preservation of thousands of acres of farmland and open space.

The Bucks 2040 Vision Plan, a land use vision for the county adopted in 2024, is an implementable comprehensive plan, seeking to identify solutions to local and regional issues through a community-based planning process. This plan focuses on the quality of life issues that are most important to Bucks County residents, and seeks to communicate how planning can help communities best achieve their land use goals. Principles of the Bucks2040 Vision Plan include equity, sustainability, resilience, and health and well-being of all Bucks County residents.

The Comprehensive Plan serves as a development guide for local officials, residents, developers, business owners, and interested agencies throughout the county. The plan identifies areas that should be targeted for both strategic development and future preservation throughout the county. The comprehensive plan details eight guiding principles that were used to identify development and preservation areas in Bucks:

1. Protect natural, historic, and scenic resources;
2. Preserve and expand parks, open space, and agricultural resources;
3. Promote energy conservation and efficiency;
4. Protect water resources and reduce waste;
5. Mitigate hazards to life and property;
6. Provide adequate community facilities and services;
7. Enhance transportation mobility;
8. Promote economic opportunity, housing diversity, and efficient use of land (BCPC, 2011a).

Bucks County also adopted the Open Space and Greenways Plan in 2011, used to develop a decision making, implementation and management tool which can protect and create linkages between the county's natural resources, open space and farmland, recreational facilities, and historic and cultural resources. The plan identifies corridors that could potentially host trails for public recreation, wildlife viewing, lessons in history, and alternative transportation. This acts as a guidance document for municipalities, conservation groups, landowners, and developers to identify greenways that should be preserved from development (BCPC, 2011b). Since the adoption of the Open Space and Greenways Plan, Bucks County has published six trail feasibility studies: (1) Mill-Queen Anne-Black Ditch Creeks, 2014; (2) Upper Neshaminy Creek Trail, 2014; (3) Lower Neshaminy Creek Trail, 2016; (4) Middle Neshaminy Creek Trail, 2019; (5) Newtown Rail Trail, 2019, and; (6) Liberty Bell Trail.

Bucks County updated the Municipal Waste Management Plan for 2018-2028 for the Pennsylvania Department of Environmental Protection between 2014 and 2019. Municipal waste management plans provide ten-year guidance for solid waste management. This includes regulation of haulers, designation of disposal sites for municipal solid waste and recyclables, documentation of flow of municipal waste generated, and assurance of disposal capacity for ten years. The plan provides detailed descriptions of waste generated, waste facilities, and safe disposal practices in Bucks County (BCPC, 2019a).

In 2017, the County published their Emergency Debris Management Plan, which is focused on helping the county to respond to a natural or manmade debris-generating event (BCEMA, 2017). The plan helps identify agencies and activities that are involved in debris operations in order to help coordinate response in the case of an event. Initiatives in this plan help address debris that may be caused by hazard events, including tornadoes, floods, winter storms, earthquakes and civil disturbance.

An additional discussion of future land development and how it interacts with hazards is provided in Section 4.4.4. Implementation actions related to hazard mitigation are detailed in Chapter 6, in addition to plan integration efforts.

2.6 Data Sources and Limitations

Gathering and analyzing new and historical data about natural hazards and the community was critical to the process of updating the plan. The Bucks County Geographic Information System (GIS) Department provided many datasets to inform the plan, including Bucks County building polygons, parcels, land assessed values, and more. The Bucks County Maps and Data Portal (https://dataportal-bucksgis.opendata.arcgis.com/) also hosts many publicly accessible datasets including a Land Use Dashboard (1990-2023), Proposed Subdivisions and Land Developments, and Bucks County Preserved and Government Owned Properties, each of which, along with other GIS layers from the Mapping and Data Portal, were used to supplement the County's Risk Assessment and Vulnerability analyses.

Bucks County's Effective Flood Insurance Rate Map (FIRM) (issued January 21, 2025) was downloaded from FEMA's Flood Map Service Center: https://msc.fema.gov/portal/home. This data provides flood frequency and elevation information used in the flood hazard risk assessment.

Additional spatial data was provided by the Pennsylvania Department of Conservation and Natural Resources (DCNR), the Pennsylvania Department of Transportation (PennDOT), and other state agencies. Spatial datasets were also obtained from the Pennsylvania Spatial Data Access (PASDA) website; a public access geospatial information clearinghouse for the Commonwealth of Pennsylvania. PASDA was developed by Penn State as a service to citizens, governments, and businesses of the Commonwealth; a cooperative project of the Governor's Office of Administration, Office for Information Technology, Geospatial Technologies Office, and Penn State Institutes of Energy and the Environment of the Pennsylvania State University.

Population and demographic data from the 2020 Decennial Census and 2019-2023 ACS five-year estimates were obtained from the U.S. Census Bureau. Vintage data for historical comparison was sourced from the 2010 Decennial Census and the 2014-2018 ACS five-year estimates. Additional information used to complete the risk assessment for this plan was taken from various government agency and non-government agency sources. These sources are cited where appropriate throughout the plan and on each map with full references.

To assess the vulnerability of different jurisdictions to the identified hazards, hazard data from the National Centers for Environmental Information (NCEI) database was utilized. NCEI is a division of the U.S. 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), also a division of NOAA. NCEI presents this data on its website in various formats. The data used for this plan came from the U.S. Storm Events database, which "documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injury, significant property damage, and/or disruption to commerce" (NOAA, 2025). The database

currently contains hazard event data from January 1950 to May 2025. 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 PA DEP and USACE's National Dam Inventory (NDI) and incorporated into the Dam Failure Profile (Appendix G). PA DEP provides information on dams and the County provides information from existing Emergency Action Plans including risk and population vulnerability.

This plan employs HAZUS, a powerful risk assessment methodology for analyzing potential losses from floods, hurricane winds, and earthquakes. HAZUS compiles current scientific and engineering knowledge along with the latest GIS technology to produce estimates of hazard-related damage before or after disaster occurs. Version 6.1 of this software was used to estimate losses from these hazards within Bucks County.

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

This hazard mitigation plan takes assets into consideration. The plan describes vulnerability of assets to the identified hazards and looks at risk that makes them susceptible to damage from each of the identified hazards. Assets considered include: people, structures, systems, natural, historic, and cultural resources, and activities that have value to the community. Various assets were identified using multiple methods, including through public outreach and through spatial datasets. For example, data on the location of historic properties was obtained through the National Parks Service National Register of Historic Places. The data includes all registered and eligible buildings, structures, sites, objects, and districts. This HMP also evaluates the vulnerability of Bucks County's critical facilities. For the purposes of this planning process, critical facilities are those entities that are essential to the health and welfare of the community, transportation infrastructure, and facilities related to the care of children. This definition includes airports, correctional facilities, daycares, EOCs, fire departments, hospitals, municipal buildings, nursing/retirement homes, police departments, rail infrastructure, rescue squads, schools, and wastewater plans. One of many County senior centers, located in Bristol Township, was included as a critical facilities because it also operates as an emergency shelter. This list of critical facilities was developed based on information available from Bucks County and the Department of Homeland Security (DHS). Datasets for all critical facility categories were provided by the County, with exception of day care data, obtained from DHS Homeland Infrastructure Foundation-Level Data (HIFLD) Open Data Portal. This portal aggregates data from hundreds of regional and local data providers to create national datasets of essential assets and infrastructure.

Table 2.5-1 summarizes the critical facilities in Bucks County by type and by municipality. Table 2.5-2 lists the number of critical facilities by type and data source. A complete listing of critical facilities and their vulnerability to individual hazards is provided in Appendix E. Due to the sensitive information in Appendix E, this appendix is not available to the public.

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

Table 2.6-1 Types of Critical Facilities in Bucks County

Type	Definition	Why It Is Critical
Child Care Facilities	An institution providing pre-kindergarten education to children, which may also include day care services.	Buildings where many people and young vulnerable populations are present during the day.
Congregate Care Facilities	A facility licensed by the department or the Department of Human Services, including, but not limited to, a long-term care nursing facility, a skilled nursing facility, an assisted living facility, a personal care home, an independent long-term care facility or an intermediate care facility for individuals with intellectual disabilities.	Provides safety and shelter for vulnerable populations, especially those that require 24/7 care and monitoring.
Emergency Operations Centers	A facility where emergency medical service (EMS) personnel are stationed or based out of, or where equipment that such personnel use in carrying out their jobs is stored for ready use.	Important for the storage and maintenance of EMS equipment.
Fire Stations	A facility where fire engines and other equipment of a fire department are housed.	Important for the storage and maintenance of firefighting equipment.
Hospitals	A place where sick or injured people are given care or treatment.	Buildings where people may be present 24/7, provide important care services, and may serve as a local shelter.
Municipal Buildings	A building that houses government functions and services.	Important for the continuation of government operations and services in times of emergency. Also, may house important documents and other resources.
Police Departments	A building which serves to accommodate police officers, other members of police staff, and their equipment.	Important for the storage and maintenance of emergency response equipment.
Prisons	A place for the confinement of people accused or convicted of a crime.	Buildings where many people are present 24/7.
Private Schools	An institution supported by a private organization or individuals to provide education to children and adults. Includes kindergarten through high school, higher education, and vocational schools	Buildings where many people and young vulnerable populations are present during the day, may also serve as a local shelter.
Public Schools	A publicly funded institution providing education to children and adults. Includes kindergarten through high school, higher education, and vocational schools	Buildings where many people and young vulnerable populations are present during the day, may also serve as a local shelter.
Pump Stations	A facility designed to move water from one location to another.	These systems are important to the everyday function of communities, as they help supply water to homes and businesses and manage wastewater. They can also help prevent flooding.
Shelters	A place giving temporary protection from bad weather or danger.	Provide physical safety from hazards, including place to sleep, meals, access to clean clothes, and/or medical care or counseling. A place where many people may gather during a hazard event.
TRI Facilities	A facility that stores toxic chemicals listed on the publicly available TRI database that may pose a threat to human health and the environment.	Provide safe storage of chemicals that are harmful to the environment and public health.

Another method of asset identification is through FEMA's Community Lifelines framework. 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 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

Table 2.6-2 Critical Facilities by Municipality and Type (Bucks County GIS, HILFD, PASDA, 2024)

Municipality	Airport	Child Care	Communication	Correctional	Electric Power	EOC	Fire Station	Medical	Municipal	Nursing Home	Police Station	Rail Station	Rescue Squad	School	Senior Center	TRI Facility	Waste Water	Water Treatment	Total
Bedminster Township	5	1	0	0	0	0	0	0	1	0	1	0	0	2	0	0	3	0	**13**
Bensalem Township	0	21	0	0	0	0	8	1	1	1	2	4	2	21	0	4	1	0	**66**
Bridgeton Township	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	**3**
Bristol Borough	0	7	0	0	0	0	4	0	1	0	1	1	0	5	0	0	0	0	**19**
Bristol Township	0	19	2	0	1	0	6	1	1	1	1	1	2	11	1	14	1	0	**62**
Buckingham Township	2	7	0	0	0	0	3	0	1	1	1	0	0	7	0	0	0	0	**22**
Chalfont Borough	0	1	0	0	0	0	1	0	1	0	1	1	0	2	0	0	0	1	**8**
Doylestown Borough	0	3	0	0	0	1	1	0	1	6	2	1	1	7	0	0	0	0	**23**
Doylestown Township	0	10	1	4	0	0	1	1	1	2	2	2	0	5	0	0	1	0	**30**
Dublin Borough	0	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	0	**4**
Durham Township	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
East Rockhill Township	1	1	0	0	0	0	1	0	1	0	0	0	0	4	0	0	1	0	**9**
Falls Township	0	18	1	0	6	0	3	1	1	0	1	0	1	14	0	15	1	0	**62**
Haycock Township	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**
Hilltown Township	1	4	1	0	0	0	2	0	1	0	1	0	0	2	0	0	1	0	**13**
Hulmeville Borough	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	**3**
Ivyland Borough	0	0	0	0	0	1	1	0	1	0	1	0	0	0	0	1	0	0	**5**
Langhorne Borough	0	1	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	**4**

Municipality	Airport	Child Care	Communication	Correctional	Electric Power	EOC	Fire Station	Medical	Municipal	Nursing Home	Police Station	Rail Station	Rescue Squad	School	Senior Center	TRI Facility	Waste Water	Water Treatment	Total
Langhorne Manor Borough	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	**4**
Lower Makefield Township	0	9	1	0	0	0	1	0	1	2	1	0	1	11	0	0	1	1	**29**
Lower Southampton Township	0	10	0	0	0	0	2	0	1	1	1	0	1	7	0	0	0	0	**23**
Middletown Township	0	19	0	0	0	0	3	3	1	6	1	2	2	12	0	1	1	1	**52**
Milford Township	2	3	0	0	0	0	2	0	1	2	0	0	0	2	0	0	0	0	**12**
Morrisville Borough	0	4	0	0	0	0	1	0	1	0	1	0	1	5	0	0	0	0	**13**
New Britain Borough	0	4	0	0	0	0	0	1	1	0	1	0	0	2	0	0	0	0	**9**
New Britain Township	1	6	0	0	0	0	1	0	1	0	1	0	1	3	0	0	1	0	**15**
New Hope Borough	0	1	0	0	0	0	1	0	1	0	1	0	1	3	0	0	0	0	**8**
Newtown Borough	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	**3**
Newtown Township	0	12	0	0	0	0	1	0	1	2	1	0	1	13	0	0	0	0	**31**
Nockamixon Township	1	1	0	0	0	0	0	0	1	0	0	0	1	4	0	0	0	0	**8**
Northampton Township	0	15	0	0	0	0	3	0	1	2	1	0	1	14	0	0	0	0	**37**
Penndel Borough	0	1	0	0	0	0	1	0	1	0	1	0	0	1	0	0	0	0	**5**
Perkasie Borough	0	3	0	0	0	0	1	0	1	0	1	0	0	2	0	0	0	0	**8**
Plumstead Township	1	8	0	0	0	0	3	0	1	0	1	0	1	7	0	2	1	0	**25**

Municipality	Airport	Child Care	Communication	Correctional	Electric Power	EOC	Fire Station	Medical	Municipal	Nursing Home	Police Station	Rail Station	Rescue Squad	School	Senior Center	TRI Facility	Waste Water	Water Treatment	Total
Quakertown Borough	0	5	0	0	0	0	2	1	1	2	1	0	1	7	0	2	0	0	**22**
Richland Township	1	3	0	0	0	0	1	0	1	0	1	0	0	2	0	1	1	0	**11**
Richlandtown Borough	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	**3**
Riegelsville Borough	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**
Sellersville Borough	0	3	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	**6**
Silverdale Borough	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	**3**
Solebury Township	1	4	0	0	0	0	1	0	1	0	1	0	0	3	0	0	0	0	**11**
Springfield Township	0	2	0	0	0	0	1	0	1	1	1	0	1	1	0	0	0	0	**8**
Telford Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
Tinicum Township	3	1	0	0	0	0	2	0	1	0	1	0	0	2	0	0	0	0	**10**
Trumbauersville Borough	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	**4**
Tullytown Borough	0	1	0	0	0	0	1	0	1	0	1	1	0	3	0	0	0	0	**8**
Upper Makefield Township	0	1	1	0	0	0	2	0	1	0	1	0	1	1	0	0	1	0	**9**
Upper Southampton Township	0	11	0	0	0	0	1	0	1	1	1	0	1	6	0	1	0	1	**24**
Warminster Township	0	11	1	0	0	0	4	0	1	6	1	1	1	8	0	6	0	0	**40**
Warrington Township	0	10	0	0	0	0	2	0	1	2	1	0	1	7	0	1	1	0	**26**
Warwick Township	1	6	0	0	0	0	1	0	1	0	1	0	1	5	0	0	0	0	**16**

Municipality	Airport	Child Care	Communication	Correctional	Electric Power	EOC	Fire Station	Medical	Municipal	Nursing Home	Police Station	Rail Station	Rescue Squad	School	Senior Center	TRI Facility	Waste Water	Water Treatment	Total
West Rockhill Township	0	3	1	0	0	0	0	1	1	1	1	0	1	4	0	1	0	0	**14**
Wrightstown Township	0	1	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	0	**5**
Yardley Borough	0	1	0	0	0	0	1	0	1	0	1	1	0	1	0	0	0	0	**6**
Grand Total	**20**	**253**	**9**	**4**	**7**	**2**	**82**	**10**	**53**	**42**	**45**	**15**	**26**	**222**	**1**	**49**	**16**	**4**	**860**

Table 2.6-3 Number of Critical Facilities in Bucks County by Type and Data Source

Type	Number In County	Data Source
Airport	20	FAA 2025
Correctional Facility	253	HIFLD 2025
Day Care	9	CDMS 2024
EOC	4	Bucks County 2025
Fire Stations	7	CDMS 2024
Hospital	2	CDMS 2024
Municipal Building	82	CDMS 2024
Nursing / Retirement Home	10	CDMS 2024
Police Department	53	Bucks County 2025
Railroad Station	42	HIFLD 2025
Rescue Squad	45	CDMS 2024
School (K-12 and Universities)	15	SEPTA 2025
Senior Center	26	Bucks County 2025
Wastewater Plant	222	CDMS 2024

Please note, while there are multiple Senior Centers in Bucks County, only one was designated critical because of its role in emergency sheltering operations.

3.0 PLANNING PROCESS

3.1 Update Process Summary

To begin the 2026 update process, a Hazard Mitigation Steering Committee (HMSC), composed of representatives from the Bucks County Planning Commission, and Bucks County Department of Emergency Management was formed. The HMSC sent meeting invitations to the Township or Borough Manager and Emergency Management Coordinator (EMC) in each municipality as well as to other miscellaneous partner agencies such as university representatives and non-profit organizations. A complete list of partner agencies that were invited throughout the planning process can be found in **Appendix C**. The HMSC and Hazard Mitigation Planning Team (HMPT) met in November 2024 to discuss the overall planning process, identify potential additional parties to include, and begin a discussion on any updates and changes to the hazards and associated mitigation opportunities, review hazards that affect the County, assess potential damages from those hazard events, select actions to address the County's vulnerability to such hazards, and develop an implementation-strategy action plan in order to mitigate potential losses. The HMSC updated the HMPT mailing list based on information provided in the first meeting. Section 3.2 provides additional information about the HMSC and HMPT as well as a table of members with their corresponding organization.

Municipal officials, partner agencies, and adjacent counties received written notification regarding all HMP meetings and reminder emails. A brief description of each meeting that was held is available in Section 3.3. In addition, meeting minutes, describing in detail, events of each meeting along are available in **Appendix C – Meeting and Other Participation Documentation**.

In order to obtain information from municipalities and other partner agencies, forms and surveys were distributed and collected throughout the planning process. Forms were presented during meetings and links to fill them out were distributed via email and completed and returned in between scheduled meetings. Communities were reminded of the importance in participating and the possible impact on municipal bond rating and FEMA grant eligibility. Communities were encouraged to attend meetings and submit forms. Table 3.5-1 lists each municipality along with their specific participation and contributions to the planning process. Sign-in sheets for each meeting with individual names are available in **Appendix C** along with all completed forms and surveys.

The Bucks County Planning Commission contracted Michael Baker International to support the HMP process and plan development. The 2026 Bucks County HMP was posted for public review on January 13, 2026, submitted for PEMA review on XXXXX, 2026; and FEMA review on XXXXX, 2026.

3.2 Update Process Summary

The HMSC for the 2026 HMP included:

Table 3.2-1 Bucks County Hazard Mitigation Plan Steering Committee

Participant	Title
Evan J. Stone, PLA	Executive Director, Bucks County Planning Commission
Matthew M. Walters	Senior Planner, Bucks County Planning Commission
Deanna M. Miller	Planner/Recycling Coordinator, Bucks County Planning Commission
Andrew G. Heimark, GISP	Director of GIS Services, Bucks County Planning Commission
George E. Wilson IV	Director, Bucks County Emergency Management
Evan Kelbaugh	Operations and Training Officer, Bucks County Emergency Management Agency

The partner agencies listed in Table 3.2.1-1 served on the 2026 countywide HMPT and actively participated in the planning process through attendance at meetings, completion of assessment surveys, or submission of comments.

Table 3.2-2 Participants in the Planning Process

Municipality /Organization	Name	Title
Warwick Township	Aaron Richwine	Lieutenant
Middletown Township	Alan Welsh	Fire Investigator/Fire Inspector
Bristol Borough	Alexander Deangelis	EMA
Bristol Township Fire Rescue/Emergency Management	Amy Siefker	Assistant Emergency Management Coordinator
Perkasie Borough	Andrea L. Coaxum	Borough Manager
Doylestown Township	Andrea Mergner	Township Manager
Warrington Township	Angela Benner	Township Manager
Solebury Township	Annelise Dahlin	Recreation Program Coordinator
Township of Falls	Anthony Montonario	Fire Inspector
Durham Township	Blake Timochenko	EAC Chairman
Lower Makefield Township	Bob Lewis	LMT Police
Palisades School District	Brandon Kook-Whitley	Head of Maintenance
Sellersville Borough	Brenda Detweiler	Borough Manager
Morrisville Borough, New Britain Borough	Brian Focht	Consultant Representative
Palisades School District	Bridget O'Connell	Superintendent
Penndel Borough	Bud Murphy	Council Member
Barry Isett & Associates	Caitlin Mest	Consultant Representative
Bucks County Planning Commission	Cassandra Goodmansen	Environmental Planner
Perkasie Borough	Cassi Grillo	Zoning Officer, Code Administrator
Solebury Township	Catherine Cataldi	Township Secretary
Haycock Township	Chris Bauer	Secretary / Treasurer
Pennsburg School District	Chris Carlini	Supervisor of Safety and Security
Milford Township	Chris Kletzing	Fire Marshall
Solebury Township	Christopher Clewell	Director of Public Works
Hilltown Township Police Department	Christopher E Engelhart	Chief of Police
Solebury Township	Christopher Garges	Township Manager
Dublin Borough	Colleen M. Pursell	Borough Manager
Newtown Borough	Craig Totaro	Borough Manager
Trumbauersville Borough	Craig Wilhelm	CEO/FM/EMC
New Britain Township	Dan Fox	Township Manager
Trumbauersville Borough	Dani McClanahan	Borough Administrator
Lower Makefield Township	Daniel J McLoone	Planner, Community Development Dept.
Durham Township	Danielle Cox	EMC, Township Administrator
Warminster Municipal Authority	Daulton George	Assistant Manager
Lower Makefield Township	David Kratzer	Township Manager
Bensalem Township Emergency Management Agency	David Marshall	Sergeant
Hilltown Township	Deanna Ferry	Township Manager
Trumbauersville Borough	Deborah Seifter	Vice Chair

Municipality /Organization	Name	Title
Upper Makefield Township	Denise Burmester	Director of Planning & Zoning, Code Enforcement Officer
Lower Makefield Township	Derek Fuller	Director of Public Works
Solebury Township	Det./Sgt. J. Koretzky	Sergeant
Milford Township	Devan Ambron	Assistant Manager / Secretary / Treasurer
Upper Southampton	Don Williams	Township Manager
Council Rock School District	Donald Mihalek	Manager of District Security
New Hope-Solebury School District	Ed Salamon	Safety & Security Specialist
Township of Falls	Edward Pullen	Fire Inspector
Sellersville Borough	Eileen M Bradley	Borough Manager
Tinicum Township	Eleanor Breslin	President, Board of Supervisors
Northampton Township	Frank Fenton	Fire Marshall
Riegelsville Borough	Frank Preedy	EMC
Wrightstown Township	Gary Smith	Zoning / Code Enforcement
West Rockhill Township	Greg Lippincott	Manager/ Municipal Administrator
Penndel Borough	James Bampfield (Jim)	Fire Marshall / Emergency Management Coordinator
Bucks County EMA	Jason S Diefenderfer	EMA Specialist
Wrightstown Township	Jason Wagner	Township Manager
Solebury Township	Jean Weiss	Administrative Assistant
Plumstead Township	Jeff Gouldey	Fire Marshall
Milford Township	Jeffery Vey	Manager
Bristol Township	Jessica Ireland	Manager
Richland Township	Jim Benner	Roadmaster
Silverdale Borough	Jim Browne	Deputy EMC
Middletown Township	Jim Ennis	Director of Building and Zoning
Buckingham Township	Jim Kettler	Director of Building and Codes / Fire Marshall / Emergency Management Coordinator
Solebury Township	Jim Kuhn	Emergency Management Coordinator
Lower Makefield Township	Jim Majewski	Director of Community Development
Township of Warminster	Joe Velten	Emergency Management and Services Coordinator
Tinicum Township	John Cole	Vice Chairperson
Lower Southampton Township	John Evarts	Township Engineer
Solebury Township	John Ives	Planning and Zoning Administrator
Wrightstown Township	John Kernan	Fire Marshall
Lower Southampton Township	John Krimmel	Police Chief
Township of Falls	John Weiss	Fire Inspector
Lower Southampton Township	Joseph Galdo	Township Manager
Tinicum Township	Judith Danko	Township Manager
Warminster Township	Justin Brewer	Warminster FD
Newtown Borough, Upper Southampton, New Britain Borough, Lower Southampton	Justin Tohanczyn	Consultant Representative
Borough of Doylestown	Karyn Hyland	Director of Building and Zoning
Solebury Township	Kate Robeson-Grubb	Sustainability and Administrative Specialist
Langhorne Borough	Kathleen Horwatt	VP Council
Tinicum Township	Kathy Moreni	Zoning Clerk
Solebury Township	Kelley Warner	Police Chief
Bristol Township	Kevin Dippolito	Fire Chief/ Fire Marshall / Emergency Management Director
Warwick Township	Kyle Seckinger	Township Manager
Warrington Township	Lee Greenberg	Assistant Township Manager / Director of EMS
Richland Township	Leslie Huhn	Township Manager / Secretary / Treasurer
Buckingham Township	Lisa Gerhardt	Zoning Officer
New Hope Borough	Lisa Littlefield	Zoning Officer
Bristol Borough	Lisa Pullen	Administrative Secretary
Bristol Township	Luke Miller	Safety and Security Coordinator
East Rockhill Township	Marianne Morano	Township Manager / Zoning Officer

Municipality /Organization	Name	Title
Warwick Township	Mark Goldberg	Chief of Police
Upper Southampton	Mark Sarson	Zoning Officer
Langhorne Borough	Mary Zimmerman	Interim Borough Manager
Upper Makefield Township	Matt Gorman	Planning & Zoning / EMS
FEMA Region 3	Matt McCullough	Community Planner
Tinicum Township	Matt Overbeck	Department of Public Works
Morrisville Borough	Matt Wiedenhaefer	EMC
Tinicum Township	Melissa Bottelier	Administrative Staff
Richland Township	Michael W Kisthardt	Sergeant
Solebury Township	Michele Blood	Assistant Township Manager
Barry Isett & Associates Representing: Morrisville Borough, Newtown Borough, Newtown Township, Lower Southampton Township, Upper Southampton Township, New Britain Borough, New Britain Township	Mike Italia	Consultant Representative
Bedminster Township, Dublin Borough	Mike Tuttle	Emergency Management Coordinator
Township of Warminster	Mike Walsh	Planning Director
Langhorne Borough	Nancy Culleton	President
Bucks County	Neale M Dougherty	Director of Sustainability
Newtown Township & Newtown Borough	Nick Weaver	Asst. Fire Chief & Deputy EMC
Tullytown Borough	P. Marks	Consultant Representative
Durham Township	Pete Cox	Roadmaster
Langhorne Manor Borough	Peter Gray	Borough Manager
Lower Southampton Township	Rich Coppens	Public Works Director
Township of Falls	Rich Dippolito	Director of Emergency Services / Fire Marshall
Springfield Township	Rich Pursell	Township Manager / Public Works Director / Treasurer
Bedminster Township	Rich Schilling	Township Manager / Zoning Officer
Richland Township	Richard Brittingham	Assistant Township Manager / Zoning Officer / Floodplain Administrator
Richland Township	Richard J. Ficco	Chief of Police
Upper Makefield Township	Robert Kay	Emergency Management Coordinator
Northampton Township	Robert Pelligrino	Township Manager
Bensalem Township Emergency Management Agency	Robert Race	Deputy Director
Bensalem Township Emergency Management Agency	Robert Sponheimer	Battalion Chief
Bridgeton Township	Roger Keller	Vice Chair – Board of Supervisors
Tinicum Township	Roger Margot	Department of Public Works
Bristol Borough	Ronald Deangelis	Emergency Management
Doylestown Township	S. Salisbury	Emergency Management Coordinator
Richland Township	Scott Ambron	Code Enforcement Officer/ Building Inspector / Fire Inspector
Borough of Doylestown	Scott Fleischer	Fire Marshall
Tullytown Borough	Sean R. Torpey	Consultant Representative
Chalfont Borough	Shawn Curran	Borough Manager
Plumstead Township	Stacey Mulholland	Township Manager
Wrightstown Township	Stacy Crandell	Township Manager
Doylestown Township	Stephanie J Mason	Township Manager
Tullytown Borough	Stephen Randazzo	Consultant Representative
Plumstead Township	Steve Hicks	Assistant Township Manager
Upper Makefield Township, Yardley Borough, Upper Southampton Borough	Susan Mazzitelli	Consultant Representative
Lower Southampton Township	Ted Krimmel	Chief of Police
Nockamixon Township	Teri Lewis	Township Manager
Bridgeton Township	Terry Kuntz	Emergency Management Coordinator
Penndel Borough	Thomas Sodano	Mayor
Richland Township	Tim Arnold	Chairperson
Lower Makefield Township	Tim Chamberlain	Fire Services Director
Wyn & Associates Representing: Springfield Township, West Rockhill Township, Haycock Township	Tim Fulmer	Township Engineer

Municipality /Organization	Name	Title
Upper Makefield Township	Trish Fitch	Planning & Zoning / EMS
Tullytown Borough	Tyler Kradzinski	Consultant Representative
Lower Bucks County Joint Municipal Authority	Vijay Rajput	Managing Director
Upper Southampton Township	Wayne McGowan	Public Works Director
Yardley Borough	Wes Foraker	Code Enforcement Officer, Emergency Management Coordinator
Tinicum Township	William Cahill	EMC
Hulmeville Borough	William Wheeler	Borough Manager
Upper Southampton Township	Zach Wolf	Code Enforcement Officer

3.3 Meetings and Documentation

The following meetings were held during the update process. Meetings with an asterisk (*) were open to the public. Invitations, agendas, sign-in sheets, and meeting summaries are included in **Appendix C - Meeting and Other Participation Documentation**.

- **November 12, 2024** – Steering Committee Kick-Off Meeting was held in person and attended by county representatives and the consultant to go over the HMP planning process and major milestones including the schedule for HMPT meetings and anticipated HMP submission dates. The group also discussed planning requirements, updated policies from FEMA/PEMA, relevant stakeholders, and the availability of geospatial data and other plans and documentation for integration.
- **December 11, 2024** – Steering Committee Check In was held in person and attended by county representatives and the consultant to outline responsibilities for the planning process, identify plans for upcoming meetings, and scope plans for outreach to Bucks County authorities and special district stakeholders of the plan.
- **January 15, 2025** – Steering Committee Check In was held in person and attended by county representatives and the consultant to go over the planning process to date, identify needs for data requests (NFIP), share data-sharing plans (SharePoint site development), outline the upcoming Risk Assessment process, and review Bucks County's existing Goals and Objectives.
- **January 17, 2025** – PEMA and FEMA Coordination Meeting was held virtually and attended by county representatives, the consultant, PEMA, and FEMA to discuss the project scope, ensure coordination and alignment with PEMA/FEMA, and discuss methodology recommendations, particularly for HHPD requirements.
- **January 28, 2025** – Plan Participant Kick-Off Meeting* was held virtually and attended by county representatives, the consultant, and jurisdictional representatives to discuss the HMP Update Overview and the Update Planning Process, to discuss new hazards being profiled, to outline expectations for participation in Risk Assessment, Capability Assessment, and Mitigation Strategy, and to outline upcoming project schedules and next steps.
- **February 12, 2025** – Steering Committee Meeting was held virtually and attended by county representatives and the consultant to discuss feedback and post-meeting action items after the Plan Participant Kick-Off. The agenda also covered new hazards being identified and profiled, an outreach and engagement strategy including stakeholder meetings, capability assessments and risk identification county-wide.

- **March 12, 2025** – Steering Committee Meeting was held in person and attended by county representatives and the consultant to discuss alignment on mapping themes and display, review ongoing Risk Assessment work, update (and request updates on) critical facilities throughout Bucks, and provide a project status update on in-progress work.
- **April 2, 2025** – Steering Committee Meeting was held virtually and attended by county representatives and the consultant to discuss logistics for the planning team kick-off, the West Branch Susquehanna Builders Association Home Show, the status of data requests, and future risk assessment meetings.
- **April 8, 2025** – Special Districts Kick-Off Meeting was held virtually and attended by county representatives, the consultant, and participating Special Districts and Authorities to introduce the HMP update process, discuss special district plan participation expectations, and outline scheduled opportunities for participation.
- **April 15, 2025** – Steering Committee Meeting was held in person and attended by county representatives and the consultant to discuss the upcoming Risk Assessment Meeting, review presentation plans for the external presentation, and confirm existing mapping direction.
- **April 29, 2025** – Hazard Mitigation Risk Assessment Meeting* was held virtually and attended by county representatives, jurisdictional representatives, participating special districts, and the consultant to present existing Risk Assessment takeaways, open a conversation for additional Risk feedback, share the process of ongoing hazard mitigation and risk assessment, and share vulnerability analysis to date. Next steps for participants were identified and shared as action items.
- **April 30, 2025** – Steering Committee Meeting was held virtually and attended by county representatives and the consultant to debrief the previous day's Risk Assessment Meeting, review comments received during 4/29 meeting, and identify next steps re: NFIP data collection, municipal participation, and looking forward to mitigation action planning.
- **May 28, 2025** – Steering Committee Meeting was held virtually and attended by county representatives, representatives from PEMA/FEMA, and the consultant to discuss opportunities for Bucks County's HMP to be a leader or example of a plan with improved HMP processes, in a goal to make HMPs more accessible, useful, and helpful to communities to find focus for risk-reduction.
- **June 24, 2025** – Steering Committee Meeting was held in person and attended by county representatives and the consultant to discuss PEMA/FEMA feedback, ongoing survey development, and feedback from jurisdictional representatives for Capability and Hazard assessments.
- **July 30, 2025** – Steering Committee Meeting was held in person and attended by county representatives and the consultant to discuss mapping progress to date, survey feedback ongoing, and development of hazard mitigation strategy.
- **August 27, 2025** – Steering Committee Meeting was held virtually and attended by county representatives and the consultant to discuss the upcoming Annual HMP Meeting, opportunities for coordination with mitigation action workshopping, and updates from public survey feedback ongoing.
- **September 24, 2025** – Steering Committee Meeting was held in person and attended by county representatives and the consultant to discuss Capability Assessment efforts, county-wide mitigation goals

and strategies, review Bucks County's updated plan Goals and Objectives, and the creation of mitigation 'worksheets' to assist municipal conversations.

- **October 15, 2025** – Steering Committee Meeting was held in person and attended by county representatives and the consultant to discuss survey takeaways from the public survey, provide a survey report on all feedback received, and share updates on the mitigation worksheet creation.
- **October 29, 2025** – Steering Committee Meeting was held virtually and attended by county representatives and the consultant to align on plans for the upcoming Mitigation Action Workshop, check off all to-do list items prior to the workshop in-person, and review created worksheets so actionable feedback could be gained from jurisdictional attendees.
- **November 7, 2025** – Mitigation Action Workshop was held in-person and attended by county representatives, the consultant, and municipal staff to discuss the work each municipality has done to further existing mitigation actions and identify new actions to respond to municipally-identified hazards. This workshop presented an update on the ongoing HMP process, identifying goals for mitigation, and used small-group breakout sessions to effectively reach participants and assist them in action identification and tailoring to their hazard concerns and mitigation goals.
- **December 22, 2025** – Steering Committee Meeting was held virtually and attended by county representatives and the consultant to discuss the upcoming Plan Review Meeting, draft plan summaries and timelines, and recap on participation to date.
- **January 13, 2026** – Draft Review Meeting*: A Draft Review meeting was held virtually, in order to provide an opportunity for the public and participating jurisdictions to review information on the plan draft, ask questions, and provide feedback on the draft document. Additionally, instructions about when and how to review the draft HMP were covered as well as a final timeline for the review and submission to PEMA and FEMA. Meeting attendees were asked to provide feedback via the provided digital question/comment form or by sharing via email.

3.4 Public and Stakeholder Participation

Each municipality was given multiple opportunities to participate in the HMP process through invitation to meetings, general comment opportunities, one-on-one meetings, review of risk assessment results and mitigation actions, and an opportunity to comment on the draft HMP. The documents listed below were distributed with meeting invitations or at meetings to solicit data, information, and comments from local municipalities and other stakeholders in Bucks County. Responses to these worksheets and surveys are included in **Appendix C**:

- ***Hazards in Your Community***: Bucks County had a robust risk assessment in its 2021 plan with 22 hazards. For the 2026 update, participants were asked to analyze the spatial extent, impact, probability, and significance of hazards to add to the analysis of existing hazards. They were also asked to identify new hazards impacting the county.
- ***Capability Assessment Survey***: Collects information on local planning, regulatory, administrative, technical, fiscal, political, and resiliency capabilities that can be included in the countywide mitigation strategy.

- ***Mitigation Action Review Form:*** Jurisdictions were provided their existing actions to note progress, and elect new actions.
- ***New Mitigation Action Form:*** This form, sent prior to the in-person Mitigation Strategy Workshop, provides an opportunity for municipalities and partner agencies to add new mitigation actions to the 2026 plan.

Community participation and comment was encouraged throughout the planning process, particularly through the County's project website: Bucks County 2026 Hazard Mitigation Plan | BCPC Connects. This site acted as a repository for the entire planning process, including presentations (PPT and meeting recordings), agendas, minutes, and worksheets from each meeting as well as promulgating meeting dates, times, and important announcements. A public survey was posted to this website and shared out by plan participants through social media channels, listservs, and other websites. The public survey is referenced additionally in Chapter 4: Risk Assessment and was incorporated throughout the planning process to inform experienced risk, perceived local vulnerability, and community feelings about Bucks County's experience of hazards county-wide.

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 County undertook an intensive effort to involve all 31 townships and 23 boroughs in the planning process. A portion of Telford Borough is in Montgomery County; this plan only addresses the risks to Bucks County residents. For Telford Borough residents to be eligible for FEMA disaster grant funding across the entire municipality, community officials may want to participate in and adopt both County HMPs.

Table 3.5-1 documents jurisdictional presence at the meetings described in Section 3.3 and other involvement from each jurisdiction throughout the planning process. Each municipality was emailed or mailed invitations to all meetings and if email addresses were available, received email reminders prior to each meeting. Surveys and forms were mailed or emailed to jurisdictions along with letters requesting that local information be provided. About 94 percent of the municipalities, 51 of 54 total municipalities, attended at least one meeting or completed one feedback form.

Table 3.5-1 Meeting Attendance

Participant	Kick-Off Meeting	Risk Assessment Meeting	Mitigation Strategy Workshop	Draft Plan Review Meeting
Bucks County	X	X	X	
Bedminster Township		X	X	
Bensalem Township	X			
Bridgeton Township	X			
Bristol Borough	X	X	X	
Bristol Township	X	X	X	
Buckingham Township		X	X	
Chalfont Borough	X			
Doylestown Borough	X	X	X	

Participant	Kick-Off Meeting	Risk Assessment Meeting	Mitigation Strategy Workshop	Draft Plan Review Meeting
Doylestown Township	X	X	X	
Dublin Borough	X	X	X	
Durham Township	X	X		
East Rockhill Township	X	X		
Falls Township	X			
Haycock Township	X	X		
Hilltown Township	X	X		
Hulmeville Borough				
Ivyland Borough				
Langhorne Borough	X			
Langhorne Manor Borough	X			
Lower Makefield Township	X		X	
Lower Southampton Township	X	X	X	
Middletown Township	X		X	
Milford Township	X	X	X	
Morrisville Borough	X	X	X	
New Britain Borough	X	X	X	
New Britain Township	X		X	
New Hope Borough	X	X	X	
Newtown Borough	X		X	
Newtown Township	X	X	X	
Nockamixon Township			X	
Northampton Township	X			
Penndel Borough	X	X		
Perkasie Borough			X	
Plumstead Township	X			
Quakertown Borough				
Richland Township	X	X		
Richlandtown Borough				
Riegelsville Borough	X	X	X	
Sellersville Borough	X			
Silverdale Borough	X			
Solebury Township	X	X	X	
Springfield Township	X	X		
Telford Borough	X			
Tinicum Township	X	X	X	
Trumbauersville Borough		X	X	
Tullytown Borough		X		
Upper Makefield Township	X		X	
Upper Southampton Township	X	X	X	
Warminster Township	X			
Warrington Township			X	
Warwick Township	X	X	X	
West Rockhill Township	X	X		
Wrightstown Township	X	X	X	
Yardley Borough	X	X	X	
Total	**44**	**31**	**30**	

Table 3.5-2 Documentation Submission

Municipality	Hazard Identification Survey	Capability Assessment Survey
Bedminster Township		
Bensalem Township	X	
Bridgeton Township	X	
Bristol Borough	X	
Bristol Township	X	

Municipality	Hazard Identification Survey	Capability Assessment Survey
Buckingham Township	X	X
Chalfont Borough		
Doylestown Borough		
Doylestown Township	X	X
Dublin Borough	X	X
Durham Township	X	
East Rockhill Township	X	X
Falls Township	X	
Haycock Township	X	X
Hilltown Township	X	
Hulmeville Borough	X	
Ivyland Borough		
Langhorne Borough	X	X
Langhorne Manor Borough	X	X
Lower Makefield Township	X	X
Lower Southampton Township	X	X
Middletown Township	X	
Milford Township		
Morrisville Borough	X	
New Britain Borough	X	X
New Britain Township		
New Hope Borough	X	X
Newtown Borough	X	
Newtown Township	X	X
Nockamixon Township	X	
Northampton Township	X	
Penndel Borough		
Perkasie Borough	X	
Plumstead Township	X	
Quakertown Borough		
Richland Township	X	X
Richlandtown Borough		
Riegelsville Borough	X	X
Sellersville Borough		
Silverdale Borough		
Solebury Township	X	X
Springfield Township	X	X
Telford Borough	X	
Tinicum Township	X	X
Trumbauersville Borough	X	
Tullytown Borough	X	X
Upper Makefield Township	X	X
Upper Southampton Township		
Warminster Township	X	X
Warrington Township	X	X
Warwick Township	X	X
West Rockhill Township		
Wrightstown Township	X	X
Yardley Borough	X	X
Total	**41**	**24**

4.0 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 county. Hazards that may affect Bucks County 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 2026 Bucks County HMP Update, unless otherwise indicated.

The HMPT reviewed all 37 hazards listed in PEMA's Standard List of Hazards from the Commonwealth of Pennsylvania's All-Hazard Mitigation Planning Standard Operating Guide (SOG) that might affect Bucks County in a PowerPoint presentation during the first planning meeting. HMPT members were asked to complete the Risk Evaluation form to review the impact of hazards currently addressed in the plan and to select new hazards found to have an impact on Bucks County. Based on the results of this survey, information from the 2019 Pennsylvania State HMP update, and past disaster declarations, the HMPT determined that the 22 hazards identified in the current plan were valid for the update. The HMPT, Special Districts, and the Public were also given the opportunity to identify and prioritize concerns.

No new natural hazards were identified. Of the 16 natural hazards identified in the Pennsylvania SOG, the Bucks County HMP includes all except coastal erosion and invasive species. The Steering Committee reaffirmed, with input from the planning process and risk assessment, that the existing 14 natural hazards reflect county concerns. In the 2021 update, the HMPT identified three additional hazards – illegal dumping, opioid addiction, and cyber terrorism – that are important to highlight as possible hazards that may become a significant issue in the future. For the 2026 plan, the HMPSC decided to profile Substance Use Disorder and Cyber Terrorism. As a result, the 2026 plan includes 10 manmade hazard profiles.

For each identified hazard, the location, extent, potential magnitude, history of events, and potential for future occurrence were reviewed and updated with new information, where available. Following hazard 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 Bucks County, including the types of parcels and critical facilities that may be at risk. The assessment allows the county and its municipalities to focus mitigation efforts on areas most likely to be damaged or most likely to require early response to a hazard event. 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.

Hazards Identify with potential impacts to Bucks County include:

Natural Hazards

- Drought
- Earthquake
- Extreme Temperature
- Flood, Flash Flood, Ice Jam
- Hailstorm
- Hurricane, Tropical Storm, Nor'easter
- Landslide,
- Lightning Strike
- Pandemic and Infectious Disease
- Radon Exposure
- Subsidence, Sinkhole
- Tornado, Windstorm
- Wildfire
- Winter Storm

Human-made Hazards

- Building and Structure Collapse
- Cyber Terrorism
- Dam Failure
- Environmental Hazards (Gas and Liquid Pipelines)
- Environmental Hazards (Hazardous Materials Releases
- Substance Use Disorder
- Terrorism
- Transportation Accident
- Urban Fire and Explosion
- Utility Interruption

4.2 HAZARD IDENTIFICATION

4.2.1 Disaster Declarations

A federal disaster or emergency declaration is issued in response to a state request when an acute event exceeds state and local capacity for response and recovery. Any hazard type that has necessitated federal assistance is included in this hazard mitigation plan update. Table 4.2-1 identifies Presidential Major Disaster and Emergency Declarations issued between 1953 through 2025 that have affected Bucks County. Additional declarations since this plan was published can be found on the FEMA website.

Table 4.2-1 Presidential Disaster and Emergency Declarations affecting Bucks County (FEMA, 2025a).

Declaration Number	Date	Event
4618	September 10, 2021	Remnants of Hurricane Ida
4506	March 30, 2020	COVID-19 Pandemic
3441	March 13, 2020	COVID-19 Pandemic
4267	March 23, 2016	Severe Winter Storm and Snowstorm
3367	February 6, 2014	Severe Winter Storm
4099	January 10, 2013	Hurricane Sandy
3356	October 29, 2012	Hurricane Sandy
4030	September 12, 2011	Tropical Storm Lee
3340	September 8, 2011	Remnants of Tropical Storm Lee
4025	September 3, 2011	Hurricane Irene
3339	August 29, 2011	Hurricane Irene
1649	June, 2006	Severe Storms, Flooding, and Mudslides
1587	April, 2005	Severe Storms and Flooding
3235	September, 2005	Proclamation of Emergency - Hurricane Katrina
1557	September, 2004	Tropical Depression Ivan
1383	June, 2001	Flash Flood (Tropical Storm Allison)
1294	September, 1999	Hurricane Floyd
1120	June, 1996	Flooding
1085	January, 1996	Severe Winter Storms
1093	January, 1996	Flooding
1015	January, 1994	Severe Winter Storms
3105	March, 1993	Blizzard
400	July, 1973	Severe Storms and Flood
340	June, 1972	Flood (Tropical Storm Agnes)
312	September, 1971	Flood
206	August, 1965	Water Shortage (Drought)

In addition to these Presidentially declared events, 44 events warranted Gubernatorial Disaster Declarations or Proclamations. Table 4.2-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Bucks County between 1955 and 2025.

Table 4.2-2 Gubernatorial Disaster Declarations or Proclamations Affecting Bucks County (PEMA, 2025a).

Date	Event
October 31, 2025	Proclamation of Disaster Emergency – SNAP Benefits
April 15, 2021	Proclamation of Disaster Emergency – Civil Disturbance
February 1, 2021	Proclamation of Disaster Emergency – Winter Weather
December 15, 2020	Proclamation of Disaster Emergency – Winter Weather
May 30, 2020	Proclamation of Disaster Emergency – Civil Disturbance
March 6, 2020	Proclamation of Disaster Emergency – Coronavirus (COVID-19)
January 18, 2019	Proclamation of Disaster Emergency – Severe Winter Event
August, 2018	Proclamation of Disaster Emergency—Rapid, Heavy Rainfall Resulting in Flash Floods
March, 2018	Proclamation of Emergency-- Opioid Crisis, Severe Winter Storms
January, 2018	Proclamation of Disaster Emergency--Opioid Crisis
March, 2017	Proclamation of Emergency-- Severe Winter Storm
March, 2017	Proclamation of Emergency-- Severe Winter Storm
January, 2016	Proclamation of Emergency--Severe Winter Storm
August, 2015	Proclamation of Emergency-- Severe Storms
January, 2015	Proclamation of Emergency-- Severe Winter Storms
February, 2014	Proclamation of Disaster--Severe Winter Storm
February, 2014	Proclamation of Disaster--Severe Winter Storm
February, 2014	Proclamation of Disaster Emergency--Severe Winter Storm
January, 2014	Proclamation of Disaster Emergency--Extreme Weather, Utility Interruption
June, 2013	Proclamation of Emergency – High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding
October, 2012	Proclamation of Emergency – Hurricane Sandy
April, 2012	Proclamation of Emergency – Spring Winter Storms
August 2011 (amended September 2011)	Proclamation of Emergency - Severe Storms and Flooding (Lee/Irene)
January, 2011	Proclamation of Emergency - Severe Winter Storm
February, 2010	Proclamation of Emergency - Severe Winter Storm
April, 2007	Severe Storm
February, 2007	Proclamation of Emergency - Severe Winter Storm
February, 2007	Proclamation of Emergency - Regulations
April, 2007	Proclamation of Emergency - Severe Winter Storm
September, 2006	Proclamation of Emergency - Tropical Depression Ernesto
September, 2005	Proclamation of Emergency - Hurricane Katrina
February, 2002	Drought & Water Shortage
August, 2000	Flooding
July, 1999	Drought
September, 1995	Drought
November, 1980	Drought Emergency
January, 1978	Heavy Snow
February, 1978	Blizzard
February, 1974	Truckers Strike
February, 1972	Heavy Snow
January, 1966	Heavy Snow

Date	Event
February, 1958	Heavy Snow

Bucks County has also received Small Business Administration (SBA) Assistance for a number of disaster events. A Small Business Administration Disaster Declaration qualifies communities for access to affordable, timely, and accessible financial assistance. The twenty-three events that qualified Bucks residents or business to receive Small Business Administration disaster-related loan assistance are listed below.

Table 4.3-3 Small Business Administration Disaster Declarations Affecting Bucks County (SBA, 2025).

Date	Event
July 12, 2021	Flash Flooding
December, 2020	Tropical Storm Isaias
August, 2020	Civil Unrest
August, 2019	Severe Weather and Flooding
January, 2019	Apartment Building Fire
July, 2016	Flash Flooding
April, 2014	Severe Winter Storms
August, 2009	Storms and Flooding
September, 2008	Fire
August, 2008	Fire
November, 2007	Fire
August, 2007	Hail and High Winds
April, 2007	Severe Storms and Flooding
August, 2001	Flooding
May, 2001	Fire
March, 2001	Fire
January, 1996	Fire
August, 1993	Flash Flood
February, 1993	Fire
June, 1992	Fire
May, 1990	Fire
December, 1988	Fire
June, 1987	Fire

4.3 HAZARD PROFILE OVERVIEW

Figure 4.3-1 contains a basic description of the 13 natural hazards and Figure 4.3-2 contains a basic description of the 14 human-made hazards that have the potential to impact Bucks County. No new natural hazards were identified for this update; the two new man-made hazards are Substance Use Disorder and Cyberterrorism.

Figure 4.3-1 Description of Natural Hazards

Drought is defined as a deficiency of precipitation experienced over an extended period of time, usually a season or more. Droughts increase the risk of other hazards, like wildfires, flash floods, and landslides or debris flows. This hazard is of particular concern in Pennsylvania due to the prevalence of farms and other water-dependent industries, water-dependent recreation uses, and residents who depend on wells for drinking water (National Drought Mitigation Center (NDMC), 2025; Ready.gov 2025).

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons and disrupt the social and economic functioning of the affected area (Ready.gov, 2025).

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, 2018). 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 (Ready.gov, 2025).

Flooding is the temporary condition of partial or complete inundation of normally dry land, and it is the most frequent and costly of all natural hazards in Pennsylvania (PEMA, 2020). Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams.

Hail precipitation is often produced at the front of a severe thunderstorm system or in conjunction with a tornado event when ice crystals form within a low-pressure front as warm air rises into the upper atmosphere and is cooled (NOAA, 2025). Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice. Hailstorms can cause significant damage to crops, livestock and property, depending on the size, duration, and intensity of hail precipitation.

In a landslide, masses of rock, earth or debris move down a slope. Landslides can be caused by a variety of factors, including earthquakes, storms, fire, and human modification of land. Areas that are prone to landslide hazards include previous landslide areas, areas on or at the base of slopes, areas in or at the base of drainage hollows, developed hillsides with leach field septic systems, and areas recently burned by forest or brush fires. (PA DCNR, 2018 and US Geological Survey (USGS), 2018).

Lightning is a rapid discharge of electrical energy in the atmosphere. When the charge difference between the ground and the cloud becomes too large, a conductive channel of air develops between the cloud and the ground, and a small amount of charge (step leader) starts moving toward the ground. When it nears the ground, an upward leader of opposite charge connects with the step leader. At the instant this connection is made, a powerful discharge occurs between the cloud and the ground. This discharge is seen as a bright flash of lightning. A bolt of lightning can reach temperatures approaching 50,000°F.

Pandemic is defined as a disease outbreak affecting or attacking many people across an extensive region, including several countries, and/or continent(s). It is further described as extensively epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale (US Department of Homeland Security (US DHS), 2022). Infectious diseases are also highly virulent, and can be spread from person-to-person.

Radon is a radioactive gas produced by the breakdown of uranium in soil and rock that can lead to lung cancer in people exposed over a long period of time. Approximately 40% of homes in Pennsylvania have radon levels above this guideline level (PA DEP, 2022b). Three sources of radon in houses are now recognized (PA DEP, 2021a):

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

Land subsidence is a gradual settling or sudden sinking of the Earth's surface due to removal or displacement of subsurface earth materials (USGS, 2019). Sinkholes are subsidence features resulting from the downward movement of surficial material into a pre-existing subsurface void. There are two common causes of subsidence in Pennsylvania: 1) dissolution of carbonate rock such as limestone or dolomite and 2) mining activity. Collapse sometimes occurs only after a large amount of activity, or when a heavy burden is placed on the overlying material (DCNR, 2022b).

A tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground (NOAA NSSL, 2022b). The impact of tornadoes or windstorms is ultimately dependent on the population or amount of property (i.e., buildings, infrastructure, agricultural land, etc.) present in the area where 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.

Wildfire occurs throughout wooded and open vegetation areas of Pennsylvania. Open fields, grass, dense brush, and forest-covered areas are typical sites for wildfire events. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands. Most wildfires are caused by human carelessness or negligence. However, some are precipitated by lightning strikes (DCNR, 2022c). Large events may require evacuation from one or more communities and necessitate regional or national firefighting support.

Winter storms are regional events and most often impact a large portion or all of Pennsylvania. Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. They begin as low-pressure systems that move through Pennsylvania usually following the jet stream (NOAA NSSL, 2022c). A winter storm can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite and freezing conditions. They can result in the closing of secondary roads, particularly in rural locations, loss of utility services and depletion of oil heating supplies (FEMA, 2022d).

Figure 4.3-2 Description of Human Made Hazards

Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides. The consequences of dam failures can include property and environmental damage and loss of life (Association of State Dam Safety Officers (ASDSO), 2018).

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).

Many of the hazards associated with conventional oil and gas extraction relate to the contamination of surface and subsurface waters. Abandoned oil and gas wells that are not properly plugged can contaminate groundwater and pollute domestic drinking water wells. In addition, surface water and soil can be contaminated by brine, a salty wastewater product of oil and gas well drilling, or by oil spills. This pollution can degrade public drinking water supplies and disrupt aquatic ecosystems.

Environmental 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.

Pipeline failures are low-probability, potentially high-consequence events. Although gas and liquid pipeline failures are infrequent, the hazardous and inflammable materials released by these events can pose a significant threat to public safety and the built and natural environment. Explosions associated with pipeline failures, for example, can cause severe injury to nearby residents and destroy homes and other property.

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

Terrorism 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 (FEMA, 2009). Cyber-attacks have become an increasingly pressing concern.

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. (FEMA, 2018)

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 (Bonner, 2017):

- Geomagnetic Storms.
- Fuel or Resource Shortage.
- Electromagnetic Pulse.
- Information Technology Failure.
- Ancillary Support Equipment.
- Public Works Failure.
- Telecommunications System Failure.
- Transmission Facility or Linear Utility Accident.
- Major Energy, Power, Utility Failure.

4.4 NATURAL HAZARDS

4.4.1 Drought

Drought is defined as a deficiency of precipitation experienced over an extended period of time, usually a season or more. Droughts increase the risk of other hazards, like wildfires, flash floods, and landslides or debris flows. This hazard is of particular concern in Pennsylvania due to the prevalence of farms and other water-dependent industries, water-dependent recreation uses, and residents who depend on wells for drinking water (National Drought Mitigation Center (NDMC), 2025; Ready.gov 2025).

4.4.1.1 Location and Extent

Droughts are regional climatic events, so they typically impact all communities in a relatively uniform fashion with only minor localized variations in rainfall events. Droughts often occur across county boundaries, affecting large areas of Pennsylvania at the same time. Therefore, a drought would affect all of Bucks County, with the largest impact being on areas of the county with extensive agriculture uses.

Locations of droughts nationwide are monitored continuously by USGS, and the PA DEP monitors conditions throughout the state. Maps showing locations currently experiencing drought conditions are posted on various websites (including http://waterwatch.usgs.gov) and show locations where stream flow is below normal and where drought conditions exist or are emerging.

4.4.1.2 Range of Magnitude

Drought is a normal part of 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. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought. Hydrologic drought events result in a reduction of stream flows, reduction of lake/reservoir storage, and a lowering of groundwater levels. When a drought becomes severe, it can events have adverse impacts on the quantity and quality of drinking water supply, agricultural operations, soil moisture, conditions conducive to wildfire events, and surface water for navigation and recreation.

The PA DEP monitors water-supply-drought conditions, using data on precipitation, streamflow, groundwater levels, and the Palmer Drought Index, an indicator of soil dryness. This index is based on several meteorological and hydrological factors, including temperature and soil moisture levels, and is computed weekly by the National Weather Service's Climate Prediction Center (see Table 4.1-1). The index compares precipitation received against the average amount expected during that period. Droughts are expressed as negative numbers. Palmer values of -2.00 to -2.99 indicate a watch status; values of -3.00 to -3.99 indicate a warning; and values of -4.00 and less indicate an emergency.

Table 4.4.1-1 Palmer Drought Severity Index (PDSI) classifications (NOAA, 2025).

Palmer Drought Severity Index	
Index	**Description of Conditions**
4.0 or more	Extremely moist
3.0 to 3.9	Very moist spell
2.0 to 2.9	Unusual Moist Spell
-1.9 to 1.9	Near normal
-2.0 to -2.9	Moderate drought
-3.0 to -3.9	Severe drought
-4.0 or less	Extreme drought

Phases of drought preparedness in Pennsylvania, in order of increasing severity, are:

Drought Watch: A period to alert government agencies, public water suppliers, water users and the public regarding the potential for future drought-related problems. The focus is on increased monitoring, awareness and preparation for response if conditions worsen. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water use by 5 percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.

Drought Warning: This phase involves a coordinated response to imminent drought conditions and potential water supply shortages through concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources, develop new sources, and if possible, forestall the need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water use by 10-15 percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.

Drought Emergency: This stage is a phase of concerted management operations to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses and to avoid unnecessary economic dislocations. It is possible during this phase to impose mandatory restrictions on non-essential water uses that are provided in the Pennsylvania Code (Chapter 119), if deemed necessary and if ordered by the Governor of Pennsylvania. The objective of water use restrictions (mandatory or voluntary) and other conservation measures during this phase is to reduce consumptive water use in the affected area by fifteen percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies.

Local Water Rationing: Although not a drought phase, local municipalities may, with the approval of the PA Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of the Pennsylvania Code (Chapter 120), require specific limits on individual water consumption to achieve significant reductions in use. Under both mandatory restrictions imposed by the Commonwealth and local

water rationing, procedures are provided for granting of variances to consider individual hardships and economic dislocations.

Droughts can have varying effects, depending upon what month they occur, severity, duration and location. Some droughts have their greatest impact on agriculture and even short-term droughts, when coupled with extreme temperatures can be devastating. Others may impact water supply or other water use activities such as recreation. Most droughts cause direct impacts to aquatic resources. Drought events are defined by rainfall amounts, vegetation conditions, soil-moisture conditions, water levels in reservoirs, stream flow, agricultural productivity, or economic impacts.

One of the most severe secondary hazards associated with drought is wildfire. Prolonged dry conditions create ideal environments for fires to ignite and spread rapidly, particularly in wooded areas and agricultural landscapes. These fires not only pose immediate threats to human safety and infrastructure but also result in long-term damage to natural ecosystems and farm production facilities.

Drought can also drive significant ecological and environmental changes. As vegetation dries out, landscapes may experience an increase in flammable scrub growth, reducing plant diversity. And the weakening of root systems that help anchor soil - contributing to soil erosion and flash flooding when rains do return.

The environmental impacts of drought are wide-ranging and interconnected. Hydrologic effects include lower water levels in reservoirs, lakes, and ponds; reduced streamflow; groundwater depletion and land subsidence; and the loss of wetlands and estuarian ecosystems. Water quality may also deteriorate due to increased concentrations of salts, elevated water temperatures, and reduced dilution of pollutants. Drought can cause profound stress to animal populations, resulting in reduced access to food and water, increased susceptibility to disease, and the migration or concentration of species in shrinking habitats. Plant communities suffer as well, with reduced biodiversity and the decline of urban trees and wooded conservation areas. Air quality may decline due to increased dust and the accumulation of airborne pollutants, further impacting respiratory health. Drought also contributes to a loss of soil quality and can degrade the aesthetic and ecological value of landscape as vegetation dies and erosion accelerates.

In Bucks County, concerns persist around the concentration of Perfluorooctanoic Acids (PFOAs) in soil and groundwater. As drought intensifies, water sources shrink and evaporate, allowing existing contaminants to become more concentrated in wells and soil, increasing the risk of exposure to hazardous chemicals. Elevated nitrate levels, which may also occur under these conditions, can pose serious health risks – particularly for pregnant women and young children.

In some cases, these hazards can compound, creating a cascading effect where drought not only damages the environment directly, but also undermines public health, regional biodiversity, and community resilience.

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

Table 4.4.1-2 Most Likely Lifelines Impacted by Drought

Lifelines	Notes
	Drought impacts both water supply and wastewater systems when demand outstrips supply.
	Crops may be lost and there are water regulation concerns.
	Food and water shortages could exacerbate health challenges, especially for food-vulnerable populations.

4.4.1.3 Previous Occurrence

Pennsylvania DEP maintains the most comprehensive data on drought occurrences across Pennsylvania. According to the DEP, between 1930 and 1994, the Commonwealth of Pennsylvania experienced five significant droughts: 1930-1934, 1939-1942, 1953-1955, 1961-1967, and 1991-1992. From 1999 through early 2003, Pennsylvania experienced a severe drought (per the PA DEP). A summary of declared drought status for Bucks County, Pennsylvania between November 1980 and February 2021 shows that the county experienced 16 drought watches, 22 drought warnings, and 10 drought emergencies during this period (PASHMP, 2023).

The worst drought event in recent history in Bucks County occurred in July of 1999. The County only received about seventy-five percent of expected rainfall between April and September (Penn State College of Agricultural Sciences, October 2, 2010). A drought warning was issued, and residents were encouraged to conserve water due to low level of ground and surface water, reducing the overall water supply (USGS, 2000). On July 20, 1999, a drought emergency was issued, restricting residents from using water to water lawns, wash cars, fill swimming pools, and operate water fountains. Residents who relied on personal water wells repotted water whenever possible. Local sports were canceled due to field conditions (PSD, 2000). Both the Governor's Proclamation and the President's Declaration of Major Disaster were announced due to the severity of the drought. Many staple crops such as corn, hay, and soybeans were reduced to ten percent of the normal yield. Fruits, vegetables, and pastureland were impacted, along with dairy farms, which had to purchase water to survive the drought. This drought event not only affected Bucks County but the whole of Pennsylvania (Pennridge School District, 2011).

Declared drought status for Bucks County from 1980 to 2025, the most recent data available from the DEP, is shown in Table 4.4.1-3, Past Drought Events in Bucks County. Descriptions for drought status categories (i.e. watch, warning, and emergency) are included above in Section 4.4.1.

Table 4.4.1-3 Past Drought Events in Bucks County (PA DEP, 2025)

Date	Drought Status	Date	Drought Status
11/18/1980 – 4/20/1982	Emergency	12/5/2001 – 2/12/2002	Warning
11/10/1982 – 3/28/1983	Warning	2/12/2002 – 6/14/2002	Emergency
1/23/1985 – 4/26/1985	Warning	6/14/2002 – 9/5/2002	Warning
4/26/1985 – 12/19/1985	Emergency	9/5/2002 – 11/7/2002	Emergency
7/7/1988 – 12/12/1988	Watch	11/7/2002 – 12/19/2002	Warning
3/3/1989 – 5/15/1989	Warning	4/11/2006 – 6/30/2006	Watch
9/13/1991 – 9/11/1992	Warning	10/5/2007 – 2/15/2008	Watch
9/11/1992 – 1/15/1993	Watch	9/16/2010 – 11/10/2010	Warning
9/1/1995 – 9/20/1995	Warning	8/5/2011 – 9/2/2011	Watch
9/20/1995 – 11/8/1995	Emergency	11/3/2016 – 5/16/2017	Watch
11/8/1995 – 12/18/1995	Warning	8/31/2022 – 10/17/2022	Watch
10/27/1997 – 1/16/1998	Warning	6/15/2023 – 1/26/24	Watch
12/3/1998 –12/14/2998	Watch	11/2/2024 – 6/9/2025	Watch
12/14/1998 – 3/15/1999	Warning		
3/15/1999 – 6/10/1999	Watch		
6/10/999 – 6/20/1999	Warning		
7/20/1999 – 9/30/1999	Emergency		
9/30/1999 – 5/5/2000	Watch		
11/6/2001 – 12/5/2001	Watch		

According to the Palmer Drought Severity Index classifications, between 1900 and 2025, Bucks County experienced between 26 and 30 drought years, which is defined as at least one summer month (June, July, August) in moderate or worse drought (PMDI <= -2.00). Data provided by Cornell University shows that drought conditions in the Southeastern Piedmont region of Pennsylvania, where Bucks County is located, have resulted in Palmer Drought Severity Index level as low as -5.21. This was during a drought that lasted for twenty-five months from 1964 - 1966. In the Southeastern Piedmont region, on average, 44.4% of the time is classified in the wet category, with the second highest percentage of time spent in the near normal category at 17.2% (NRCC, 2021).

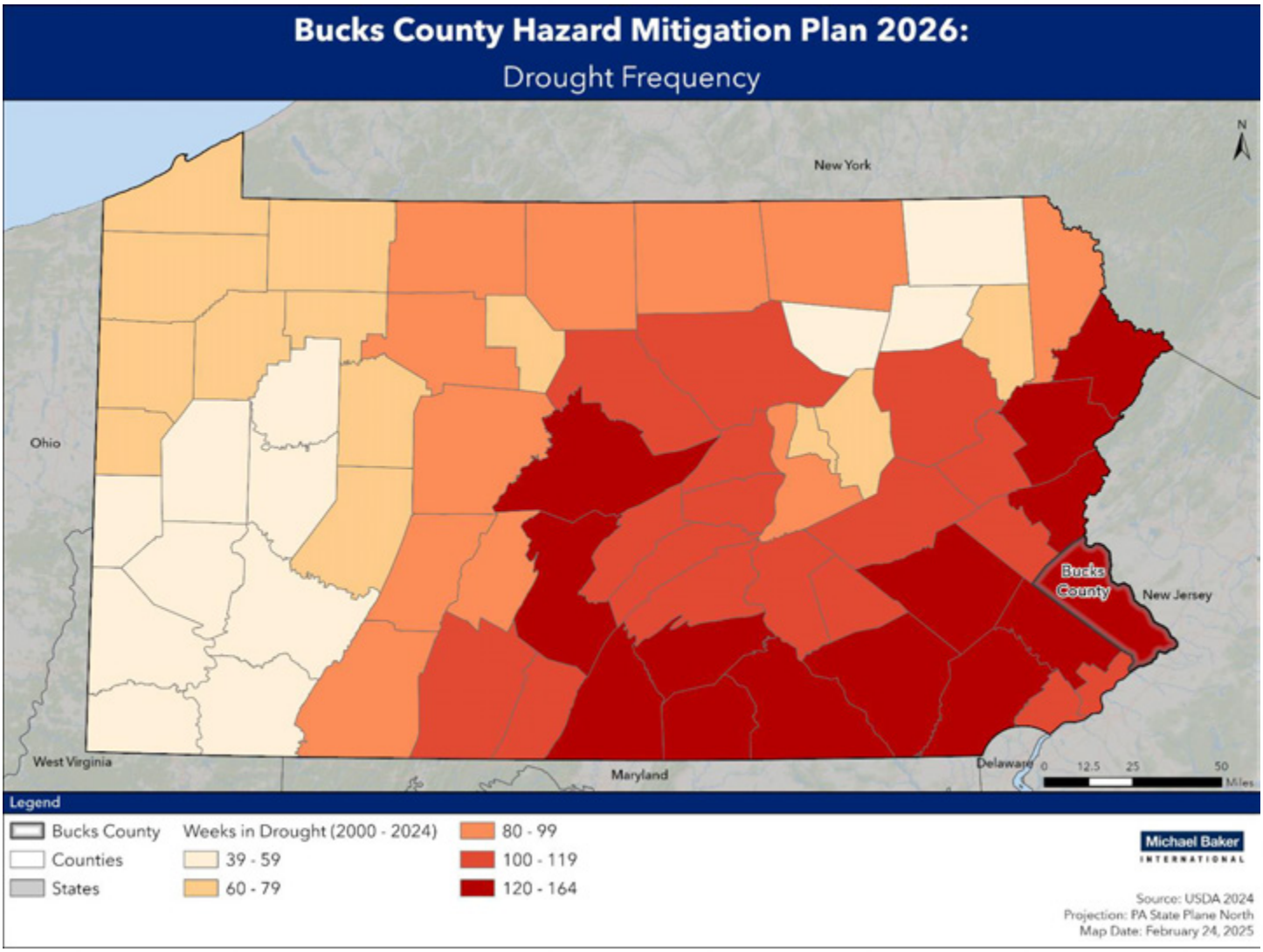
Most recently, a drought watch stretched from November 2024 to June 2025. Since the previous hazard mitigation plan, there has not been a severe drought for any communities in Bucks County.

As seen in the table above, Bucks County has not had a severe drought since 2023. In addition to these documented times of drought, a burn ban was issued for Bucks County on April 16, 2006 due to extremely dry weather conditions.

One way to measure the magnitude of a drought is through the PDSI. This index is based on several meteorological and hydrological factors, including temperature and soil moisture levels, and is computed weekly by the NWS's Climate Prediction Center. The index compares precipitation received against the average amount expected during that period. Droughts are expressed as negative numbers. Palmer values of -2.00 to -2.99 indicate a watch status; values of -3.00 to -3.99 indicate a warning; and values of -4.00 and less indicate an emergency.

According to the PDSI, Bucks County spent 120 and 164 weeks in drought between 2000 and 2024. Figure 4.4.1-1 displays these findings and Bucks County in relation to other areas in Pennsylvania.

Figure 4.4.1-1 Drought Frequency in Pennsylvania and Bucks County from 2000-2024.



4.4.1.4 Future Occurrence

It is difficult to forecast the exact severity and frequency of future drought events in Bucks County, but the County Hazards and Vulnerability Analysis (HVA) reports that droughts have become more frequent in recent years, and the demand for water is ever increasing (National Integrated Drought Information System, 2021). Based on national data from 2000 through 2024, Bucks County has had over 120 'Weeks in Drought', represented by the darkest red color in Figure 4.1-1. This figure map illustrates that Bucks County, highlighted with a blue border, is in the zone of the Commonwealth with highest drought prevalence; along with many of the other Commonwealth Counties in the Southeast and Central portions of Pennsylvania. Therefore, the future occurrence of drought for Bucks County can be considered likely as defined by the Risk Factor methodology probability criteria (see Table 4.6-1).

Climate change is altering precipitation patterns and increasing the frequency and severity of extreme weather events in Bucks County. While total annual rainfall may be expected to increase, this trend is accompanied by greater variability in weather patterns –resulting in longer dry spells punctuated by more intense storms. This shift means that even as the region receives more rainfall overall, the water may come in shorter, more intense bursts that quickly run off the landscape rather than replenishing soil moisture and groundwater supplies. As a result, the risk of drought persists and may even grow, particularly during the hot summer months when evaporation rates are higher and water demand peaks.

This increased variability contributes to what is known as 'flash droughts' – short-term droughts that develop quickly and can catch communities and ecosystems off guard. Bucks County may be particularly vulnerable due to its mix of suburban development, agricultural areas, and sensitive ecosystems that rely on consistent moisture levels. In addition, higher temperatures associated with climate change can worsen drought conditions by accelerating evaporation from soils, waterways, and vegetation. These combined factors heighten drought risk in the region, challenging water resource management, stressing natural systems, and increasing the potential for secondary hazards like wildfires and water quality degradation.

Drought can also accompany extreme heat events. As the average temperature increases in Bucks County, drought events could also increase. Additional information regarding climate change in the past as well as future climate change predictions can be located in Section 4.4.4.

The Climate Mapping for Resilience and Adaptation (CMRA) Tool provides county-level assessment reports for certain hazards, including drought. As of December 2025, the tool estimates the annual maximum consecutive dry days is projected to increase from 11.5 days historically to 12 days by mid-century and 12.7 days by end-of-century under a high emissions scenario.

Figure 4.4.1-2 Bucks County Drought Hazard Assessment Report (CRMA, 2025).

Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		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:							
Average annual total precipitation	**46"** 44 - 48	**48"** 44 - 53	**49"** 44 - 53	**49"** 45 - 56	**49"** 45 - 54	**50"** 44 - 55	**51"** 45 - 58
Days per year with precipitation (wet days)	**181 days** 176 - 186	**181 days** 172 - 191	**181 days** 166 - 190	**180 days** 167 - 193	**179 days** 161 - 193	**180 days** 167 - 191	**177 days** 151 - 195
Days per year with no precipitation (dry days)	**184 days** 179 - 189	**184 days** 174 - 193	**185 days** 175 - 199	**185 days** 172 - 198	**186 days** 172 - 204	**185 days** 174 - 198	**188 days** 171 - 214
Maximum number of consecutive dry days	**11 days** 11 - 13	**12 days** 10 - 14	**12 days** 11 - 15	**12** days 11 - 15	**12 days** 11 - 15	**12 days** 11 - 15	**13 days** 11 - 16
Temperature thresholds:							
Annual days with maximum temperature > 90 °F	**13 days** 13 - 19	**33 days** 19 - 44	**35 days** 20 - 49	**43 days** 21 - 61	**52 days** 26 - 68	**52 days** 28 - 77	**83 days** 37 - 105
Annual days with maximum temperature > 100 °F	**0 days** 0 - 0	**2 days** 0 - 6	**2 days** 1 - 6	**3 days** 1 - 10	**6 days** 1 - 14	**6 days** 1 - 10	**20 days** 2 - 46

N/A = Data Not Available for the selected area

4.4.1.5 Vulnerability Assessment

Bucks County faces increasing vulnerability to drought due to a combination of shifting climate patterns, land use pressures (including agricultural land, water dependent industry, and recreational uses within Bucks), and aging infrastructure. Although the county lies within a relatively water-rich region bordering major waterways, climate change has introduced greater precipitation variability, including longer dry spells and more erratic rainfall. These trends make the county more susceptible to short-and medium-term droughts, which can arise quickly and strain both natural and built systems. Bucks County's mix of urban, suburban, and rural communities, each with unique water demands and infrastructure needs, amplifies the challenge of preparing for and responding to drought conditions.

The county's vulnerability is further heightened by its dependencies on groundwater and surface water resources which may not be resilient to rapid changes in recharge or flow. Compounded by expanding development and impervious surfaces that limit filtration, even moderate drought can have outsized effects on ecosystems, agriculture, and human health. Communities with private wells, limited access to emergency water sources, or legacy pollution concerns may be especially at risk.

Agriculture & Food Supply

The USDA Census of Agriculture, conducted once every five years, produces a summary of agricultural value, sales, and farm attributes, most recently released in 2022. According to this most recent data, Bucks County makes up 1% of state agricultural sales, with production totaling $98.3 million in market value (USDA, 2022). About 62 percent of this total is the production of crops, including nursery and greenhouse crops; the remaining agricultural production is made up of vegetables, fruits, livestock, poultry, and their products (USDA, 2022). The county ranks 7th in nursery, greenhouse, floriculture, and sod and 37th in grains, oilseeds, dry beans, and dry peas in Pennsylvania by sales value. Other important crops in Bucks County include fruits, tree nuts, and berries; vegetables, melons, potatoes, and sweet potatoes; and the sale of livestock, such as cattle and calves and milk from cows (USDA, 2022). See Figure 4.1.1-2, Agricultural Land Use in Bucks County, for an understanding of where these farms are located throughout the county.

Agriculture is a vital part of Bucks County's economy and cultural landscape, encompassing both large-scale operations and small family farms. However, the sector is highly sensitive to drought. Periods of low precipitation reduce soil moisture, hinder crop generation and growth, and diminish pasture productivity. Livestock operations are similarly affected by reduced feed quality and water availability. Because many farms in the region depend on rainfall rather than extensive irrigation infrastructure, even short-term droughts can lead to significant yield losses and income instability.

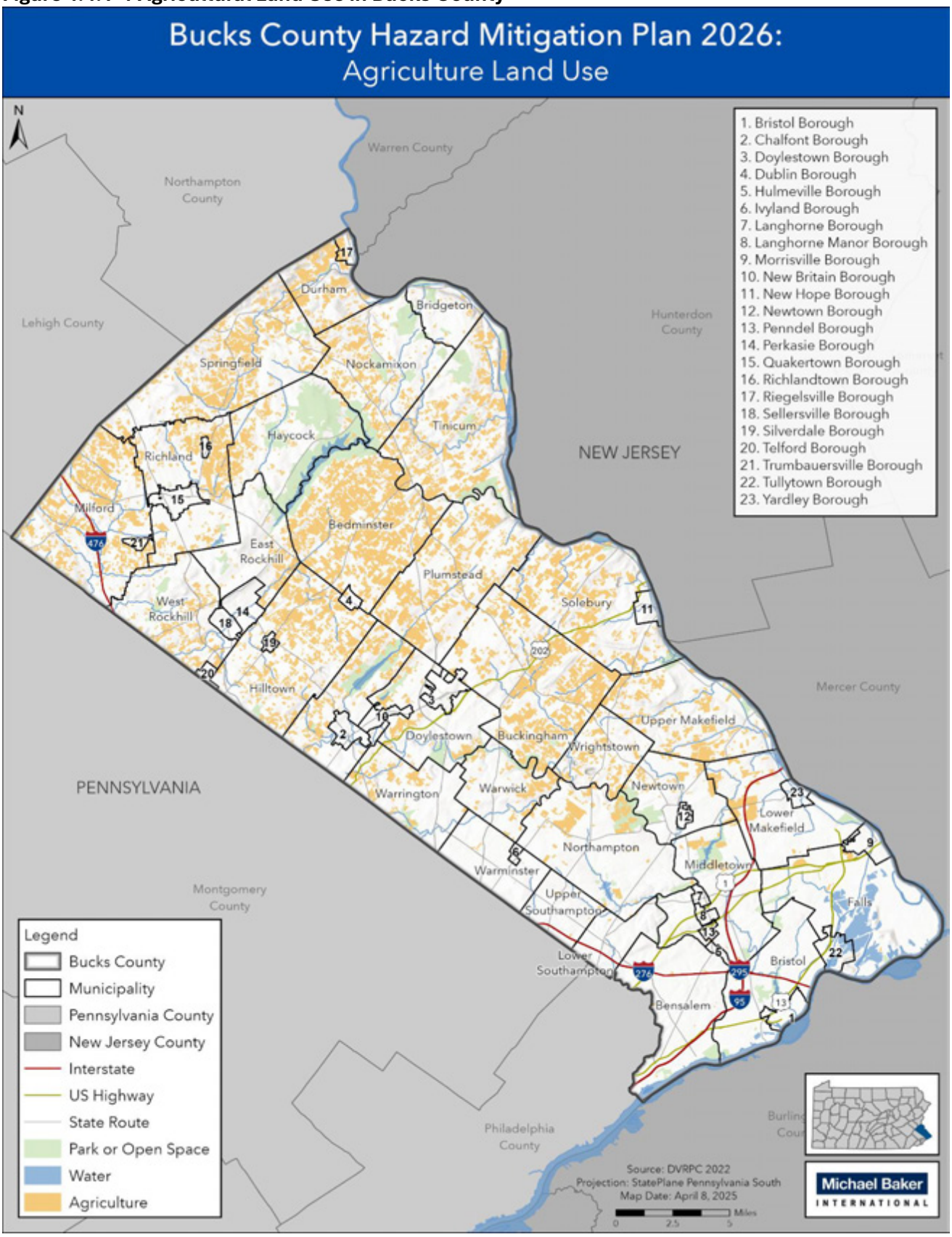
Drought also threatens the long-term viability of local food systems. Reduced production may increase reliance on imports, disrupt seasonal farmers markets, and raise food prices. Additionally, stress on agriculture may accelerate land use changes, as struggling farms face pressure to sell or convert land to residential or commercial development, potentially creating a feedback loop that increases the region's vulnerability.

Figure 4.4.1-3 Top Livestock Inventory Items in Bucks County (USDA, 2022)

Livestock	Count
Layers	15,454
Broilers and other meat-type chickens	10,081
Cattle and calves	6,638
Pullets	3,071
Horses and ponies	1,886
Sheep and lambs	1,813
Goats	997
Hogs and pigs	899

Prolonged drought would affect the 871 farms located in Bucks County, which sold approximately $98,316,000 in agricultural products in 2022, a market growth of about 30% since 2017 (USDA, 2022). The top crop assortment in Bucks County is nursery, greenhouse, floriculture, and sod, which totaled $33,444,000 in sales in 2022, a market share currently making Bucks 7th in the state for these products (USDA, 2022). According to the USDA 2022 Census of Agriculture, most sales to date have come from crop sales, totaling $61,411,000. Livestock sales made up the remaining portion, with $36,905,000 in sales as of 2022.

Figure 4.4.1-4 Agricultural Land Use in Bucks County



Water Supply

Bucks County's water supply comes from a mix of groundwater wells, local streams, and surface reservoirs. During droughts, these sources can become stressed as natural recharge rates decline and demand—especially for irrigation, landscaping, and cooling –intensifies. Rural areas that depend on private wells may face more immediate risks of water shortages, while municipal systems may need to impose conservation measures or find alternative sources under drought-stressed conditions.

Drought also compounds existing water quality issues. Reduced streamflow and groundwater levels can concentrate pollutants such as nitrates, heavy metals, or legacy contaminants like perfluorooctanoic acids (PFOAs) which have been an ongoing concern in parts of the Commonwealth and parts of Bucks County. Lower water levels in reservoirs and rivers can also lead to higher temperatures and lower oxygen levels, affecting aquatic ecosystems and complicating water treatment processes.

Many residents of Bucks County rely on domestic wells for their primary water access. Drought can significantly impact domestic water wells by lowering the water table, potentially causing wells to run dry or produce reduced yields. As water levels drop, wells may also draw in sediment or concentrated contaminants highlighted above, which exacerbate water quality issues and have the potential to impact household health and safety. Table 4.4.1-4 displays the number of domestic wells by Bucks County municipality. It is important to note that this well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS), which relies on voluntary submissions of well record data by well drillers; as a result, is not a complete database of all domestic wells in the County but is the most complete dataset of domestic wells available. As seen in Table 4.1-3, the municipalities with the highest number of domestic wells are Buckingham, Doylestown Township, Plumstead, and Bristol Townships.

Table 4.4.1-4 Reported Wells in Bucks County (PaGWIS, DCNR, 2025)

Municipality	Number of Reported Domestic Wells
Bedminster Township	410
Bensalem Township	585
Bridgeton Township	184
Bristol Borough	99
Bristol Township	711
Buckingham Township	1,132
Chalfont Borough	46
Doylestown Borough	138
Doylestown Township	826
Dublin Borough	66
Durham Township	63
East Rockhill Township	343
Falls Township	431
Haycock Township	267
Hilltown Township	457
Hulmeville Borough	25
Ivyland Borough	18
Langhorne Borough	11
Langhorne Manor Borough	4
Lower Makefield Township	175
Lower Southampton Township	200
Middletown Township	382
Milford Township	516

Municipality	Number of Reported Domestic Wells
Morrisville Borough	49
New Britain Borough	71
New Britain Township	301
New Hope Borough	82
Newtown Borough	8
Newtown Township	129
Nockamixon Township	401
Northampton Township	664
Penndel Borough	58
Perkasie Borough	84
Plumstead Township	746
Quakertown Borough	117
Richland Township	402
Richlandtown Borough	11
Riegelsville Borough	4
Sellersville Borough	43
Silverdale Borough	12
Solebury Township	669
Springfield Township	498
Telford Borough	7
Tinicum Township	453
Trumbauersville Borough	23
Tullytown Borough	51
Upper Makefield Township	700
Upper Southampton Township	244
Warminster Township	588
Warrington Township	384
Warwick Township	311
West Rockhill Township	276
Wrightstown Township	356
Yardley Borough	22
TOTAL	**14,853**

While the impact of drought is concerning, Bucks County has the support of many agencies that administer programs to mitigate hazards associated with water supply sources and systems. These agencies represent a supportive network that helps protect Bucks County's water from the negative impacts of drought and other hazards. The Bucks County Comprehensive Plan outlines county-wide capability and assets that are potentially vulnerable to drought; assets are addressed in the following paragraphs.

Although the greatest amount of groundwater obtained in Bucks County is from wells, springs are a significant source of water supply in a few instances (e.g. Riegelsville Borough and Springfield Township) (BCPC, 2011a). In addition, many of the Bucks County water suppliers obtaining water from surface sources also use wells to augment available water supplies or have wells available for emergency backup.

Bucks County has seen an increase in groundwater demand due to development occurring in areas served by public water supplies which withdraw mainly from surface water sources. Locally, these sources include the Delaware River, North Branch Neshaminy Creek, Pine Run, and man-made impoundments on some smaller streams within the county. Other sources of surface water in the county include the Ironworks Reservoir on Ironworks Creek in Northampton Township and the Smoketown Creek catch basin located on a tributary to Three Mile Run in West Rockhill Township. Many of the municipal wastewater treatment plants within Bucks County have been upgraded to

provide advanced secondary treatment, and many Bucks municipalities now have industrial pretreatment ordinances requiring industries to treat wastewater before releasing into a public wastewater treatment system. Therefore, the cleanup of industrial and municipal wastewater has helped ensure the integrity of local surface water supply systems.

The economic impact of drought in Bucks County can ripple across multiple sectors. Agriculture and landscaping industries are directly affected through lost revenue, higher costs, and reduced productivity. Homeowners and businesses may also experience increased costs through water restrictions or the need to upgrade or repair failing wells. In extreme cases, drought conditions can affect property values and insurance costs, particularly in areas facing recurring water stress.

Indirectly, the county may see economic strain from reduced tourism or outdoor recreation if natural areas throughout Bucks suffer from drought-induced degradation, wildfires, or poor air and water quality. Local governments may need to divert resources to manage emergency responses, water conservation programs, or infrastructure upgrades—expenditures that can stress municipal budgets and limit investment in other community priorities.

4.4.1.6 Equity in Vulnerable Communities

Individuals that rely on wells are uniquely vulnerable to drought. Additionally, industries that rely on potable water, such as farming, would be vulnerable. In Bucks County, both households that rely on wells, as well as farms, are interspersed across the county.

4.4.2 Earthquake

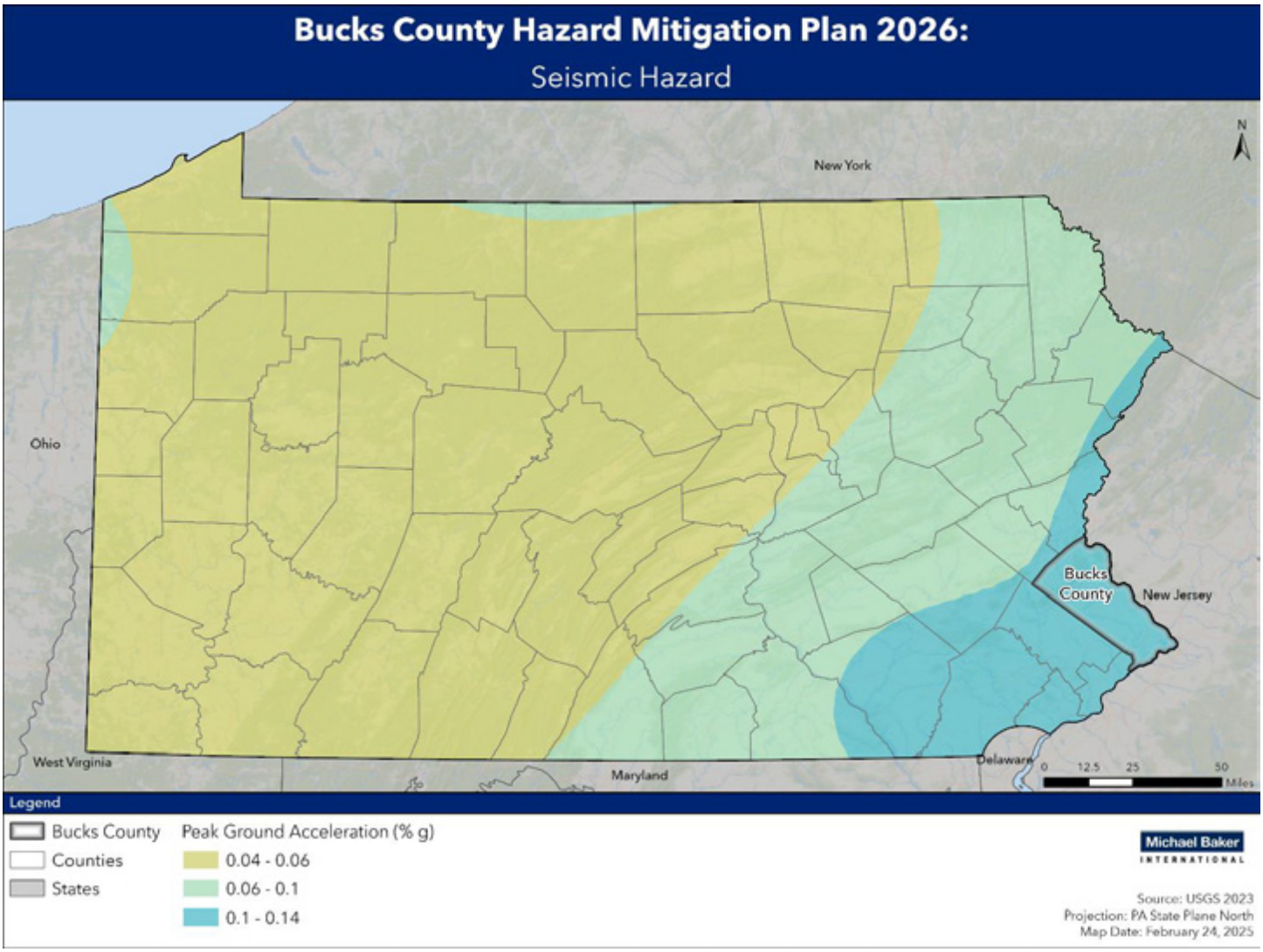
An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands 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, 2025).

4.4.2.1 Location and Extent

The closest fault line that might contribute to an earthquake in Bucks County is the Mid-Atlantic Ridge, which is approximately 2,000 miles to the east of Pennsylvania. As regional hazards, an earthquake would affect all of Bucks County. Earthquakes can cause damage to buildings and other rigid superstructures, depending on factors like earthquake magnitude, distance of local areas to the earthquake epicenter, and local geologic conditions. It remains incredibly difficult to predict when and where an earthquake will occur in the northeast U.S. and Pennsylvania.

Earthquake events in Pennsylvania typically do not impact areas greater than 100 km (62 miles) from the epicenter, and earthquake epicenters in Bucks County are rare. The area is generally not known for seismicity, and USGS downgraded the probabilistic seismic hazard for much of Pennsylvania in 2014. Figure 4.3.2-1 shows the earthquake hazard in Pennsylvania and Bucks County, expressed as the two-percent probability of exceedance in 50 years of peak ground acceleration (g). The following map was digitized from the National Seismic Hazard report. The County is located in the 0.1 to .14 zone, indicating that the potential for a quake is moderate. However, earthquakes originating outside Pennsylvania can affect Bucks County, though they are not expected to cause significant damage.

Figure 4.4.2-1 Seismic Hazard Map



4.4.2.2 Range of Magnitude

There are several different ways of describing the magnitude of an earthquake. One method measures peak ground acceleration. Peak ground acceleration is the maximum horizontal ground acceleration measured in centimeters per second per second (cm/sec^2). Peak ground acceleration can range from zero for an earthquake that is noticed by very few people to 350, which would be categorized as a catastrophic event. A peak ground acceleration of 10 cm/sec2 means that the shaking is equivalent to about one percent of the acceleration due to gravity. Generally, ground acceleration must exceed 15 cm/sec^2 for significant damage to occur. Bucks County, as discussed above, located in the 0.1 peak ground acceleration zone.

Earthquake magnitude is also often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. Table 4.4.2-1 below summarizes Richter Scale Magnitudes as they relate to the spatial extent of impacted areas. Pennsylvania has not experienced any earthquakes with a magnitude greater than 6.0.

Table 4.4.2-1 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 in areas where people live up to about 100 kilometers across.
7.0-7.9	Major earthquake. Can cause serious damage over large areas.
8.0 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

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. Therefore, another way of measuring the intensity of an earthquake is the Modified Mercalli Intensity Scale. Measures on this scale range from I, an earthquake that is not generally noticeable, to XII, an earthquake that causes complete destruction. Table 4.4.2-2 below summarizes Modified Mercalli Intensity Scale impacts of earthquake events, measured in terms of earthquake intensity.

Recent earthquakes in Pennsylvania have been measured from IV to VI on the Modified Mercalli Intensity Scale. However, since the worst earthquake recorded in Pennsylvania was a magnitude 5.2, a worst-case scenario for this hazard would be if an earthquake of similar magnitude occurred in or around Bucks County near a populated area.

Table 4.4.2-2 Modified Mercalli Intensity Scale with Associated Impacts

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs.	<4.2
II	Feeble	Some people feel it.	<4.2
III	Slight	Felt by people resting; like a truck rumbling by.	<4.2
IV	Moderate	Felt by people walking.	<4.2
V	Slightly Strong	Sleepers awake; church bells ring.	<4.8
VI	Strong	Trees sway; suspended objects swing; objects fall off shelves.	<5.4
VII	Very Strong	Mild alarm, walls crack, plaster falls.	<6.1
VIII	Destructive	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged.	<6.9
IX	Ruinous	Some houses collapse, ground cracks, pipes break open.	<6.9
X	Disastrous	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread.	<7.3
XI	Very Disastrous	Most buildings and bridges collapse, roads, railways, pipes, and cables destroyed, general triggering of other hazards.	<8.1
XII	Catastrophic	Total destruction, trees fall, ground rises and falls in waves.	>8.1

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

Table 4.4.2-3 Community Lifelines Impacted by Earthquakes

Most Likely Lifelines Impacted by Earthquakes	
Lifelines	Notes
	Shelters may be affected depending on severity. Higher earthquake building standards can aid in mitigation.
	Personnel will likely be overutilized in response and recovery, leading to potential gaps in capability.
	Pipelines may be affected. Mitigation includes requiring earthquake-resistant maintenance, design and construction standards.

4.4.2.3 Previous Occurrence

There have been 12 earthquake epicenters recorded in Bucks County up to the present, listed in Table 4.4.2-4. No earthquakes have occurred in Bucks County since the 2021 HMP Update. Most were minor with magnitudes below 3 on the Richter scale. As a result, their impacts were unlikely to be felt by county residents. However, earthquakes from well outside the county boundaries can have a significant impact as well. In 2011, a magnitude 5.8 earthquake with an epicenter in rural Louisa County, VA was felt throughout Pennsylvania, triggering evacuations, emergency bridge and tunnel inspections, and minor damage to buildings. While earthquake epicenters have been concentrated in Lower Bucks, there are also concentrations in nearby Berks and Lancaster Counties. In recent years, the majority of earthquake epicenters located in counties surrounding Bucks County have been around a magnitude of 2 to 3.

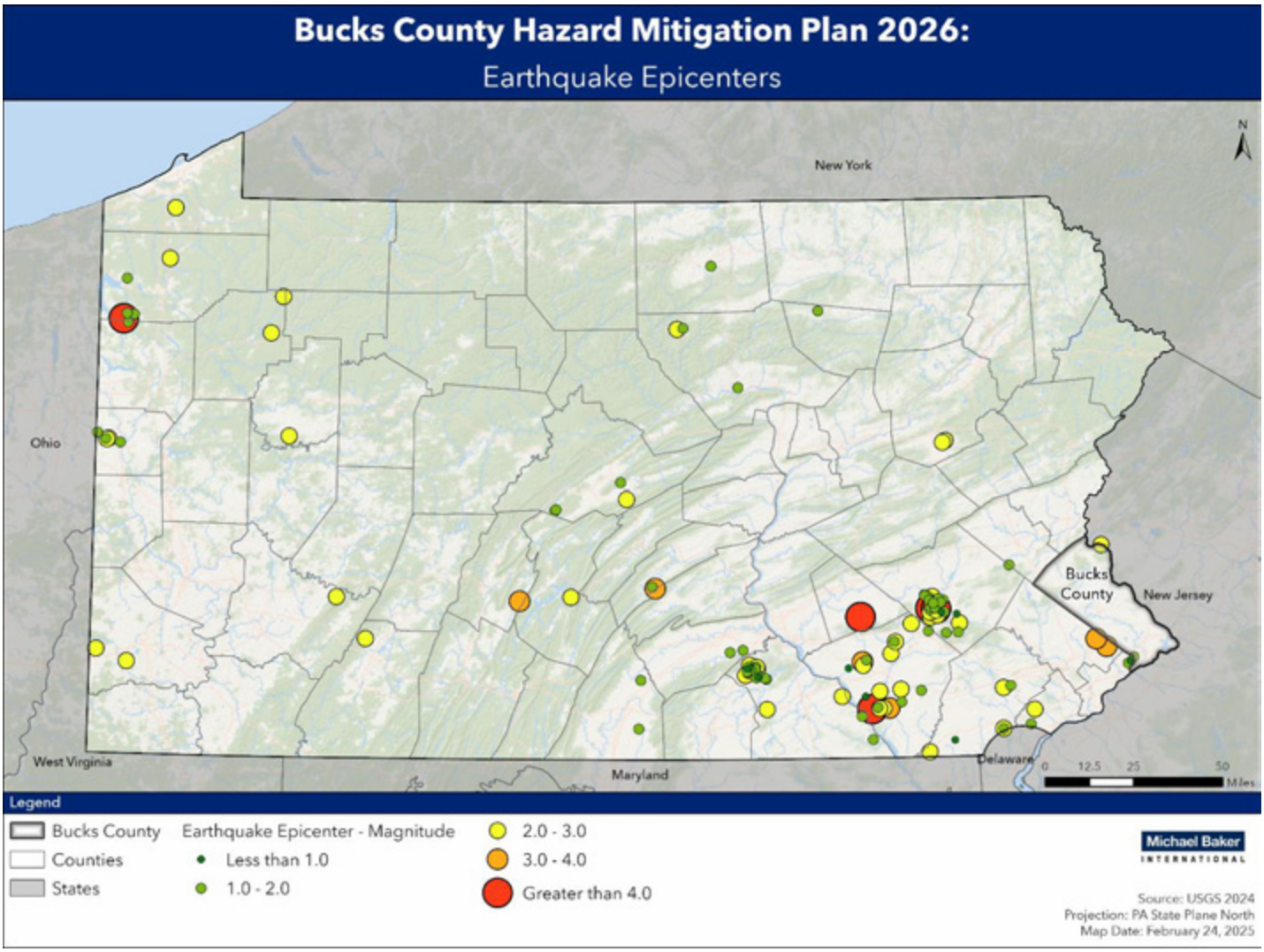
Table 4.4.2-4 Earthquake Epicenters Identified in Bucks County (USGS, 2021a)

Municipality	Date	Magnitude
Bristol Township	12/27/1961	3.3
Upper Southampton Township	3/2/1980	2.8
Ivyland Borough	3/5/1980	3.1
Northampton Township	3/11/1980	2.8
Warwick Township	5/2/1980	3
Langhorne Borough	5/2/1980	2.8
Penndel Borough	5/12/1982	2.4
Perkasie Borough	2/2/1989	Unknown
Milford Township	5/15/1992	1.6
Village of Pineville	3/11/1997	1.6
Bucks County near New Jersey	10/1/2003	2.2

Table 4.4.2-4 Earthquake Epicenters Identified in Bucks County (USGS, 2021a)

Municipality	Date	Magnitude
Greater Philadelphia Area (Bucks, Chester, Delaware, Montgomery and Philadelphia Counties)	10/25/2013	1.14

Figure 4.4.2-2 Bucks County and Pennsylvania Seismic Hazard and Earthquake History (USGS 2025).



4.4.2.4 Potential for Future Occurrence

The probability of a significant earthquake event occurring in Bucks County is very low. Bucks County does not sit on any fault lines; therefore, it is reasonable to believe that the County will not experience earthquake damage anytime soon. The future occurrence of significant earthquakes can be considered unlikely as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1).

4.4.2.5 Vulnerability Assessment

All structures and infrastructure in Bucks County are equally at risk of experiencing an earthquake. However, in a mild earthquake of the magnitude typically experienced in Pennsylvania, no structural damage is anticipated. In other cases, damages are expected to be limited, and examples of anticipated damages 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, pipeline failures, and utility interruptions. A very large earthquake affecting Bucks County 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.

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 Bucks County due to earthquake, damages are estimated to be limited to the more dilapidated structures and structures with unreinforced masonry. As shown in Table 4.4.2-5, 26,783 homes were built prior to 1940 in Bucks County (US Census, 2019). The Table below shows the number of homes built before 2000.

All future structures will also have the potential to experience an earthquake. However, given that new structures must meet current building codes and given the expected magnitude of earthquakes in the County, no property damage is anticipated.

Table 4.4.2-5 Year Structure Built in Bucks County (US Census, 2019)

Year	Number of Homes	Percent of Homes
1939 or earlier	26,783	10.7%
1940-1949	8,605	3.4%
1950-1959	43,374	17.3%
1960-1969	30,110	12.0%
1970-1979	40,424	16.1%
1980-1989	37,754	15.1%
1990-1999	34,121	13.6%

Table 4.4.2-6 Age of Housing Units in Bucks County (US Census, 2019)

Municipality	Number of Housing Units Built Prior To 1940	Percent of Total Housing Units	Municipality	Number of Housing Units Built Prior To 1940	Percent of Total Housing Units
Bedminster Township	369	13.0%	Newtown Borough	509	51.0%
Bensalem Township	1,059	4.2%	Newtown Township	132	1.6%
Bridgeton Township	256	42.2%	Nockamixon Township	378	23.4%
Bristol Borough	2,416	57.7%	Northampton Township	336	2.3%
Bristol Township	1,556	7.4%	Penndel Borough	106	9.0%
Buckingham Township	687	9.0%	Perkasie Borough	1,172	34.5%
Chalfont Borough	175	9.9%	Plumstead Township	576	10.8%
Doylestown Borough	1,179	28.7%	Quakertown Borough	1,374	38.3%
Doylestown Township	289	4.6%	Richland Township	479	9.0%
Dublin Borough	182	19.5%	Richlandtown Borough	214	43.7%
Durham Township	128	26.6%	Riegelsville Borough	239	58.4%
East Rockhill Township	327	15.9%	Sellersville Borough	598	33.9%
Falls Township	429	3.2%	Silverdale Borough	51	20.5%
Haycock Township	120	13.4%	Solebury Township	763	19.3%
Hilltown Township	724	12.7%	Springfield Township	671	31.4%
Hulmeville Borough	151	41.6%	Telford Borough	133	12.8%
Ivyland Borough	80	24.9%	Tinicum Township	764	35.3%
Langhorne Borough	311	46.3%	Trumbauersville Borough	214	51.9%
Langhorne Manor Borough	133	42.5%	Tullytown Borough	83	9.0%
Lower Makefield Township	539	4.3%	Upper Makefield Township	443	13.7%
Lower Southampton Township	362	5.0%	Upper Southampton Township	296	4.7%
Middletown Township	612	3.5%	Warminster Township	600	4.4%
Milford Township	646	17.0%	Warrington Township	316	3.5%
Morrisville Borough	1,407	35.7%	Warwick Township	317	5.7%
New Britain Borough	118	11.7%	West Rockhill Township	344	14.9%
New Britain Township	288	6.6%	Wrightstown Township	341	29.1%
New Hope Borough	434	29.0%	Yardley Borough	357	28.8%

Table 4.4.2-7 below shows the Expected Annual Losses for each census tract in the county according to FEMA's National Risk Index.

Table 4.4.2-7 Expected Annual Losses to Earthquake by Census Tract (FEMA NRI, 2026)

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100102	Bensalem Township	$171,865.48	Relatively Moderate
42017100103	Bensalem Township	$124,918.63	Relatively Low
42017100104	Bensalem Township	$89,975.73	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100105	Bensalem Township	$74,587.59	Relatively Low
42017100201	Bensalem Township	$277,693.72	Relatively Moderate
42017100206	Bensalem Township	$24,552.00	Relatively Low
42017100207	Bensalem Township	$23,594.97	Relatively Low
42017100208	Bensalem Township	$83,734.02	Relatively Low
42017100209	Bensalem Township		
42017100210	Bensalem Township	$52,585.06	Relatively Low
42017100211	Bensalem Township	$70,396.97	Relatively Low
42017100212	Bensalem Township	$53,053.01	Relatively Low
42017100213	Bensalem Township	$89,355.56	Relatively Low
42017100214	Bensalem Township	$80,159.99	Relatively Low
42017100302	Bristol Township	$116,584.33	Relatively Low
42017100303	Bristol Township	$59,877.73	Relatively Low
42017100304	Bristol Township	$85,490.23	Relatively Low
42017100306	Bristol Township	$65,018.71	Relatively Low
42017100307	Bristol Township	$15,003.83	Very Low
42017100401	Bristol Township	$115,381.68	Relatively Low
42017100402	Bristol Township	$155,111.03	Relatively Moderate
42017100403	Bristol Township	$202,154.02	Relatively Moderate
42017100404	Bristol Township	$79,372.34	Relatively Low
42017100406	Bristol Township	$108,004.16	Relatively Low
42017100407	Bristol Township	$178,793.35	Relatively Moderate
42017100408	Bristol Township	$95,689.96	Relatively Low
42017100500	Bristol Borough	$119,325.70	Relatively Low
42017100600	Bristol Borough	$119,308.74	Relatively Low
42017100700	Bristol Borough	$66,911.85	Relatively Low
42017100803	Middletown Township	$150,144.99	Relatively Moderate
42017100804	Middletown Township	$143,071.55	Relatively Low
42017100805	Middletown Township	$69,170.33	Relatively Low
42017100807	Middletown Township	$142,070.10	Relatively Low
42017100808	Middletown Township	$172,293.40	Relatively Moderate
42017100809	Middletown Township	$63,861.22	Relatively Low
42017100811	Middletown Township	$85,534.68	Relatively Low
42017100900	Middletown Township	$100,074.30	Relatively Low
42017101100	Penndel Borough	$161,310.15	Relatively Moderate
42017101401	Lower Southampton Township	$33,389.39	Relatively Low
42017101403	Lower Southampton Township	$80,057.17	Relatively Low
42017101404	Lower Southampton Township	$23,790.61	Relatively Low
42017101405	Lower Southampton Township	$78,572.37	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017101503	Upper Southampton Township	$108,267.12	Relatively Low
42017101504	Upper Southampton Township	$148,670.03	Relatively Moderate
42017101505	Upper Southampton Township	$64,573.87	Relatively Low
42017101506	Upper Southampton Township	$107,637.11	Relatively Low
42017101603	Warminster Township	$52,741.07	Relatively Low
42017101605	Warminster Township	$44,405.09	Relatively Low
42017101607	Warminster Township	$61,939.06	Relatively Low
42017101609	Warminster Township	$13,902.38	Very Low
42017101610	Warminster Township	$68,046.43	Relatively Low
42017101611	Warminster Township	$72,608.49	Relatively Low
42017101802	Warrington Township	$27,010.64	Relatively Low
42017101803	Warrington Township		
42017101805	Warrington Township	$96,633.58	Relatively Low
42017101807	Warrington Township	$121,333.67	Relatively Low
42017101808	Warrington Township	$42,572.02	Relatively Low
42017101809	Warrington Township	$172,664.98	Relatively Moderate
42017101810	Warrington Township	$127,164.12	Relatively Low
42017101900	Chalfont Borough	$93,183.59	Relatively Low
42017102002	New Britain Township	$71,183.90	Relatively Low
42017102003	New Britain Township	$127,562.45	Relatively Low
42017102004	New Britain Township	$93,670.76	Relatively Low
42017102102	Hilltown Township	$47,528.62	Relatively Low
42017102104	Hilltown Township	$98,403.33	Relatively Low
42017102300	East Rockhill Township	$89,069.66	Relatively Low
42017102401	Perkasie Borough	$238,049.53	Relatively Moderate
42017102402	Perkasie Borough	$146,807.91	Relatively Moderate
42017102500	Sellersville Borough, West Rockhill Township	$117,292.19	Relatively Low
42017102600	Telford Borough	$102,208.25	Relatively Low
42017102700	West Rockhill Township	$91,365.49	Relatively Low
42017102801	Milford Township	$59,129.17	Relatively Low
42017103101	Quakertown Borough	$98,004.63	Relatively Low
42017103102	Quakertown Borough	$68,366.00	Relatively Low
42017103103	Quakertown Borough	$196,688.37	Relatively Moderate
42017103300	Haycock Township	$74,531.84	Relatively Low
42017103400	Springfield Township	$72,861.27	Relatively Low
42017103700	Nockamixon Township	$98,986.03	Relatively Low
42017103800	Bridgeton Township	$41,398.38	Relatively Low
42017103900	Tinicum Township	$82,916.84	Relatively Low
42017104000	Bedminster Township	$82,796.74	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017104100	Dublin Borough	$149,758.88	Relatively Moderate
42017104201	Plumstead Township	$149,728.41	Relatively Moderate
42017104203	Plumstead Township	$194,374.62	Relatively Moderate
42017104204	Plumstead Township	$125,137.82	Relatively Low
42017104301	Solebury Township	$70,041.10	Relatively Low
42017104303	Solebury Township	$90,126.13	Relatively Low
42017104304	Solebury Township	$88,900.54	Relatively Low
42017104400	New Hope Borough	$75,822.72	Relatively Low
42017104502	Buckingham Township	$77,927.40	Relatively Low
42017104503	Buckingham Township	$113,455.73	Relatively Low
42017104505	Buckingham Township	$35,250.51	Relatively Low
42017104506	Buckingham Township	$121,613.28	Relatively Low
42017104601	Doylestown Township	$76,251.52	Relatively Low
42017104603	Doylestown Township	$38,600.71	Relatively Low
42017104604	Doylestown Township	$34,760.44	Relatively Low
42017104701	Doylestown Borough, Doylestown Township	$99,678.75	Relatively Low
42017104702	Doylestown Borough	$43,042.19	Relatively Low
42017104703	Doylestown Borough	$102,701.34	Relatively Low
42017104800	New Britain Borough	$106,156.84	Relatively Low
42017104901	Warwick Township	$95,687.22	Relatively Low
42017104902	Warwick Township	$125,936.36	Relatively Low
42017105003	Northampton Township	$172,831.73	Relatively Moderate
42017105004	Northampton Township	$108,542.68	Relatively Low
42017105006	Northampton Township	$123,379.58	Relatively Low
42017105008	Northampton Township	$113,079.40	Relatively Low
42017105009	Northampton Township	$53,447.32	Relatively Low
42017105010	Northampton Township	$88,087.53	Relatively Low
42017105011	Northampton Township	$43,655.82	Relatively Low
42017105012	Northampton Township	$77,154.33	Relatively Low
42017105013	Northampton Township	$44,677.91	Relatively Low
42017105100	Wrightstown Township	$82,919.73	Relatively Low
42017105202	Newtown Township	$95,324.53	Relatively Low
42017105203	Newtown Township	$81,636.46	Relatively Low
42017105206	Newtown Township	$78,821.99	Relatively Low
42017105207	Newtown Township	$60,182.00	Relatively Low
42017105208	Newtown Township	$70,229.30	Relatively Low
42017105300	Newtown Borough	$140,064.66	Relatively Low
42017105401	Upper Makefield Township	$60,240.15	Relatively Low
42017105402	Upper Makefield Township	$39,657.61	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017105505	Lower Makefield Township	$64,565.64	Relatively Low
42017105506	Lower Makefield Township	$69,116.05	Relatively Low
42017105507	Lower Makefield Township	$57,407.71	Relatively Low
42017105508	Lower Makefield Township	$110,410.86	Relatively Low
42017105509	Lower Makefield Township	$46,382.91	Relatively Low
42017105510	Lower Makefield Township	$65,748.86	Relatively Low
42017105511	Lower Makefield Township	$36,709.42	Relatively Low
42017105600	Yardley Borough	$59,873.38	Relatively Low
42017105702	Morrisville Borough	$77,578.06	Relatively Low
42017105704	Morrisville Borough, Falls Township	$94,080.79	Relatively Low
42017105801	Falls Township	$159,596.18	Relatively Moderate
42017105805	Falls Township	$51,413.25	Relatively Low
42017105807	Falls Township	$206,976.84	Relatively Moderate
42017105808	Falls Township	$66,602.30	Relatively Low
42017105809	Falls Township	$34,542.16	Relatively Low
42017105810	Falls Township	$55,969.14	Relatively Low
42017105811	Falls Township	$59,062.79	Relatively Low
42017105812	Falls Township	$106,990.77	Relatively Low
42017105900	Tullytown Borough	$92,003.43	Relatively Low
42017106000	Middletown Township, Hulmeville Borough	$73,872.12	Relatively Low
42017106100	Langhorne Manor Borough, Langhorne Borough	$36,965.79	Relatively Low
42017106201	Warminster Township	$52,316.57	Relatively Low
42017106202	Warminster Township, Ivyland Borough	$48,631.13	Relatively Low
42017106300	Hilltown Township, Silverdale Borough	$61,181.51	Relatively Low
42017106401	Richland Township	$23,405.28	Relatively Low
42017106402	Milford Township, Trumbauersville Borough	$100,351.00	Relatively Low
42017106500	Richland Township, Richlandtown Borough	$32,549.08	Relatively Low
42017106600	Durham Township, Riegelsville Borough	$63,056.71	Relatively Low
42017980000	Falls Township	$95,614.48	Relatively Low
TOTAL		**$13,275,874.72**	

4.4.2.6 Equity in Vulnerable Communities

There is no indication that any vulnerable populations have a higher risk to earthquakes within Bucks County. However, if the county were to be impacted, households residing in older homes with less wealth would have the greatest vulnerability. A significant earthquake can render a home unhabitable, leaving individuals and families with housing insecurity.

4.4.3 Extreme Temperature

Extreme heat often results in the highest number of annual deaths of all weather-related hazards. In most of the United States, extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. (Ready.gov, 2018). 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 (Ready.gov, 2025).

4.4.3.1 Location and Extent

Bucks County is subject to extreme temperatures in the summer and winter seasons. Temperature extremes are a concern in Bucks County because of the effect they can have on agricultural products as well as the human health issues they can cause. The elderly, the very young, and those with low or no income are more vulnerable to the effects of extreme temperatures, so the demographics of each of the municipalities in Bucks County effect their vulnerability to this hazard. Areas most susceptible to extreme heat include urban environments, which tend to retain the heat well into the night, leaving little opportunity for dwellings to cool.

Figure 4.4.3-1 and Figure 4.4.3-2 show annual mean maximum and minimum temperatures throughout Pennsylvania and highlight Bucks County. These maps present the year-round average minimum temperature (40-45°F) and average maximum temperature (64-69°F). However, during July, the warmest month, the average high temperature is 85.2° F. In January, the coldest month, the average low in Bucks County is 21.2° F (BestPlaces, 2025).

Figure 4.4.3-1 Average Maximum Temperature for Pennsylvania and Bucks County (NOAA 2021)

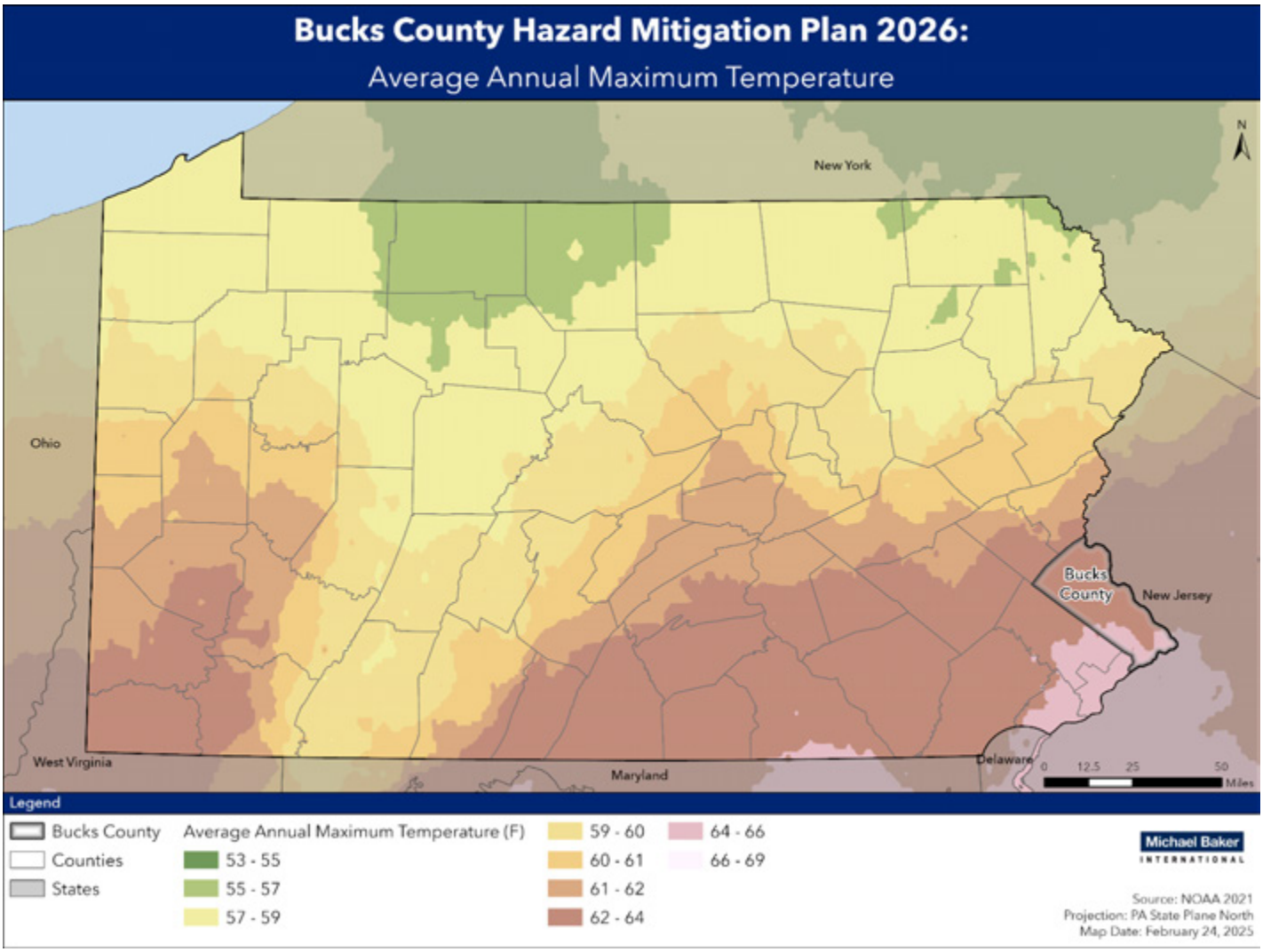
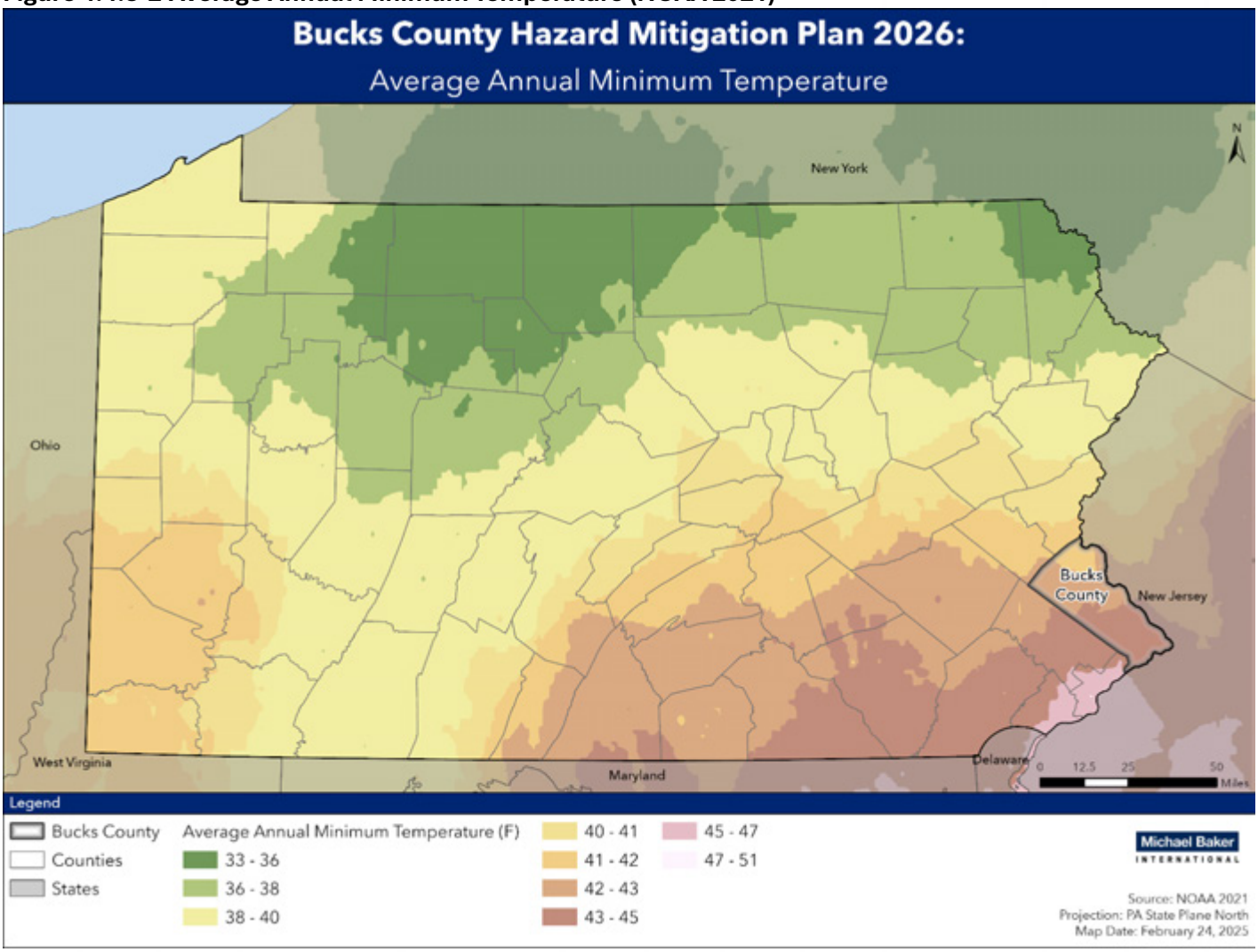


Figure 4.4.3-2 Average Annual Minimum Temperature (NOAA 2021)



4.4.3.2 Range of Magnitude

Extreme temperatures can cause a range of impacts to communities, including:

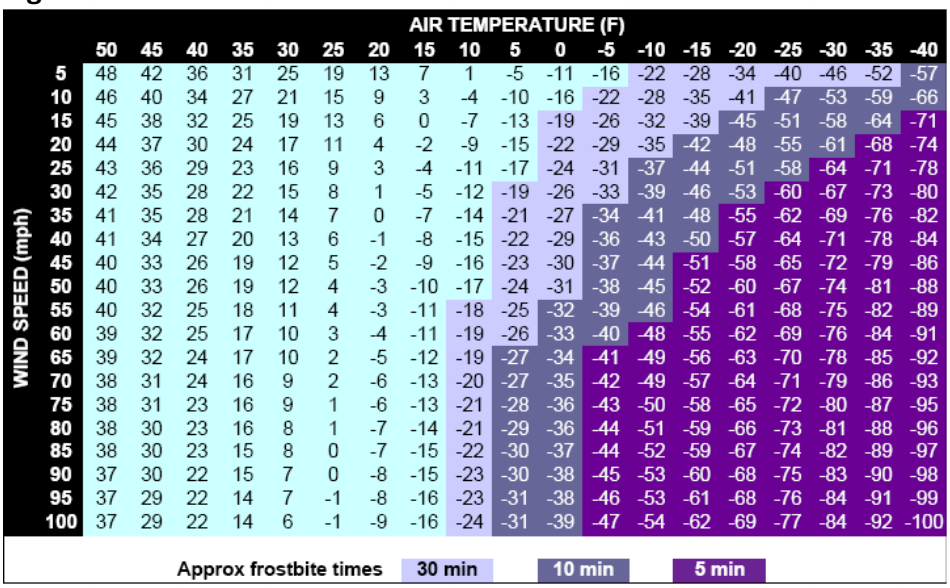
- Health Impacts – The health impacts of extreme cold are greater in terms of mortality in humans, but often after more prolonged exposure versus a cold snap. Extreme heat waves, however, can prove more deadly over a shorter duration. At greatest risk of death in heat waves are the urban-dwelling elderly without access to an air-conditioned environment for at least part of the day.
- Transportation – Cold weather can impact automotive engines, possibly stranding motorists, and stress metal bridge structures. Highways and railroad tracks can become distorted in high heat. Disruptions to the transportation network and accidents due to extreme temperatures represent an additional risk.
- Agriculture – Absolute temperature and duration of extreme cold can have devastating effects on trees and winter crops. Livestock is especially vulnerable to heat, and crop yields can be impacted by heat waves that occur during key development stages.
- Energy – Energy consumption rises significantly during extreme cold weather. Residents are placed in extreme danger when any fuel shortages or utility failures prevent the heating of a dwelling. Extreme heat also can result in utility interruptions, and sagging transmission lines due to the heat can lead to shorting out. Power failures during extreme heat scenarios can also place residents in danger. The inability to properly cool homes during a heat scenario can make residents more prone to heat stroke and exhaustion.

The range of these impacts, especially health effects, can be mitigated through improved forecasts, warnings, community preparedness, and appropriate community-based response.

Temperature advisories, watches, and warnings are issued by the National Weather Service relating the above impacts to the range of temperatures typically experienced in Pennsylvania. Exact thresholds vary across the Commonwealth, but in general Heat Advisories are issued when the heat index will be equal to or greater than 100°F, but less than 105°F, Excessive Heat Warnings are issued when heat indices will attain or exceed 105°F, and Excessive Heat Watches, are issued when there is a possibility that excessive heat warning criteria may be experienced within twelve to forty-eight hours (NOAA NWS, 2021b). In terms of human health concerns, extremely high temperatures cause heat stress which can be divided into four categories. Each category is defined by apparent temperature which is associated with a heat index value that captures the combined effects of dry air temperature and relative humidity on humans and animals. Major human risks for these temperatures include heat cramps, heat syncope, heat exhaustion, heatstroke, and death. Note that while the temperatures in Figure 4.3.3-3 serves as a guide for various danger categories, the impacts of high temperatures will vary from person to person based on individual age, health, and other factors. The elderly, the very young, and those with low or no income are most vulnerable to health-related impacts of extreme temperatures.

Cold temperatures can be extremely dangerous to humans and animals exposed to the elements. Without heat and shelter, cold temperatures can cause hypothermia, frost bite, and death. Wind chill temperatures are often used in place of raw temperature values due to the effect of wind can have in drawing heat from the body under cold temperatures. These values represent what temperatures actually feel like to humans and animals under cold, windy conditions. Similar to high temperatures, the effect of cold temperatures will vary by individual.

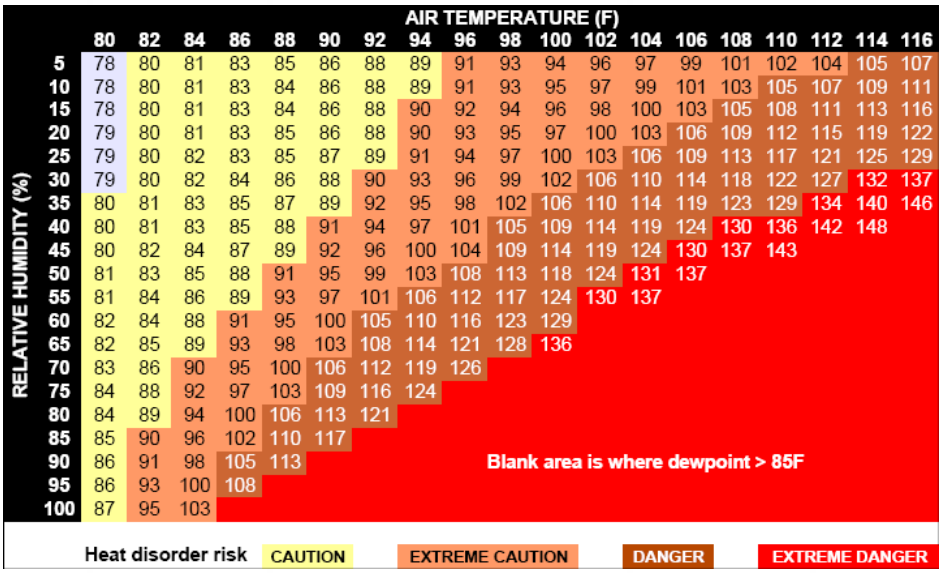
Figure 4.4.3-3 Extreme Cold and Wind Chill Index



WIND SPEED (mph) \ AIR TEMPERATURE (F)	50	45	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
5	48	42	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57
10	46	40	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66
15	45	38	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71
20	44	37	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74
25	43	36	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78
30	42	35	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80
35	41	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82
40	41	34	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84
45	40	33	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86
50	40	33	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88
55	40	32	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89
60	39	32	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91
65	39	32	24	17	10	2	-5	-12	-19	-27	-34	-41	-49	-56	-63	-70	-78	-85	-92
70	38	31	24	16	9	2	-6	-13	-20	-27	-35	-42	-49	-57	-64	-71	-79	-86	-93
75	38	31	23	16	9	1	-6	-13	-21	-28	-36	-43	-50	-58	-65	-72	-80	-87	-95
80	38	30	23	16	8	1	-7	-14	-21	-29	-36	-44	-51	-59	-66	-73	-81	-88	-96
85	38	30	23	15	8	0	-7	-15	-22	-30	-37	-44	-52	-59	-67	-74	-82	-89	-97
90	37	30	22	15	7	0	-8	-15	-23	-30	-38	-45	-53	-60	-68	-75	-83	-90	-98
95	37	29	22	14	7	-1	-8	-16	-23	-31	-38	-46	-53	-61	-68	-76	-84	-91	-99
100	37	29	22	14	6	-1	-9	-16	-24	-31	-39	-47	-54	-62	-69	-77	-84	-92	-100

Approx frostbite times: 30 min | 10 min | 5 min

Figure 4.4.3-4 Extreme Heat and Heat Index



RELATIVE HUMIDITY (%) \ AIR TEMPERATURE (F)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116
5	78	80	81	83	85	86	88	89	91	93	94	96	97	99	101	102	104	105	107
10	78	80	81	83	84	86	88	89	91	93	95	97	99	101	103	105	107	109	111
15	78	80	81	83	84	86	88	90	92	94	96	98	100	103	105	108	111	113	116
20	79	80	81	83	85	86	88	90	93	95	97	100	103	106	109	112	115	119	122
25	79	80	82	83	85	87	89	91	94	97	100	103	106	109	113	117	121	125	129
30	79	80	82	84	86	88	90	93	96	99	102	106	110	114	118	122	127	132	137
35	80	81	83	85	87	89	92	95	98	102	106	110	114	119	123	129	134	140	146
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136	142	148	
45	80	82	84	87	89	92	96	100	104	109	114	119	124	130	137	143			
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137					
55	81	84	86	89	93	97	101	106	112	117	124	130	137						
60	82	84	88	91	95	100	105	110	116	123	129								
65	82	85	89	93	98	103	108	114	121	128	136								
70	83	86	90	95	100	106	112	119	126										
75	84	88	92	97	103	109	116	124											
80	84	89	94	100	106	113	121												
85	85	90	96	102	110	117													
90	86	91	98	105	113														
95	86	93	100	108															
100	87	95	103																

Blank area is where dewpoint > 85F

Heat disorder risk: CAUTION | EXTREME CAUTION | DANGER | EXTREME DANGER

Figure 4.3.3-3 shows the effects of wind speed on extreme cold events and humidity on extreme heat events. These compounding factors can increase the risk experienced by vulnerable populations and the general public.

The worst extreme heat occurred on July 15, 1995 where high temperatures near and above the 100-degree mark were some of the hottest reported in Eastern Pennsylvania in 29 years. There were 67 heat-related deaths in the region. Most were elderly, shut-ins, or people in otherwise poor health with no ventilation or air conditioning (Bucks County, 2011a). A worst case for extreme cold temperatures would include injuries resulting from direct exposure (as a result of an interruption of energy supplies) and from being cut off from medical care due to associated snow or ice impacting travel. This scenario is estimated to require medical care for 1 percent of Bucks County's population over 65 years of age and cause 10 percent mortality of those impacted. With an approximate population of 120,630

persons who are 65 and older (US Census, 2019), this results in 1,210 injuries and 120 deaths from a potential worst-case scenario.

Major human risks to extremely high temperatures include heat cramps, heat syncope, heat exhaustion, heatstroke, and death. The elderly, the very young, and those with low or no income are most vulnerable to health-related impacts of extreme temperatures. Cold temperatures can be extremely dangerous to humans and animals exposed to the elements. Without heat and shelter, cold temperatures can cause hypothermia, frost bite, and death. Wind chill temperatures are often used in place of raw temperature values due to the effect of wind can have in drawing heat from the body under cold temperatures.

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

Table 4.4.3-1 Most Likely Lifelines Impacted by Extreme Temperature

Lifelines	Notes
	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.

Table 4.4.3-2 describes events related to extreme heat and cold in Bucks County between 2000 and October 2025 as reported to the National Centers for Environmental Information Storm Events Database. While each of these events affected Bucks County, the temperatures, deaths, injuries, and damage indicated in the table were not necessarily in Bucks County itself; data for these events is regional in nature.

Note: Unseasonably warm events were not included in this table, as they were in previous versions of the plan because these events do not pose life threatening results to living things.

4.4.3.3 Potential for Future Occurrence

The future occurrence of extreme temperature can be considered possible as defined by the Risk Factor methodology probability criteria (see Table 4.6-1). Due to its location and geography, the County is more likely to encounter excessive heat than extreme cold weather. Topography and vegetation can impact temperature differentials across the County (NOAA NCEI, 2021).

It is important to note that frequency estimates may not be an accurate representation of future conditions due to the unknown impacts of climate change. Significant, broad evidence supports human influence to a long-term trend of global warming. It has been difficult to predict how much, how fast, or how long the warming will occur, due to the large number of variables involved. According to the 2021 Pennsylvania Climate Impacts Assessment, Pennsylvania is projected to see higher average temperatures over the course of the next several decades. Increasing

annual and seasonal average temperatures are currently rated medium risk but are projected to be rated high risk for the mid-century. Across the state, annual average temperatures are projected to increase by about 5.9°F (3.3°C) by mid-century and 9.4°F (5.2°C) by the end-of-century. Some areas of the world may experience greater temperature changes than others. Predictions for smaller areas and shorter time periods become more uncertain (PADEP, 2021c).

Figure 4.4.3-5 Bucks County Extreme Heat Hazard Assessment Report (CRMA, 2025)

Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		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
Temperature thresholds:							
Annual days with maximum temperature > 90°F	**13 days** 13 - 19	**33 days** 19 - 44	**35 days** 20 - 49	**43 days** 21 - 61	**52 days** 26 - 68	**52 days** 28 - 77	**83 days** 37 - 105
Annual days with maximum temperature > 95°F	**3 days** 2 - 4	**10 days** 4 - 18	**11 days** 5 - 17	**14 days** 6 - 28	**20 days** 7 - 32	**21 days** 7 - 41	**48 days** 10 - 73
Annual days with maximum temperature > 100°F	**0 days** 0 - 0	**2 days** 0 - 6	**2 days** 1 - 6	**3 days** 1 - 10	**6 days** 1 - 14	**6 days** 1 - 10	**20 days** 2 - 46
Annual days with maximum temperature > 105°F	**0 days** 0 - 0	**0 days** 0 - 1	**0 days** 0 - 1	**0 days** 0 - 3	**1 days** 0 - 5	**1 days** 0 - 6	**7 days** 0 - 26
Annual temperature:							
Annual single highest maximum temperature °F	**97 °F** 96 - 97	**100 °F** 98 - 103	**100 °F** 97 - 104	**102 °F** 98 - 106	**103 °F** 99 - 108	**103 °F** 99 - 108	**108 °F** 99 - 115
Annual highest maximum temperature averaged over a 5-day period °F	**92 °F** 91 - 93	**95 °F** 93 - 99	**95 °F** 93 - 98	**97 °F** 94 - 101	**98 °F** 94 - 102	**98 °F** 95 - 104	**103 °F** 95 - 110
Cooling degree days (CDD)	**873 degree-days** 810 - 939	**1,185 degree-days** 984 - 1,467	**1,223 degree-days** 994 - 1,467	**1,358 degree-days** 1,051 - 1,704	**1,519 degree-days** 1,137 - 1,834	**1,540 degree-days** 1,161 - 1,997	**2,174 degree-days** 1,420 - 2,830

N/A = Data Not Available for the selected area

4.4.3.4 Past Occurrences

The table below details past occurrences of extreme temperatures in Bucks County and the surrounding region.

Table 4.4.3-2 Recorded Temperature Extremes in Bucks County and Surrounding Region (NOAA NCEI, 2021)

Date	Vent	Temperature (Wind Chill)	Deaths	Injuries	Property Damage ($)	Crop Damage ($)
05/02/2001	Unseasonably Hot	92°F	0	0	0	0
06/26/2001	Excessive Heat	96°F	2	0	0	0
07/01/2001	Excessive Heat	91°F	1	0	0	0
07/24/2001	Excessive Heat	94°F	2	0	0	0
08/26/2001	Excessive Heat	99°F	22	0	0	0
06/24/2002	Excessive Heat	95°F	4	0	0	0
07/01/2002	Excessive Heat	98°F	15	0	0	0
07/15/2002	Excessive Heat	96°F	2	0	0	0
07/28/2002	Excessive Heat	95°F	3	0	0	0
08/01/2002	Excessive Heat	102°F	9	0	0	0
08/11/2002	Excessive Heat	98°F	8	0	0	0
01/14/2003	Extreme Cold/wind chill	6°F	4	0	0	0
06/23/2003	Excessive Heat	93°F	3	0	0	0
07/04/2003	Excessive Heat	92°F	4	0	0	0
01/09/2004	Extreme Cold/wind chill	-2°F	2	0	0	0
01/15/2004	Extreme Cold/wind chill	1°F	1	0	0	0
12/20/2004	Extreme Cold/wind chill	3°F	0	0	0	0
01/18/2005	Extreme Cold/wind chill	-10°F	2	1	0	0
01/23/2005	Extreme Cold/wind chill	-3°F	10	0	0	0
01/28/2005	Extreme Cold/wind chill	-6°F	0	0	0	0
06/13/2005	Excessive Heat	92°F	3	0	0	0
07/18/2005	Excessive Heat	92°F	6	0	0	0
07/25/2005	Excessive Heat	96°F	7	0	0	0
08/02/2005	Excessive Heat	95°F	5	0	0	0
08/11/2005	Excessive Heat	96°F	2	0	0	0
07/16/2006	Excessive Heat	98°F	3	0	0	0

Date	Vent	Temperature (Wind Chill)	Deaths	Injuries	Property Damage ($)	Crop Damage ($)
08/01/2006	Excessive Heat	105°F	24	40	0	0
02/15/2007	Cold/wind chill	4°F	0	0	0	0
02/16/2007	Cold/wind chill	4°F	0	0	0	0
02/19/2007	Cold/wind chill	6°F	0	0	0	0
07/08/2007	Excessive Heat	95°F	0	0	0	0
08/07/2007	Excessive Heat	96°F	0	0	0	0
04/25/2009	Heat	93°F	0	0	0	0
07/01/2009	Heat	86°F	1	0	0	0
08/10/2009	Excessive Heat	103°F	0	0	0	0
08/16/2009	Heat	95°F	0	0	0	0
06/23/2010	Excessive Heat	94°F	0	0	0	0
07/16/2010	Excessive Heat	90°F	0	0	0	0
7/6/2013	Excessive Heat	95°F	0	0	0	0
7/15/2013	Excessive Heat	95°F	0	0	0	0
7/18/2013	Excessive Heat	95°F	0	0	0	0
9/11/2013	Heat	91°F	0	0	0	0
1/4/2014	Extreme Cold/Wind Chill	-2°F	0	0	0	0
1/7/2014	Cold/Wind Chill	-22°F (with wind chill)	0	0	0	0
1/22/2014	Cold/Wind Chill	-15°F (with wind chill)	0	0	0	0
6/17/2014	Heat	94°F	0	0	0	0
7/2/2014	Heat	96°F	0	0	0	0
1/7/2015	Cold/Wind Chill	-11°F (with wind chill)	0	0	0	0
2/13/2015	Cold/Wind Chill	4°F	0	0	0	0
2/15/2015	Cold/Wind Chill	-20°F (with wind chill)	0	0	0	0
2/19/2015	Cold/Wind Chill	-23°F (with wind chill)	0	0	0	0
2/24/2015	Cold/Wind Chill	-5°F	0	0	0	0
2/14/2016	Cold/Wind Chill	-4°F	0	0	0	0
7/6/2016	Excessive Heat	95°F	3	0	0	0
7/15/2016	Excessive Heat	95°F	1	0	0	0
8/11/2016	Excessive Heat	92°F	6	0	0	0
6/13/2017	Excessive Heat	99°F	0	7	0	0

Date	Vent	Temperature (Wind Chill)	Deaths	Injuries	Property Damage ($)	Crop Damage ($)
7/13/2017	Excessive Heat	101°F	0	0	0	0
7/1/2018	Excessive Heat	110°F	0	0	0	0
7/5/2018	Excessive Heat	110°F	1	0	0	0
6/30/2021	Excessive Heat	105°F	0	0	0	0
8/12/2021	Excessive Heat	105°F	0	0	0	0
8/9/2022	Excessive Heat	105°F	0	0	0	0
12/24/2022	Cold/Wind Chill	-15°F	0	0	0	0
6/22/2024	Excessive Heat	105°F	0	0	0	0
7/5/2024	Excessive Heat	108°F	0	0	0	0
7/6/2024	Excessive Heat	105°F	0	0	0	0
7/9/2024	Excessive Heat	107°F	0	0	0	0
8/2/2024	Excessive Heat	106°F	0	0	0	0
6/25/2025	Excessive Heat	112°F	0	0	0	0
7/25/2025	Excessive Heat	108°F	0	0	0	0
7/29/2025	Excessive Heat	105°F	0	0	0	0

4.4.3.5 Vulnerability Assessment

The potential for extreme heat and cold always exists in and around the summer and winter months. In terms of human and social vulnerabilities, weather forecasters can normally predict the temperature with excellent accuracy and they, along with local emergency management personnel and social services agencies, are instrumental in reducing extreme temperature vulnerabilities through public education and attention to the issue. Adhering to extreme temperature warnings can significantly reduce the risk of temperature-related deaths.

Those hardest hit by both heat and cold waves include the elderly, the very young, and those with low or no income, and others who are already physically vulnerable. Excessive heat exposure also affects people with certain pre-existing medical conditions, including cardiovascular disease, respiratory illnesses, and obesity. All 54 jurisdictions are considered to be 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.

Table 4.4.3-3 shows the precent of population by census tract that are estimated to have no social vulnerability, and the percent of population that are estimated to have three or more characteristics of social vulnerability. The Community Resilience Estimates for Heat released in 2022 by the US Census Bureau are one means of identifying populations that may face higher vulnerability to extreme heat events.

Table 4.4.3-3 Populations Vulnerable to Extreme Heat

Name	Total Population	% of Pop with no SV	% of Pop with 3 or more
Census Tract 1055.06, Bucks County, Pennsylvania	4165	66	7.25
Census Tract 1020.03, Bucks County, Pennsylvania	4443	66.53	7.4
Census Tract 1020.02, Bucks County, Pennsylvania	2856	53.36	7.7
Census Tract 1052.08, Bucks County, Pennsylvania	2370	51.6	7.93
Census Tract 1055.08, Bucks County, Pennsylvania	3563	59.28	8.48
Census Tract 1050.12, Bucks County, Pennsylvania	2698	56.41	8.56
Census Tract 1042.03, Bucks County, Pennsylvania	5620	65.34	8.68
Census Tract 1063, Bucks County, Pennsylvania	7474	61.61	9.27
Census Tract 1008.09, Bucks County, Pennsylvania	5890	51.48	9.42
Census Tract 1050.13, Bucks County, Pennsylvania	5783	49.89	9.53
Census Tract 1050.11, Bucks County, Pennsylvania	3463	52.7	10.34
Census Tract 1045.05, Bucks County, Pennsylvania	5599	62.33	10.36
Census Tract 1052.03, Bucks County, Pennsylvania	2065	47.36	10.51
Census Tract 1018.05, Bucks County, Pennsylvania	2185	53.41	10.66
Census Tract 1023, Bucks County, Pennsylvania	5736	36.51	10.7
Census Tract 1041, Bucks County, Pennsylvania	2174	45.86	10.81
Census Tract 1045.06, Bucks County, Pennsylvania	2465	50.67	10.83
Census Tract 1046.01, Bucks County, Pennsylvania	4904	60.89	11.09
Census Tract 1056, Bucks County, Pennsylvania	2595	44.51	11.1
Census Tract 1042.04, Bucks County, Pennsylvania	5335	61.82	11.47
Census Tract 1031.02, Bucks County, Pennsylvania	2182	56.65	11.78
Census Tract 1049.01, Bucks County, Pennsylvania	7184	49.46	11.93
Census Tract 1053, Bucks County, Pennsylvania	2255	49.14	11.93
Census Tract 1050.06, Bucks County, Pennsylvania	5879	49.62	12.01
Census Tract 1018.02, Bucks County, Pennsylvania	6368	56.83	12.08
Census Tract 1043.01, Bucks County, Pennsylvania	2877	51.69	12.17
Census Tract 1050.08, Bucks County, Pennsylvania	3888	46.6	12.24
Census Tract 1064.01, Bucks County, Pennsylvania	7694	60.88	12.45
Census Tract 1050.04, Bucks County, Pennsylvania	5609	50.13	12.46
Census Tract 1058.09, Bucks County, Pennsylvania	4377	45.58	12.54
Census Tract 1018.10, Bucks County, Pennsylvania	6302	56.01	12.58
Census Tract 1004.01, Bucks County, Pennsylvania	6308	44.56	12.79
Census Tract 1051, Bucks County, Pennsylvania	3261	51.18	13.19
Census Tract 1045.02, Bucks County, Pennsylvania	8086	59.44	13.41
Census Tract 1019, Bucks County, Pennsylvania	4216	44.62	13.64
Census Tract 1042.01, Bucks County, Pennsylvania	2902	36.6	13.65
Census Tract 1016.09, Bucks County, Pennsylvania	4516	51.53	13.68
Census Tract 1055.09, Bucks County, Pennsylvania	4601	43.69	13.8
Census Tract 1009, Bucks County, Pennsylvania	7629	33.12	13.97

Name	Total Population	% of Pop with no SV	% of Pop with 3 or more
Census Tract 1040, Bucks County, Pennsylvania	7466	58.32	14.04
Census Tract 1020.04, Bucks County, Pennsylvania	4951	47.59	14.14
Census Tract 1018.07, Bucks County, Pennsylvania	4608	61.13	14.21
Census Tract 1048, Bucks County, Pennsylvania	2122	48.26	14.56
Census Tract 1058.01, Bucks County, Pennsylvania	6230	35.23	14.57
Census Tract 1043.03, Bucks County, Pennsylvania	4556	50.72	14.64
Census Tract 1045.03, Bucks County, Pennsylvania	4532	60.66	14.67
Census Tract 1002.01, Bucks County, Pennsylvania	5271	38.28	14.82
Census Tract 1050.10, Bucks County, Pennsylvania	3980	40.38	14.85
Census Tract 1065, Bucks County, Pennsylvania	7375	44.6	14.97
Census Tract 1039, Bucks County, Pennsylvania	3765	33.44	14.98
Census Tract 1050.03, Bucks County, Pennsylvania	4880	48.69	15.02
Census Tract 1014.01, Bucks County, Pennsylvania	5264	33.64	15.06
Census Tract 1054.02, Bucks County, Pennsylvania	4225	54.7	15.08
Census Tract 1033, Bucks County, Pennsylvania	2182	58.3	15.35
Census Tract 1024.02, Bucks County, Pennsylvania	5005	58.34	15.42
Census Tract 1055.07, Bucks County, Pennsylvania	7346	44.05	15.48
Census Tract 1058.08, Bucks County, Pennsylvania	3709	43.97	15.58
Census Tract 1052.07, Bucks County, Pennsylvania	5012	47.29	15.9
Census Tract 1066, Bucks County, Pennsylvania	1929	40.28	15.91
Census Tract 1058.12, Bucks County, Pennsylvania	1696	38.8	15.92
Census Tract 1015.03, Bucks County, Pennsylvania	3900	38.59	16.28
Census Tract 1054.01, Bucks County, Pennsylvania	4596	38.97	16.41
Census Tract 1008.03, Bucks County, Pennsylvania	4743	46.95	16.45
Census Tract 1058.11, Bucks County, Pennsylvania	6135	40.21	16.48
Census Tract 1004.04, Bucks County, Pennsylvania	6156	17.45	16.49
Census Tract 1001.05, Bucks County, Pennsylvania	3237	28.79	16.59
Census Tract 1046.03, Bucks County, Pennsylvania	5601	58.74	17.05
Census Tract 1006, Bucks County, Pennsylvania	3755	49.05	17.15
Census Tract 1018.09, Bucks County, Pennsylvania	3501	39.02	17.2
Census Tract 1037, Bucks County, Pennsylvania	3352	37.02	17.24
Census Tract 1014.03, Bucks County, Pennsylvania	5858	50.77	17.26
Census Tract 1008.08, Bucks County, Pennsylvania	5302	47.68	17.35
Census Tract 1055.11, Bucks County, Pennsylvania	4154	52.41	17.36
Census Tract 1003.07, Bucks County, Pennsylvania	5059	35.17	17.36
Census Tract 1025, Bucks County, Pennsylvania	4672	51.31	17.42
Census Tract 1008.05, Bucks County, Pennsylvania	6176	44.06	17.42
Census Tract 1062.01, Bucks County, Pennsylvania	3500	44.94	17.51
Census Tract 1014.04, Bucks County, Pennsylvania	2495	35.19	17.64
Census Tract 1021.02, Bucks County, Pennsylvania	3502	29.5	17.73
Census Tract 1047.03, Bucks County, Pennsylvania	2214	47.61	17.75

Name	Total Population	% of Pop with no SV	% of Pop with 3 or more
Census Tract 1002.06, Bucks County, Pennsylvania	5598	35.91	17.85
Census Tract 1002.11, Bucks County, Pennsylvania	6753	40.65	18.04
Census Tract 1049.02, Bucks County, Pennsylvania	7567	40.87	18.05
Census Tract 1028.01, Bucks County, Pennsylvania	3426	41.94	18.1
Census Tract 1052.06, Bucks County, Pennsylvania	5299	50.2	18.12
Census Tract 1016.11, Bucks County, Pennsylvania	7116	49.47	18.35
Census Tract 1002.13, Bucks County, Pennsylvania	5535	40.31	18.36
Census Tract 1003.02, Bucks County, Pennsylvania	5012	41.28	18.54
Census Tract 1055.10, Bucks County, Pennsylvania	5298	51.11	18.71
Census Tract 1043.04, Bucks County, Pennsylvania	1246	43.02	18.86
Census Tract 1027, Bucks County, Pennsylvania	5279	43.97	18.98
Census Tract 1015.05, Bucks County, Pennsylvania	3318	39.51	19.17
Census Tract 1016.03, Bucks County, Pennsylvania	3285	43.68	19.3
Census Tract 1055.05, Bucks County, Pennsylvania	3907	45.92	19.71
Census Tract 1001.03, Bucks County, Pennsylvania	2396	40.28	19.78
Census Tract 1064.02, Bucks County, Pennsylvania	7614	52.77	19.81
Census Tract 1004.07, Bucks County, Pennsylvania	1217	43.06	20.05
Census Tract 1044, Bucks County, Pennsylvania	2616	32.34	20.11
Census Tract 1047.01, Bucks County, Pennsylvania	3545	28.35	20.2
Census Tract 1002.12, Bucks County, Pennsylvania	3874	31.31	20.29
Census Tract 1015.06, Bucks County, Pennsylvania	5175	34.32	20.46
Census Tract 1015.04, Bucks County, Pennsylvania	2781	47.57	20.53
Census Tract 1004.03, Bucks County, Pennsylvania	2148	26.16	20.58
Census Tract 1004.08, Bucks County, Pennsylvania	6845	26.37	20.83
Census Tract 1004.06, Bucks County, Pennsylvania	3659	46.73	21.18
Census Tract 1058.10, Bucks County, Pennsylvania	2410	33.2	21.33
Census Tract 1024.01, Bucks County, Pennsylvania	4022	41.89	21.38
Census Tract 1031.01, Bucks County, Pennsylvania	2345	31.73	21.45
Census Tract 1016.10, Bucks County, Pennsylvania	4718	44.93	21.62
Census Tract 1058.05, Bucks County, Pennsylvania	5643	32.5	21.69
Census Tract 1026, Bucks County, Pennsylvania	2222	48.02	21.87
Census Tract 1004.02, Bucks County, Pennsylvania	6442	25.18	22.17
Census Tract 1014.05, Bucks County, Pennsylvania	6850	25.75	22.38
Census Tract 1011, Bucks County, Pennsylvania	2509	40.57	22.48
Census Tract 1001.02, Bucks County, Pennsylvania	3134	35	22.78
Census Tract 1034, Bucks County, Pennsylvania	5140	36.75	23.27
Census Tract 1038, Bucks County, Pennsylvania	1227	36.76	23.96
Census Tract 1058.07, Bucks County, Pennsylvania	3762	30.68	24.24
Census Tract 1052.02, Bucks County, Pennsylvania	5110	43.7	24.46
Census Tract 1046.04, Bucks County, Pennsylvania	6348	48.39	24.59
Census Tract 1059, Bucks County, Pennsylvania	2275	40.4	24.75

Name	Total Population	% of Pop with no SV	% of Pop with 3 or more
Census Tract 1016.05, Bucks County, Pennsylvania	4510	31.2	25.01
Census Tract 1008.04, Bucks County, Pennsylvania	3879	28.8	25.01
Census Tract 1021.04, Bucks County, Pennsylvania	5985	43.71	25.08
Census Tract 1047.02, Bucks County, Pennsylvania	2542	26.83	25.14
Census Tract 1003.04, Bucks County, Pennsylvania	2618	31.82	26.39
Census Tract 1018.08, Bucks County, Pennsylvania	2666	39.05	26.93
Census Tract 1057.04, Bucks County, Pennsylvania	7202	28.27	29.12
Census Tract 1057.02, Bucks County, Pennsylvania	3326	33.4	29.46
Census Tract 1002.07, Bucks County, Pennsylvania	4410	19.55	29.48
Census Tract 1061, Bucks County, Pennsylvania	2611	34.09	30.14
Census Tract 1050.09, Bucks County, Pennsylvania	3457	46.98	30.58
Census Tract 1008.11, Bucks County, Pennsylvania	4460	22.98	30.81
Census Tract 1002.14, Bucks County, Pennsylvania	4237	38.19	31.18
Census Tract 1031.03, Bucks County, Pennsylvania	4798	32.37	31.18
Census Tract 1016.07, Bucks County, Pennsylvania	3650	31.64	31.23
Census Tract 1005, Bucks County, Pennsylvania	2716	24.34	33.39
Census Tract 1008.07, Bucks County, Pennsylvania	4192	20.9	33.92
Census Tract 1060, Bucks County, Pennsylvania	4503	37.8	34.24
Census Tract 1003.03, Bucks County, Pennsylvania	5168	16.85	36.2
Census Tract 1003.06, Bucks County, Pennsylvania	3680	22.01	36.22
Census Tract 1007, Bucks County, Pennsylvania	3448	18.68	38.23
Census Tract 1002.10, Bucks County, Pennsylvania	7436	29.9	38.29
Census Tract 1002.08, Bucks County, Pennsylvania	6638	10.62	40.57
Census Tract 1001.04, Bucks County, Pennsylvania	4756	11.73	44.49
Census Tract 1062.02, Bucks County, Pennsylvania	3353	19.62	53.47

4.4.4 Flood, Flash Flood, Ice Jam

Flooding is the temporary condition of partial or complete inundation of normally dry land, and it is the most frequent and costly of all natural hazards in Pennsylvania (PEMA, 2020). Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams.

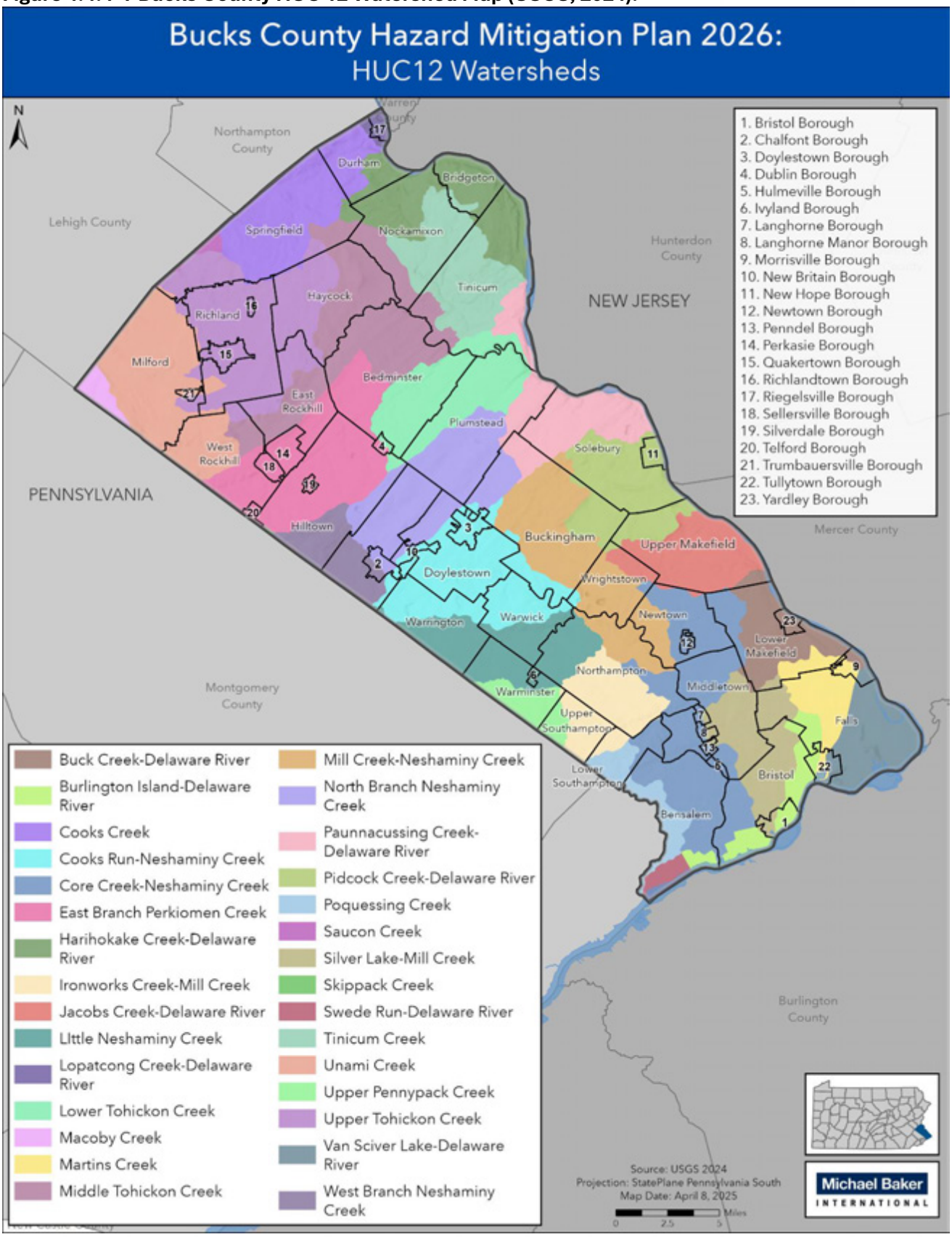
4.4.4.1 Location and Extent

Fluvial 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. Snow melt combined with heavy rains can cause frozen rivers to swell, which can break the ice layer on top of a river. If this occurs, large chunks can float downstream, piling up in narrow passages and near other obstructions such as bridges and dams causing an ice jam.

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.

Bucks County is located largely in the Central Delaware River sub-basin, though some of the southern and western areas are located in the Lower Delaware River sub-basin. This area has a typical piedmont geography with low rolling hills flattening out to the Atlantic Coastal Plain along the Delaware River. Excess water from rainfall or snowmelt can accumulate in this area and drain into the streams and rivers, which can then overflow onto stream banks and adjacent floodplains. Bucks County, like many other areas in Pennsylvania, is flood prone due to the terrain and because most of the communities are located in the floodplains along streams and valleys.

Figure 4.4.4-1 Bucks County HUC 12 Watershed Map (USGS, 2024).



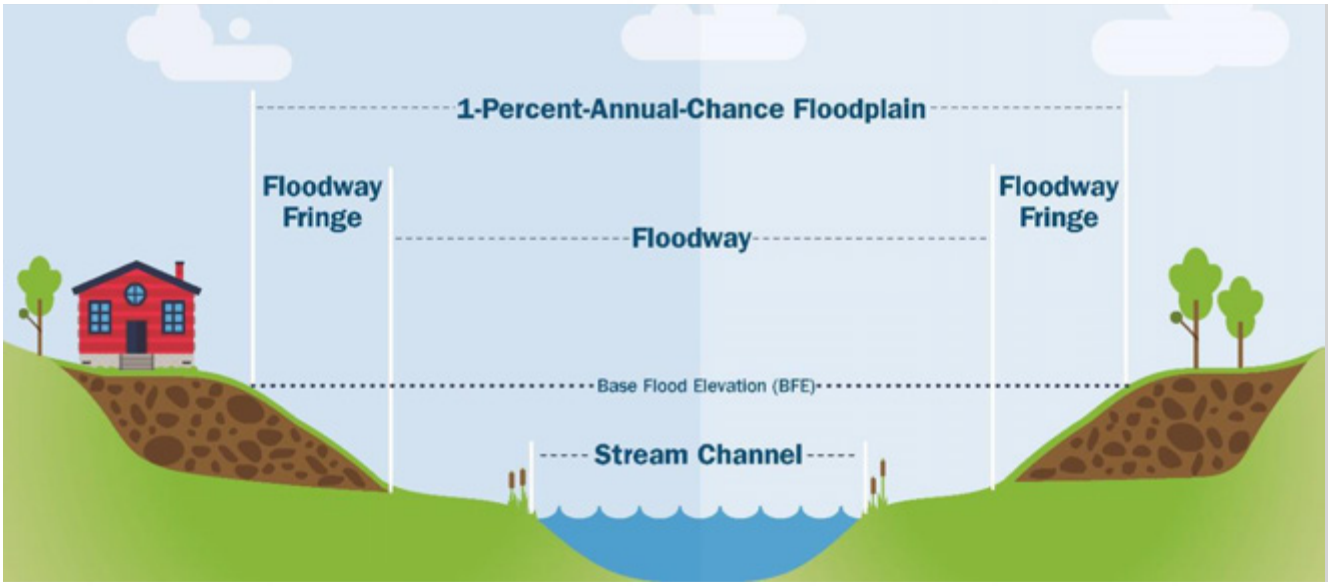
Bucks County manages Act 167 Stormwater Management Plans for nine different watersheds within its boundaries. These identify and prioritize "general" and "detailed" drainage obstructions or flooding problem areas. An obstruction refers to structures of conditions in the flow of water downstream, which, under certain conditions can cause flooding. Problem areas are identified through a variety of issues, including sedimentation, erosion, flooding, landslide, water pollution, Flood Insurance Study (FIS) bridge backwater data, and non-attaining streams. Some plans include obstructions within the problem area count. The number of obstructions and/or problem areas identified throughout the watersheds are listed in Table 4.4.4-1 below. While stormwater problems exist throughout the entire County, the highest concentrations of problem areas were identified in areas with more urbanization. Each problem area includes a photograph of the location of concern, a description of the problem including probable causes if identified, and suggested solutions. Several problems require further investigation to determine optimal solutions and associated costs; these areas are noted accordingly in the plan.

Table 4.4.4-1 Obstructions and Problem Areas identified in Act 167 Stormwater Management Plans in Bucks County

HUC-10 Watershed	Obstructions	Problem Areas	Citation
Delaware River North Watershed	458	-	Bucks County Planning Commission, 2002a
Delaware River South Watershed	-	423	Bucks County Planning Commission, 2004a
East Branch Perkiomen Creek Watershed	-	101	Bucks County Planning Commission, 2004b
Perkiomen Creek Headwaters	24	23	Lehigh Valley Planning Commission, 2009
Neshaminy Creek Watershed	995	153	Bucks County Planning Commission, 2010
Saucony Creek Headwaters	35	1	Lehigh Valley Planning Commission, 2010
Tohickon Creek Watershed	343	-	Bucks County Planning Commission, 2002b
Pennypack Creek Watershed	300+	-	Temple University Center for Sustainable Communities, 2011
Poquessing Watershed	-	142	Philadelphia Water Department, 2012

The size of the floodplain is described by the recurrence interval of a given flood. Flood recurrence intervals are explained in more detail in Section 4.4.4.4. However, in assessing the potential spatial extent of flooding it is important to know that a floodplain associated with a 10-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. The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies 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). Figure 4.3.4-2 illustrates these terms. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania, and Bucks County local governments when determining risk associated with flooding.

4.4.4.2 Diagram Identifying Special Flood Hazard Area, 1% Annual Chance (100-Year) Floodplain, Floodway and Flood fringe



The effective countywide FIRM and Flood Insurance Study (FIS) report were published for Bucks County on March 21, 2017 (FEMA, 2017a; FEMA, 2017b). This remains the most recent flood hazard data, which was used to update this flood hazard profile. The FIRM and FIS for the entire county can be obtained from the FEMA Map Service Center (http://www.msc.fema.gov) 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. All but four municipalities in the County have identified special flood hazard areas (SFHAs). The following municipalities do not have identified SFHAs: Dublin, Ivyland, Richlandtown, and Telford Boroughs (FEMA, 2017b). Figure 4.4.4-3 shows the location of approximate and detailed (include BFEs) SFHAs in Bucks County.

The countywide FIS conducted by FEMA identifies areas of principal flood problems (FEMA, 2017b). The principal flood problems within Bucks County are along Delaware River, Neshaminy Creek, and the streams of Brock, Wilver, and Buck Creeks. Flooding was a yearly occurrence along the Delaware River between 1901-1904 and 1933-1936. Between 1900 and 1955, nineteen major flood events occurred, with multiple flooding events occurring in 1924 and 1936. Late winter and early spring are typically when the Delaware River basin floods, but the four greatest flooding events on record have happened during different seasons of the year, indicating the area is vulnerable to floods year-round. Due to the low topography and vegetation-heavy geography around Delaware River, the floods are wide and deep with high amounts of debris. The August 1955 flood on the Delaware River, the worst flood on record, had a flow of 329,000 cubic feet per second (cfs) at Trenton, New Jersey. The same flooding event on Neshaminy Creek had a peak discharge of 49,300 cfs which was also the highest flow rate ever recorded. The minor streams had minor flooding events for the 1955 flood.

Major storms can cause localized inundation of structures along streams and creeks across the County including:

Countywide

- Delaware River

Upper Bucks

- Beaver Run
- Cabin Run
- Cooks Creek
- Deep Run
- Gallows Run
- Gallows Run Tributary No. 2
- Haycock Creek Tributary A to Little Neshaminy Creek
- Kimples Creek Tributary No. 1 of Martins Creek
- Licking Creek Tributary No. 1 to Lahaska Creek
- Perkiomen Creek
- Pleasant Spring Creek
- Ridge Valley Creek
- Three Mile Run
- Tohickon Creek

Central Bucks

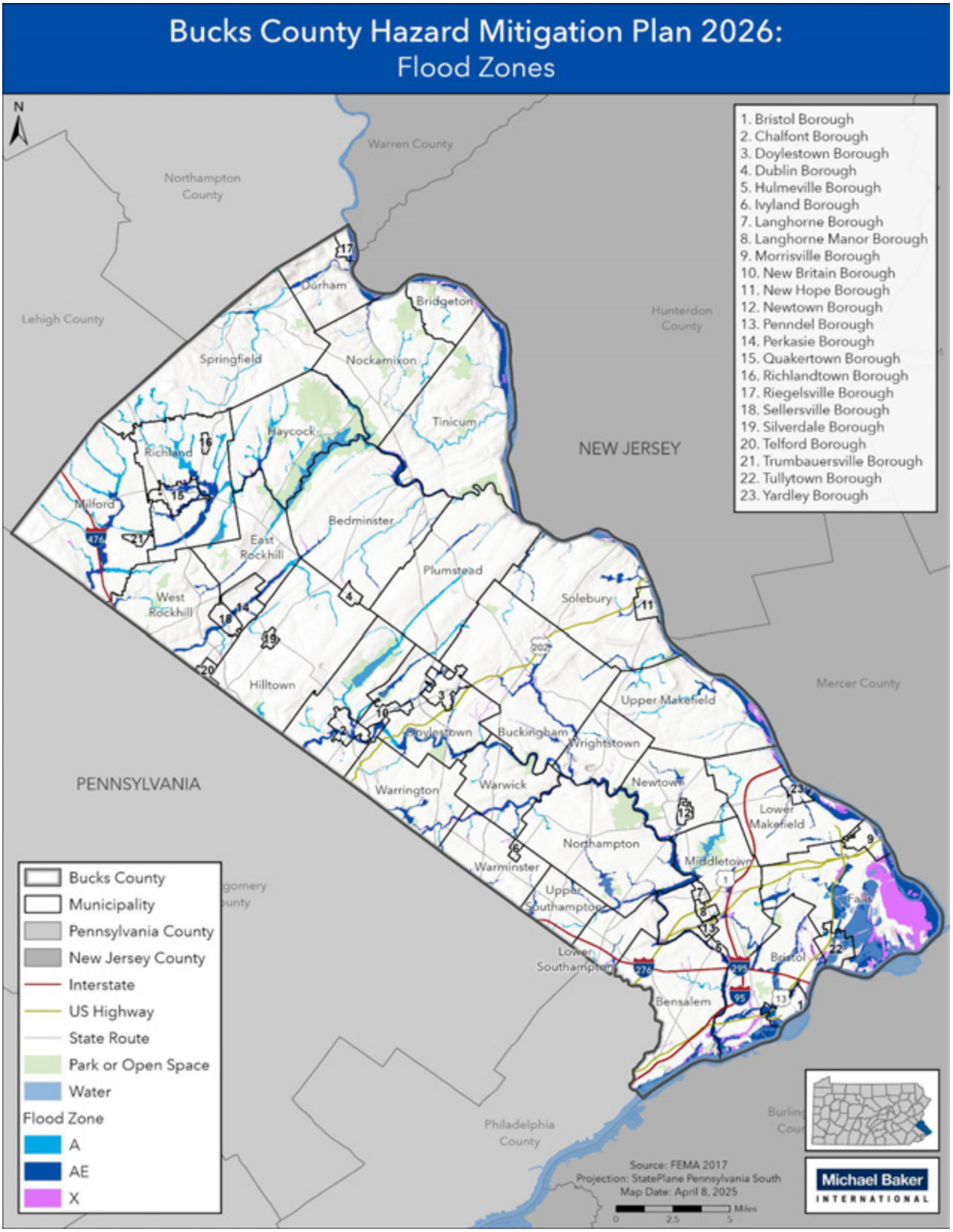
- Aquetong Creek
- Cafferty Run
- Cafferty Run Tributary
- Cooks Run
- Coppernose Run
- Cuttalossa Creek
- Geddes Run
- Geddes Run Tributary
- Tributary 1 to Mill Creek
- Jericho Creek Tributary D to Neshaminy Creek
- Lahaska Creek Tributary No. 1 of Queen Anne Creek
- Paunacussing Creek Tributary No. 1
- Paunacussing Creek Tributary No. 2
- Pidcock Creek
- Pine Run No. 1
- Pine Run No. 2
- Primrose Creek
- Primrose Creek Tributary No. 1
- Rabbit Run
- Railroad Creek
- Robin Run

Lower Bucks

- Anne Creek
- Black Ditch
- Blair Mill Run
- Blair Mill Run Tributary (Tributary 02463 to Blair Mill Run)
- Brock Creek
- Buck Creek
- Chubb Run
- Core Creek
- Croydon Run
- Croydon Tributary
- Hough's Creek Tributary A to Neshaminy Creek
- Poquessing Creek
- Poquessing Creek Tributary No. 2
- Poquessing Creek Tributary No. 3
- Queen Anne Creek (Newportville)
- Rock Run
- Rock Run Tributary East Branch
- Silver Creek No. 1
- Silver Creek No. 2
- Southampton Creek
- Tributary No. 1
- Tributary No. 1 Ironworks Creek Tributary B to Little Neshaminy Creek

It should also be noted that flooding is not only caused by heavy rain events. Additionally, as described in the Dam Failure Hazard Profile (**Appendix G**), there are 13 state regulated, high-hazard dams located within the County and eight federally owned, high hazard dams in or upstream of the County. If any one of these dams were to fail, there could be loss of life and property damage resulting from flooding within the dam inundation areas. Flood risk is also associated with levee failure. The United States Army Corps of Engineers (USACE) identifies four levee systems in Bucks County through the National Levee Database: Morrisville, North Branch Neshaminy Creek Levee, Rohm and Haas Plant Levee System, and West Branch Neshaminy Creek Levee (USACE, 2021a).

Figure 4.4.4-2 Map Showing the Location of Watercourses and Flood Zones Throughout Bucks County



4.4.4.3 Range of Magnitude

Floods are considered hazards when people and properties may be 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. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can 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 impermeable surfaces such as large parking lots, paved roadways, or other impervious developed areas (MRCC, 2022).

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover, and rate of snowmelt (Doocy et al., 2013). Water runoff is greater in areas with steep slopes and little or no vegetative ground cover. Ditches of roads, valleys of hills, land with natural or man-made low topographical areas, and poor draining soils can all attribute to localized flooding outside of a mapped floodplain. Flooding can also be exacerbated through the process of urbanization. Urbanization removes native vegetation and agricultural land present and replaces them with impervious surfaces, which drastically reduces stormwater infiltration rates and forces rainfall to run off into nearby surfaces (Polk, 2024). If mismanaged, this runoff can accumulate quickly and create hazardous conditions. Stormwater runoff may contain and transport harmful pollutants such as fertilizers or pesticides from agricultural/residential applications, bacteria from livestock and pet waste, oil from vehicles, and other pollutants. These contaminants may infiltrate drinking water supply or swimming areas. When excess nitrogen and phosphorus are flushed into the surface water from fertilizers, algal blooms can occur which degrade living conditions for fish and other organisms (Yencha, 2022). How and when a community was built can also contribute to the severity of a flood event. Flooding may be caused or exacerbated in older communities built prior to stormwater management requirements. Communities where this is the case may want to consider mitigation actions focused on retrofitting and incorporating stormwater management initiatives.

Flooding in Bucks County can be worsened if the flow of water is obstructed in some way such as by an undersized culvert. If undersized culverts trap debris they can create a dam, which would increase flooding in upstream municipalities. Flooding can also be worsened by bridge washouts, like the damages and washouts brought about by Hurricane Floyd in September 1999, or Tropical Storm Allison in June 2001. Strong thunderstorms that bring heavy rain downpours can also wash bridges out, like the August 2003 event that washed out County Line Road bridge in West Rockhill Township. More extensive event narratives can be found in the Structure Collapse (Infrastructure) profile, Section 4.3.15. Both culvert and bridge washouts can cause damage to transportation infrastructure, making response and recovery actions more difficult.

In Bucks County, there are seasonal differences in how floods are caused. In the winter and early spring (February to April), major flooding has occurred from intense rainfall on dense snowpack throughout contributing watersheds, although the snowpack is generally moderate during most winters. Furthermore, ice jams are common during the winter and spring along rivers, streams, and creeks. As ice or debris moves downstream, it may get caught on any sort of obstruction to the water flow. When this occurs, water can be held back, causing upstream flooding. When the jam finally breaks, flash flooding can occur downstream (NOAA NWS, n.d.). Ice jams have been an issue on the Delaware River causing major flooding events in 2014 and 2018 as discussed in the Past Occurrence section. 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, the County occasionally experiences intense rainfall from tropical storms in late summer and early fall.

The magnitude of a flood ranges from a small event in which water enters basements and covers low-lying roads to regional flooding events where swollen creeks and rivers destroy homes, businesses, and infrastructure. According to the County, the worst-case flood event occurred in Bucks County in August 1955, when Hurricanes Connie and Diane struck a week apart and caused the worst damage ever in the history of the watershed (BCEMA, 2011). Hurricane Connie hit the Mid-Atlantic August 12-13, dropping significant rainfall across eastern Pennsylvania and flooding along the Delaware River, Neshaminy Creek, and Perkiomen Creek. Then, just five days later, Hurricane Diane brought heavy rains to an already soaked region. Damages from this flood were estimated at $10.6 million, in July 1961 prices (Gelber, 2002).

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems which have not been disrupted by human actions; benefits include groundwater recharge and the introduction of nutrient rich sediment improving soil fertility (WMO, 2006). 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.

Dams, levees, and reservoirs act as flood protection measures in Bucks County. There are 137 dams in the County; however, 13 of these are high hazard dams. Please refer to the Dam Failure hazard profile in Appendix G for more information on dams. As previously mentioned, there are four levee systems in the County.

The following community lifelines are affected by floods, flash floods, and ice jams:

Table 4.4.4-2 Most Likely Lifelines Impacted by Floods, Flash Foods, and Ice Jams

Lifelines	Notes
	Government operations and facilities, including police, fire, and search and rescue are needed for response and recovery.
	Significant risk to buildings is posed and can create issues for food and water access.
	Transportation routes will be affected due to direct damage from flooding and potential compounding hazards like landslides.
	Floods may affect hazardous materials storage due to damage to facilities.

4.4.4.4 Previous Occurrence

Bucks County has a long history of flooding problems. The Delaware River boarders the southeast edge of the County as well as many streams, creeks, and tributaries. This topography has contributed to numerous major floods and localized flash flooding (FEMA, 2017b). Table 4.4.4-3 describes events related to flooding and flash floods in Bucks County between 2000 and November 2025 as reported to the National Centers for Environmental Information (NCEI) Storm Events Database. Estimated property damages include every loss to any type of facility (residential, commercial, agricultural, or industrial) and include structure, content, and crop damages. Not included in this listing or appendix are severe flood events that occurred prior to 1993 as they are not available on the Storm Events Database. Note that property damage values are estimates based on best available information from NCEI's database. "Countywide" indicates several locations in the County were affected.

Table 4.4.4-3 Flood and Flash Flood Events Impacting Bucks County from 2000-2025 (NOAA NCEI, 2026).

Date	Location & Description	Reported Damage ($)*
7/30/2000	SOUTHERN BUCKS COUNTY. Flood – Thunderstorms with torrential downpours caused flash flooding of the Mill Creek Basin, leading to significant structure damage, bridge washouts, and road closures.	$5,000,000
9/19/2000	WARRINGTON. Flood – Heavy rain caused by the remnants of what was Hurricane Gordon caused poor drainage flooding in low-lying areas.	None Reported
12/17/2000	COUNTYWIDE. Flood – Showers and thunderstorms caused urban and poor drainage flooding as well as flooding in major streams and rivers.	None Reported
6/16/2001	SOUTHERN PORTION OF THE COUNTY. Flood – Tropical Storm Allison drenched the southern half of the County with up to ten inches of rain.	$1,500,000
8/4/2001	CROYDON. Flash Flood – Slow moving thunderstorms with torrential downpours produced urban and flash flooding in and around Bristol Township.	None Reported
8/11/2001	WOODSIDE. Flash Flood – Thunderstorms with torrential rains caused flash flooding of Rock Run in Lower Makefield and Yardley.	None Reported
11/17/2002	DUBLIN. Flood – A Northeaster produced steady, heavy rain across Southeast Pennsylvania.	None Reported
2/22/2003	SOUTHERN PORTION OF THE COUNTY. Flash Flood – The combination of heavy rain and melting snow caused widespread roadway flooding and ponding in poor drainage areas; the Neshaminy Creek experienced ice jams.	None Reported
6/4/2003	COUNTYWIDE. Flood – Two separate surges of heavy rain caused urban and poor drainage flooding and flooding on the Neshaminy and East Branch of the Perkiomen Creeks.	None Reported
7/22/2003	Countywide. Flash Flood – Two evenings of thunderstorms in a row caused flash flooding in upper Bucks County. Flooding was worst at Riegelsville.	None Reported
9/15/2003	NORTHWEST PORTION OF THE COUNTY. Flash Flood – Remnants of Tropical Storm Henri caused significant heavy rainfall of 3-4 inches.	None Reported
9/23/2003	COUNTYWIDE. Flood – Heavy rainfall caused widespread poor drainage flooding and covered roads with 2-3 feet of water.	None Reported
9/28/2003	CENTRAL PORTION. Flash Flood – Thunderstorms dropped 3-4 inches between Doylestown and Perkasie causing small stream flooding.	None Reported
10/27/2003	COUNTYWIDE. Flood - Showers and thunderstorms associated with a slow moving cold front produced poor drainage flooding and stream flooding in Bucks County.	None Reported
10/29/2003	COUNTYWIDE. Flood – Heavy rainfall across the county, especially in the lower portion, caused Neshaminy Creek to reach flood stage.	None Reported
11/5/2003	WEST CENTRAL PORTION. Flash Flood - Thunderstorms caused flooding along smaller streams in the Neshaminy Creek Watershed and urban and poor drainage flooding.	None Reported
11/20/2003	COUNTYWIDE. Flood – Heavy rain fell and caused poor drainage and creek flooding across the County.	None Reported
12/11/2003	COUNTYWIDE. Flood - A combination of heavy rain and melting snow runoff caused widespread poor drainage flooding exacerbated by high tide, mudslides, and road closures.	None Reported

Date	Location & Description	Reported Damage ($)*
2/6/2004	COUNTYWIDE. Flood – Heavy rain and snow melt caused poor drainage and creek flooding throughout the County.	None Reported
7/14/2004	NEW BRITAIN. Flash Flood – Thunderstorms with heavy downpours produced stream and roadway flooding in the township.	None Reported
7/27/2004	COUNTYWIDE. Flash Flood - Thunderstorms with very heavy rain caused road closures, stream flooding and vehicle rescues in two stripes across the county.	None Reported
7/28/2004	NEW BRITAIN. Flash Flood – Thunderstorms with heavy downpours produced stream and roadway flooding in the township.	None Reported
8/1/2004	PENNDEL. Flash Flood - Thunderstorms with very heavy rain caused poor drainage and stream flooding in extreme southwest and east central Bucks County.	None Reported
9/18/2004	COUNTYWIDE. Flood/Flash Flood – The remnants of Hurricane Ivan coupled with rain in the upper Delaware River Basin caused widespread poor drainage and creek flooding. Bucks County declared a disaster area.	$1,000,000
9/28/2004	COUNTYWIDE. Flash Flood – The remnants of Hurricane Jeanne caused between 3-8 inches of rain, spurring road flooding, poor drainage, and small creek flooding.	None Reported
11/28/2004	COUNTYWIDE. Flood - A strong cold front and a prolonged flow from the Gulf of Mexico and nearby Atlantic Ocean produced heavy rain across Bucks County. Storm totals of 2 to 3 inches produced widespread poor drainage flooding and creek and stream flooding.	None Reported
1/14/2005	Countywide. Flood – A slow-moving cold front dropped 1-2 inches of rain and led to urban and poor drainage flooding that and led to stream and creek flooding.	None Reported
4/3/2005	COUNTYWIDE. Flood – A greater-than-50-year storm caused significant flooding, triggering widespread evacuation, road closures, and a state of emergency declaration.	None Reported
4/8/2005	COUNTYWIDE. Flash Flood – Heavy rain that fell on already saturated ground caused stream flooding in northwestern Bucks County.	None Reported
10/8/2005	NORTHWEST PORTION OF THE COUNTY. Flash Flood – The remnants of Tropical Storm Tammy produced persistent and heavy rain across the County with storm total averages between 4-6 inches.	None Reported
12/16/2005	LANGHORNE. Flood – The combination of snow melt and excessive precipitation caused minor flooding along the Neshaminy Creek.	None Reported
6/28/2006	MULTIPLE COUNTIES. Flood/Flash Flood/Coastal Flood – Freshwater runoff from excessive precipitation combined with high astronomical tides caused moderate tidal flooding, extending inland on the tidal portions of Delaware River tributaries. At times other than high tide, major flooding occurred along the Delaware River, striking Yardley and New Hope the hardest.	$30,000,000
6/29/2006	SOUTHWEST PORTION OF THE COUNTY. Flash Flood – Thunderstorms with heavy rain caused poor drainage flooding and some creek flooding in southwestern Bucks County.	None Reported
7/21/2006	NORTH PORTION OF THE COUNTY. Flash Flood - Thunderstorms with 3-4 inches of heavy rain caused poor drainage flooding and some creek flooding in northern Bucks County.	None Reported
9/2/2006	LANGHORNE. Flood – The remnants of Tropical Storm Ernest and a large high pressure system over Canada produced heavy rain and strong winds in Bucks County. This caused power outages and downed trees in and around Langhorne in particular.	None Reported
11/8/2006	QUAKERTOWN TO LANGHORNE. Flood - A slow moving low pressure system that moved from the Gulf of Mexico caused heavy rain to fall averaging between 2 and 3 inches during about a twelve hour period. The heavy rain caused urban and poor drainage flooding exacerbated by fallen leaves that clogged catch basins.	None Reported
1/1/2007	DUBLIN. Flood - Heavy rain caused flooding along the East Branch of the Perkiomen Creek in upper Bucks County.	None Reported
3/2/2007	ANDALUSIA. Flood - The borough of Croydon briefly experienced some minor street flooding, with two homes being surrounded by water as the Neshaminy Creek neared flood stage. Flooding also occurred along the Neshaminy Creek at Langhorne.	None Reported
3/2/2007	BRISTOL. Coastal Flood – Tidal flooding along the Delaware river in Bristol pushed water onto properties immediately along the river.	None Reported
4/15/2007	QUAKERTOWN. Flood - The heavy rain caused flooding across Bucks County with the worst reported flooding along the Neshaminy Creek. Ground floor apartments, roadways, and basements flooded in floods prone areas along the creek in Bensalem, Bristol, Middletown, Hulmeville, and Northampton. Minor coastal flooding was also seen along the Delaware River.	$1,000,000

Date	Location & Description	Reported Damage ($)*
4/27/2007	NEW BRITAIN TO SOLEBURY, LANGHORNE. Flood/Flash Flood – Thunderstorms with heavy rain continued to repeat in a narrow band in central Bucks County, leading to road closures and multiple rescues.	$1,000,000
6/12/2007	SOUTHAMPTON. Flash Flood – Thunderstorms with very heavy rain caused stream and poor drainage flooding in Upper and Lower Southampton Townships.	None Reported
10/27/2007	LANGHORNE. Flood – A slow moving weather pattern led to approximately 5 inches of rain falling across the County, causing small creek and poor drainage flooding.	None Reported
2/13/2008	LANGHORNE. Flood - Runoff from the heavy rain and melting ice caused flooding along the Neshaminy Creek. The heavy rain also caused poor drainage flooding.	None Reported
3/8/2008	BRISTOL. Flash Flood – Runoff from the heavy rain caused flash flooding along the East Branch of the Perkiomen Creek as well as started flooding along the Neshaminy Creek. Some minor flooding also occurred along the Delaware River in Bridgeton.	None Reported
3/20/2008	TELFORD TO SOLEBURY. Flash Flood - Thunderstorms with heavy rain over saturated ground caused flash flooding along roadways and smaller streams in the Philadelphia northwest suburbs.	None Reported
6/4/2008	NESHAMINY TO DAVISVILLE; LANGHORNE. Flash Flood - Thunderstorms with heavy rain caused flash flooding of smaller streams as well as poor drainage flooding across central and lower Bucks Counties.	None Reported
9/28/2008	KINTNERSVILLE TO FERNDALE. Flash Flood - Showers and thunderstorms with heavy rain caused the flooding and washouts of a few roads in Durham and Nockamixon Townships. A large mudslide occurred across Pennsylvania State Route 611 in Durham Township and closed it. Other major roads closed in the area included Center Hill and Kintner Hill Roads.	$750,000
12/12/2008	NEWTON TO LANGHORNE. Flood - The main stem of the Neshaminy Creek flooded. The heavy rain also caused another section of the Delaware Canal wall to collapse just south of the Groundhog Lock between Raubsville and Riegelsville on the berm side of the waterway.	None Reported
5/7/2009	ERWINNA VANSANT AIRPORT TO BUCKMANVILLE. Flash Flood - Heavy rain from thunderstorms caused flooding across smaller creeks in central and upper Bucks County.	None Reported
6/13/2009	BON AIR TO JACKSONVILLE; LANGHORNE. Flash Flood - Slow moving thunderstorms with torrential downpours caused poor drainage as well as flash flooding of smaller streams and creeks including the headwaters of the Neshaminy Creek in and around Doylestown, Warwick, Warrington, and Westminster Townships in central Bucks County. Runoff from heavy rain upstream caused flooding along lower parts of the Neshaminy Creek.	None Reported
6/30/2009	ARGUS TO TELFORD. Flash Flood - Thunderstorms with heavy rain caused poor drainage flooding as well as flooding of streams in the East Branch of the Perkiomen Creek basin in West Rockhill Township.	None Reported
2/2/2009	KEELERSVILLE TO SPRINGTOWN. Flash Flood - Thunderstorms with torrential downpours caused flash flooding of smaller streams and roadway flooding in upper Bucks County. Several roadways were closed.	None Reported
8/2/2009	NEWTOWN. Flash Flood - Thunderstorms with torrential downpours caused poor drainage flooding as well as flooding along the Neshaminy Creek basin in lower or southern Bucks County. Doppler Radar storm total estimates reached three to four inches in the area. The Neshaminy Creek covered roads and backyards near Langhorne.	None Reported
10/24/2009	TREVOSE TO WASHINGTON CROSSING. Flash Flood - Showers and thunderstorms with heavy rain caused flash flooding of some of the smaller creeks as well as poor drainage flooding mainly in the central third of Bucks County.	None Reported
10/25/2009	LANGHORNE. Flood – Runoff from the heavy rain on this evening caused the Neshaminy Creek to reach flood stage. Precipitation caused flash flooding during the early evening.	None Reported
12/9/2009	LANGHORNE. Flood - The combination of snow melt and heavy rain caused poor drainage flooding and flooding along sections of the Neshaminy Creek.	None Reported
12/26/2009	LANGHORNE. Flood - The combination of melting snow and heavy rain produced field, poor drainage and stream and creek flooding in southeastern Pennsylvania throughout the Philadelphia Metropolitan Area.	None Reported
1/25/2010	LANGHORNE. Flood - Heavy rain that fell during the first half of the day on the 25th caused some river and poor drainage flooding in southeastern Pennsylvania. Event precipitation totals averaged 1.5 to 2 inches, but most of it fell between 6 a.m. and Noon EST.	None Reported

Date	Location & Description	Reported Damage ($)*
3/13/2010	LANGHORNE. Flood - Four days of rain, heaviest on the 13th, culminated in flooding across southeastern Pennsylvania. The Neshaminy Creek flooded Bridal Drive, but no homes were affected. Roadway flooding was reported from County Line to River Road in the county. Pennsylvania State Route 32 was closed due to flooding in Yardley and Solebury.	None Reported
3/10/2010	LANGHORNE. Flood - A series of low pressure systems that brought between two and four inches of rain from the evening of the 28th into the early morning of the 31st. Coupled with already wet conditions, this caused renewed flooding in southeastern Pennsylvania.	None Reported
10/1/2010	QUAKERTOWN TO TRADESVILLE. Flood - A series of low pressure systems that moved north along a slowly moving cold front brought heavy rain into Eastern Pennsylvania. Both Yardley and Lower Makefield closed River Road as waters from the Delaware River crept a few inches onto the roadway. Roadway flooding and closures including Erie Road were reported in Quakertown as the Tohickon Creek flooded.	None Reported
3/7/2011	LANGHORNE and RIEGELSVILLE. Flood - A slow moving cold front with waves of low pressure that developed along it brought a precipitation event that dropped between 1 and 3 inches of water equivalent over Eastern Pennsylvania. Precipitation ended briefly as snow. Snow melt contributed to the flooding which mainly affected the counties near or along the Delaware River.	None Reported
3/11/2011	LANGHORNE and RIEGELSVILLE. Flood - For the second time within a week heavy rain fell across Eastern Pennsylvania. An additional 1.5 to 5 inches of precipitation fell and caused more widespread river, stream, and poor drainage flooding including the Delaware, Lehigh, and Schuylkill Rivers. Generally minor flooding occurred on the Delaware and Schuylkill Rivers. Snowmelt in the upper reaches of the Lehigh and Delaware Basins contributed to the flooding. The worst reported damage was along the towpaths of the Delaware River in Bucks County.	$250,000
4/16/2011	LANGHORNE. Flood - Heavy rain caused poor drainage flooding in Eastern Pennsylvania and mainly minor to moderate creek and river flooding in Southeastern Pennsylvania. Precipitation totals averaged 1.5 to 3.0 inches with the highest amounts along the interstate 95 corridor.	None Reported
8/21/2011	CORNWELLS HGTS. Flash Flood - A series of thunderstorms with heavy rain caused poor drainage and stream flash flooding in Bucks County. Event precipitation totals averaged two to three inches.	None Reported
8/27/2011 - 8/28/2011	QUAKERTOWN and RIEGELSVILLE. Flash Flood - Irene produced heavy flooding rain, tropical storm force wind gusts with hundreds of thousands of outages, moderate tidal flooding along the Delaware River and one flooding related death in Eastern Pennsylvania over the weekend of August 27th and 28th. Moderate stream and river flooding occurred in the Poconos and Lehigh Valley and moderate to major river flooding occurred in southeast Pennsylvania. For many places in southeastern Pennsylvania, it was the worst creek and river flooding since Hurricane Floyd in 1999 or the remnants of Hurricane Jeanne in 2004. Flooding along non-tidal sections of the Delaware River was minor to moderate. About 500,000 PECO Energy and 420,000 Pennsylvania Power and Light customers lost power in Eastern Pennsylvania. For both utilities this ranked within the top five outages of all time. Preliminary damage estimates were around six million dollars. In addition to property damage, the winds and rains badly damaged the corn crop in southeastern Pennsylvania. The Delaware Water Gap National Recreational Area was closed through Labor Day Weekend (September 5th). Tropical storm force wind gusts overspread Eastern Pennsylvania during Irene. Among the highest wind gusts recorded during the storm, two were recorded in Bucks County: 44 mph in Newbold and 40 mph in Quakertown. During the evening of the 27th, The Southeastern Pennsylvania Transportation Authority halted all commuter rail service as multiple tornado warnings were issued, three large shelters were established in Philadelphia, and the Philadelphia International Airport was closed.	$700,000

Date	Location & Description	Reported Damage ($)*
9/6/2011 - 9/8/2011	TRUMBAUERSVILLE, GERYVILLE, and NESHAMINY. Flood - The remnants of Tropical Storm Lee that interacted with a stalled frontal boundary produced several days with periods of heavy rain across Eastern Pennsylvania. Event precipitation totals averaged 4 to 9 inches. The heavy rain caused widespread poor drainage flooding as well as moderate flooding along the Delaware and Schuylkill Basins and minor to moderate flooding along the Lehigh River Basin. Crests in the upper Schuylkill, Lehigh, and Delaware River Basins were higher than what occurred with Irene the previous month and the highest crests since late June of 2006 in most instances. The crests along the Delaware River were 2 to 4 feet higher than what occurred during Irene. Some of the smaller streams in southeastern Pennsylvania reached major flooding levels, but most of those crests were lower than what occurred with Irene. In addition to the freshwater flooding, moderate tidal flooding occurred along the lower Delaware River and its tributaries. In Eastern Pennsylvania, there were 22 homes and businesses that were destroyed, 201 that suffered major damage, 672 that had minor damage and 1217 others that were affected. The preliminary damage estimate for the state of Pennsylvania was five hundred million dollars.	None Reported
11/23/2011	LANGHORNE. Flood - Periods of rain, heavy at times, produced poor drainage flooding as well as minor to moderate flooding of creeks and rivers in Eastern Pennsylvania from the Lehigh Valley south through the Philadelphia Metropolitan Area. Event precipitation totals averaged two to three inches.	None Reported
12/7/2011	LANGHORNE. Flood - A protracted rain event with heavy rain caused poor drainage flooding in Eastern Pennsylvania. The heavy rain also caused minor to locally moderate river and creek flooding in Southeast Pennsylvania. Event precipitation totals averaged around two inches.	None Reported
5/15/2012	KEELERSVILLE. Flood - A weakening cold front helped trigger scattered showers and thunderstorms with heavy rain. Event precipitation totals during multiple thunderstorms reached between 2.0 and 3.5 inches and caused flash flooding and flooding of smaller streams and creeks in southeastern Pennsylvania.	None Reported
5/27/2012	SPINNERSTOWN. Flood - Series of thunderstorms with heavy rain produced poor drainage and creek flash flooding. Residual flooding in Bucks County along parts of the Perkiomen Creek as runoff went farther downstream. Doppler Radar storm total estimates reached around two inches in the upper part of the basin.	None Reported
8/1/2012	HARTSVILLE. Flash Flood - The combination of a weak cold front and a mid-level disturbance, along with an increasingly hot and humid air mass, triggered strong to severe thunderstorms, which produced heavy rain and flooding in Pennsylvania. Doppler Radar storm total estimates reached between 3 and 6 inches.	None Reported
12/21/2012	CORNWELLS HGTS. Flood - Major tidal flooding along the Delaware Bay and Delaware River. Moderate to heavy rain occurred with storm totals ranging between 1 to 3 inches. This rain resulted in poor drainage flooding as well as minor to moderate flooding of streams and creeks in Eastern Pennsylvania. In Philadelphia, the tidal flooding forced the closure of the southbound lanes of Interstate 95 at Columbus Boulevard. Columbus Boulevard/Delaware Avenue was flooded and closed in both directions between Washington and Fairmount Avenues. In Bucks County, tidal flooding affected the Radcliffe, Cedar, and Mill Street areas of Bristol Township. The high tide swamped the backyards and basements of stores in the business district along Radcliffe and Cedar Streets The Mill Street parking lot was under water as was the Landmark Wharf on Mill Street. The high tide in Philadelphia reached 10.35 feet above mean lower low water. This was the third highest tide on record. Major tidal flooding starts at 10.2 feet above mean lower low water. The high tide reached 12.13 feet above mean lower low water at Newbold Island (Bucks County). There are no established flood categories for this site. Strong winds occurred in the southeast part of the state, peak wind gusts included 55 mph in Newbold Island.	None Reported
1/31/2013	KEELERSVILLE. Flood - Heavy rain caused poor drainage flooding as well as stream and river flooding in southeastern Pennsylvania. Most of the waterway flooding was. Event totals averaged 1.5 to 3.0 inches.	None Reported
6/7/2013	LANGHORNE. Flood - The remnants of Tropical Storm Andrea moving up the Eastern Seaboard, led to waves of heavy rain and thunderstorms. Doppler radar storm total estimates ranged from around 2 to 4 inches of rain for the event across eastern Pennsylvania. Waves of heavy precipitation resulted in areas of flooding.	None Reported
6/10/2013	LANGHORNE. Flash Flood - Heavy rain that moved across southeast Pennsylvania during the day on the 10th caused renewed flooding in the area. Event precipitation totals averaged between 1.5 and 3.5 inches.	None Reported

Date	Location & Description	Reported Damage ($)*
6/27/2013	HARTSVILLE. Flood - A series of thunderstorms with very heavy rain caused flooding in the Philadelphia northwest suburbs that lasted overnight, with 2 to 3 inches in the hardest hit parts of Bucks County.	None Reported
7/13/2013	MORRISVILLE. Flood - Heavy downpours across sections of Bucks County that caused poor drainage and roadway flooding, with total estimates of 1 to 2.5 inches in sections of Bucks County.	None Reported
8/13/2013	CORNWELLS HGTS. Flash Flood - A complex of showers and thunderstorms produced both wind damage and flash flooding in southeastern Pennsylvania. Doppler Radar storm total estimates averaged 2.5 to 7.0 inches. In addition to widespread poor drainage flooding, flooding also affected sections of the Brandywine basin. Vehicle water rescues were performed in lower Bucks County. The AAA of Mid-Atlantic reported a 60 percent increase in assistance calls. Because the torrential rain coincided with the morning commute, traffic on some interstates were backed up for hours. SEPTA commuter regional rail lines experienced on average thirty minute system-wide delays through the morning. Arrival delays to Philadelphia International Airport reached 90 minutes.	None Reported
8/28/2013	QUAKERTOWN. Flash Flood - An area of rain with embedded thunderstorms caused flash flooding in upper Bucks County and brief minor flooding along the Frankford Creek.	None Reported
9/2/2013	FOUNTAINVILLE. Flash Flood - Clusters of showers and thunderstorms with torrential downpours occurred in southeast Pennsylvania This caused urban, poor drainage and small creek flash flooding. Event precipitation totals reached between 1.0 and 3.5 inches in many areas in and around the local Philadelphia area and marred traveling plans on this Labor Day.	None Reported
1/8/2014	MORRISVILLE. Flood - Ice jam flooding along the Delaware River north of the jam in Bucks County and along the Lehigh River in Northampton County before its confluence with the Delaware River.	None Reported
4/30/2014 - 5/1/2014	CORNWELLS HGTS. Flood - Very heavy rain caused widespread poor drainage, moderate to major creek flooding in Bucks County. Flooding along the Neshaminy Creek was the worst since Tropical Storm Irene on August 28, 2011. Even moderate tidal flooding occurred along the Delaware River. An apartment building along the East Branch of the Perkiomen Creek in Perkasie was evacuated because of flooding. Vehicles were stuck in flood waters in Bensalem Township. Townships reporting road closures due to flooding included Milford and New Britain. Event precipitation totals included 4.90 inches in Quakertown and Richlandtown, 4.82 inches in Warrington, 4.79 inches in Furlong, 4.57 inches in Warwick Township and 4.42 inches in Doylestown.	$200,000
7/14/2014	EDGELY. Flash Flood - Thunderstorms with very heavy rain caused poor drainage flash flooding in Bristol Township. Numerous roadways were flooded near the Delaware River and included Radcliffe Street, Farragut Street and Wilson Street. Event precipitation totals included 2.16 inches at the Northeast Philadelphia Airport, 2.01 inches in Warrington, 1.96 inches in Newtown and 1.92 inches in Jamison.	None Reported
7/14/2014	WEST BRISTOL. Flash Flood - Thunderstorms with very heavy rain caused poor drainage flash flooding on the campus of the Lower Bucks Hospital in Bristol Township. Flood waters started to cascade from the parking lots into the hospital's staircases. No patients had to be evacuated. Event precipitation totals included 2.16 inches at the Northeast Philadelphia Airport, 2.01 inches in Warrington, 1.96 inches in Newtown and 1.92 inches in Jamison.	$10,000
06/15/2015	SPRINGTOWN. Flash Flood - Slowly westward moving thunderstorms that formed along a backdoor cold front caused flash flooding in parts of Northampton and Upper Bucks Counties during the evening of the 15th. Reported event precipitation totals reached 2 to 3 inches. Doppler Radar storm total estimates exceeded 4 inches in south central Northampton County. Thunderstorms with torrential downpours caused poor drainage flooding as well as flash flooding of smaller creeks in Durham and Nockamixon Townships. Doppler Radar storm totals reached 3 to 4 inches near the Northampton County border.	None Reported
7/6/2015	SELLERSVILLE. Flash Flood - Thunderstorms with very heavy rain caused flash flooding of smaller creeks as well as flooding of roadways in Upper Bucks County from Perkasie east into Nockamixon and Tinicum Townships. Water was crossing roadways in Perkasie. One cooperative weather observer in Perkasie reported 2.05 inches of rain within two hours. Doppler Radar storm total estimates neared 4 inches farther to the east close to Lake Nockamixon.	None Reported
8/21/2015	WAMINSTER. Flash Flood - Thunderstorms with heavy downpours caused flash flooding of roadways and smaller streams in southern Bucks County. Event precipitation totals included 2.61 inches in Penndel, 2.57 inches in Langhorne, 2.55 inches in Richboro, 2.42 inches in Bensalem, and 2.32 inches in Warminster. Much of this rain fell within a very short time period of about one hour.	None Reported
7/8/2016	NEW HOPE. Flash Flood - Several roads closed due to flash flooding with some debris washed into roadways.	None Reported

Date	Location & Description	Reported Damage ($)*
7/8/2016	WASHINGTON CROSSING. Flash Flood - Several roads were closed due to flash flooding with rocks and debris washing up on to roads.	None Reported
7/25/2016	CORNWELLS HEIGHTS. Flash Flood - An underpass of interstate 95 at Station avenue flooded rapidly. A SEPTA bus became stuck in the flood waters. Water also led to flooding in Cornwall Apartments.	None Reported
7/24/2017	ZION HILL. Flood - A foot of water on the road. A stalled frontal boundary was the focus for several rounds of thunderstorms that produced damaging winds and flooding in spots. Over 8,000 people lost power.	None Reported
8/3/2017	WEST BRISTOL. Flood - Several roads with water a foot or so deep in spots. A hot and humid air mass with weak boundaries led to slow moving strong to severe thunderstorms with damaging winds, hail and flooding. A few thousand people lost power.	None Reported
1/15/2018	MORRISVILLE. Flood - Several roads were closed due to minor flooding by an Ice Jam. Minor Flooding occurred along the Delaware River due to an Ice Jam. Flood stage is 20.0 feet and the river was between 19 and 20 feet throughout most of Monday. Lower Makefield township was impacted with a few roads flooded. Roads closed included River, West Trenton, and Richard.	None Reported
4/16/2018	LANGHORNE. Flood - The Neshaminy Creek At Langhorne rose above flood stage of 9.0 feet. The maximum height was 10.29 feet. A strong backdoor cold front moved from northeast to southwest across the area late Saturday afternoon April 15th into Sunday morning April 16th. Not only was there a significant drop in temperature coinciding with the passage of the front, but also a stark difference between high temperatures on Saturday and Sunday. The backdoor front became stationary south of the region then moved northward as a warm front Sunday night into Monday morning. Meanwhile, a strong cold front approached from the west and swept across the area Monday afternoon and evening, along with an attendant area of low pressure. This robust storm system tapped large amounts of moisture, which was lifted along the warm front as overrunning precipitation, and along the cold front as a line of showers and thunderstorms. As a result, heavy rainfall occurred across the region. A widespread 1 to 3 inches of rainfall occurred, with localized amounts over 4 inches. This led to flooding across portions of the area. Along the coast, an extended period of onshore flow occurred, beginning with east-northeast winds Saturday Night, which then shifted to the southeast on Sunday Night into Monday Morning April 16th. By Monday morning and afternoon, tidal flooding made its way up the Delaware River to Philadelphia as a result of the onshore flow.	None Reported
5/27/2018	FOUNTAINVILLE. Flash Flood - Numerous roads in Doylestown were flooded and impassable. The Doylestown airport received 3.75 inches of rain in 80 minutes.	None Reported
5/27/2018	LANGHORNE. Flash Flood - The Neshaminy Creek exceeded its flood stage at Langhorne.	None Reported
8/11/2018	SPINNERSTOWN. Flash Flood - Widespread flash flooding occurred in Milford Township. Five water rescues took place and eight individuals were evacuated from their homes. Many roads were closed due to the flooding.	None Reported
9/25/2018	STANWOOD. Flash Flood - Roadway flooding in Bensalem Township. A family was rescued from their vehicle that was trapped in flood waters on Galloway Road.	None Reported
9/25/2018	MORRISVILLE. Flash Flood - A quick 1 to 2 inches of rain fell in parts of far southeastern Pennsylvania during the late afternoon and early evening of September 25. Widespread roadway flooding in Morrisville.	None Reported
11/2/2018	TRUMBAUERSVILLE. Flash Flood - Widespread roadway flooding in Milford Township and in Trumbauersville.	None Reported
5/29/2019	CHURCHVILLE. Flash Flood - Widespread roadway flooding in Warminster Township, Upper Southampton Township and Lower Southampton Township. Many roads became impassable due to the flash flooding.	None Reported
5/29/2019	KEELERSVILLE. Flash Flood - Minor flooding occurred along the East Branch of the Perkiomen Creek at and in the vicinity of the Dublin river gauge.	None Reported
5/29/2019	CORNWELLS HEIGHTS. Flash Flood - Several water rescues took place in Bensalem Township, Bristol Township and Middletown Township.	None Reported
5/29/2019	RUSHLAND. Flash Flood - Moderate flooding occurred along the Neshaminy Creek at and in the vicinity of the Penns Park river gauge.	None Reported
5/29/2019	LEVITTOWN. Flash Flood - The local fire department pulled a male teenager out of the flood swollen Mill Creek in Middletown Township. The individual was kayaking with another male teenage when he fell out of the kayak. The victim was pulled from the creek but later died at Children's Hospital in Philadelphia. A law enforcement official indicated that the creek's high and fast moving water likely contributed to the victims death.	None Reported

Date	Location & Description	Reported Damage ($)*
6/19/2019	CROYDON. Flash Flood - Several roadways in the Croydon section of Bristol Township were impassable. A few water rescues took place. State Road was damaged by the flood waters.	None Reported
7/6/2019	MECHANICSVILLE. Flash Flood - Heavy rain caused roadway flooding in the Lahaska area. Some roads became impassable.	None Reported
7/11/2019	TELFORD. Flash Flood - A water rescue took place at the intersection of Bethlehem Pike and Cherry Road in Hilltown Township.	None Reported
7/11/2019	PERKASIE. Flash Flood - Moderate flooding occurred along the East Branch of the Perkiomen Creek above Perkasie.	None Reported
7/11/2019	RICHBORO. Flash Flood - Minor flooding occurred along the Neshaminy Creek in the Penns Park area.	None Reported
10/31/2019	ZION HILL. Flash Flood - PA Route 309 was closed in Springfield Township due to flash flooding.	None Reported
7/6/2020	CORNWELLS HEIGHTS. Flash Flood - Three vehicles were submerged in flood waters on Willow Court in Bensalem Township.	None Reported
8/4/2020	KEELERSVILLE. Flash Flood - Major flooding occurred on the East Branch of the Perkiomen Creek in the Dublin and Perkasie area.	None Reported
8/4/2020	RICHBORO. Flash Flood - Moderate flooding occurred along the Neshaminy Creek in the Penns Park and Rushland area.	None Reported
8/7/2020	PERKASIE PENRIDGE AR. Flash Flood - Moderate flooding occurred along the East Branch of the Perkiomen Creek in the Perkasie and Dublin area.	None Reported
8/13/2020	CARVERSVILLE. Flash Flood - Widespread roadway flooding occurred in Buckingham Township. Several roads were closed including Mill Road, Forest Grove Road, Lower Mountain Road, PA Route 413, New Hope Road and Smith Road.	None Reported
8/13/2020	CROSS KEYS. Flash Flood - North Broad Street was closed at Sandy Ridge Drive in Doylestown due to flooding.	None Reported
7/12/2021	STANWOOD. Flash Flood - Widespread flooding occurred in Bensalem Township. Several roads were closed including parts of Interstate 95, US Route 13, Woodhaven Road and State Road. Many individuals were trapped in vehicles by the flood waters, with numerous water rescues becoming necessary. Flood waters reached houses including some along Allen Avenue, McKinley Avenue and Kings Avenue, where residents needed to be rescued from their homes. The Lafayette Garden Apartments along US Route 13 at the Poquessing Creek were severely flooded with 80 to 100 units affected.	None Reported
7/12/2021	BATH ADDITION. Flash Flood - Widespread significant flooding occurred in Bristol Township. There were many road closures including parts of US Route 13. Many individuals were trapped in vehicles by the flood waters, with numerous water rescues becoming necessary including those along Walnut Avenue and along McKinley Street at Wilson Avenue. Flood waters reached some buildings along US Route 13 in the Croyden section of the township. Part of Dixon Avenue near Newportville Road was washed out, and residents needed to be evacuated from nearby homes.	None Reported
7/12/2021	TULLYTOWN. Flash Flood - Many roads in Tullytown became impassable. Water rescue was required along Spencer Drive.	None Reported
7/17/2021	CORNWELLS HGTS. Flash Flood – A water rescue occurred in Bensalem Township.	None Reported
7/29/2021	LUMBERVILLE. Flash Flood - Flood waters were rushing across River Road in Plumstead Township.	None Reported
9/1/2021	AQUETONG. Flash Flood - Widespread flash flooding occurred in upper Bucks County with many road closures and vehicles stranded. There were numerous water rescues. One flood related fatality was reported in Milford Township. Most waterways in the county overflowed, including the Delaware River (with a highly unusual quick response to the runoff), Neshaminy Creek, Tohickon Creek and the East Branch of the Perkiomen Creek. Many buildings and homes were flooded.	26,000,000
9/1/2021	DAVISVILLE. Flash Flood - Widespread flash flooding occurred in lower Bucks County with many road closures and vehicles stranded. There were numerous water rescues. Most waterways in the county overflowed, including the Delaware River (with a highly unusual quick response to the runoff), Neshaminy Creek, Tohickon Creek and the East Branch of the Perkiomen Creek. Many buildings and homes were flooded.	25,000,000
9/23/2021	STANWOOD. Flash Flood - The Poquessing Creek was out of its banks in Bensalem Township.	None Reported
6/27/2023	STANWOOD GARDENS. Flash Flood - Bristol Road in Bensalem Township became impassable due to flooding around Bensalem Boulevard.	None Reported

Date	Location & Description	Reported Damage ($)*
7/9/2023	BRICK TAVERN. Flash Flood - Widespread roadway flooding and road closures occurred in Quakertown. Numerous vehicles were trapped in flood waters making some water rescues necessary.	None Reported
7/9/2023	DURHAM. Flash Flood - Some residents were evacuated from their homes in Durham Township due to rising flood waters.	None Reported
7/9/2023	TRUMBAUERSVILLE. Flash Flood - Morgan Creek overflowed its banks in Trumbauersville, flooding a section of Allentown Road near Yankee Road.	None Reported
7/15/2023	BUCKMANVILLE. Flash Flood - Catastrophic flash flooding occurred in Upper Makefield Township, resulting in the loss of seven lives. A reliable rain gauge located within the township indicated that 4.64 inches of rain fell during the event which lasted less than 2 hours. Widespread roadway flooding occurred with many roads becoming impassable. Numerous water rescues took place in the township. The worst of the flooding occurred along Hough's Creek. The creek rose rapidly and the rushing water carried away many vehicles, most along Taylorsville Road which parallels the Delaware Canal. Eleven vehicles were reported to have been swept into the creek. Eight individual were rescued from their vehicle and two from the creek. Unfortunately, seven people perished either while trapped in their vehicle or while attempting to escape the flood waters.||The Taylorsville Road Bridge over Hough's Creek was structurally compromised. PA Route 532 between Stonebridge Crossing Road and Wrightstown Road was damaged severely by the raging flood waters from Hough's Creek.	None Reported
7/15/2023	YARDLEY. Flash Flood - Widespread roadway flooding occurred in Lower Makefield Township. There were numerous road closures and water rescues.	None Reported
9/8/2023	PIPERSVILLE. Flash Flood - Widespread roadway flooding in Plumstead Township with some road closures.	None Reported
9/8/2023	FARM SCHOOL. Flash Flood - Widespread roadway flooding in Doylestown with some road closures.	None Reported
9/8/2023	DOYLESTOWN ARPT. Flash Flood - Widespread roadway flooding in Buckingham Township with some road closures.	None Reported
9/10/2023	STANWOOD. Flash Flood - Flooding occurred along Poquessing Creek in Bensalem.	None Reported
12/18/2023	CROYDEN. Flood - Across southeast Pennsylvania and northern Delaware, flooding occurred on the Brandywine River, the Schuylkill River, the Christina River, Red Clay Creek, and White Clay Creek. The Coochs Bridge gauge crested at 12.2 ft. The Langhorne gauge crested at 13.59 ft. The Langhorne gauge crested at 13.59 ft. The Downingtown gauge crested at 10.94 ft. The Chadds Ford gauge crested at 12.18 ft. The Wooddale gauge crested at 8.58 ft. The Newark gauge crested at 14.45 ft. The Wooddale gauge crested at 8.58 ft. The Graterford gauge crested at 16.30 ft. The Chester gauge crested at 11.87 ft. The Philadelphia gauge crested at 11.82 ft. The Pottstown gauge crested at 13.92. The Norristown gauge crested at 15.85. The Langhorne gauge crested at 13.59 ft. The Wilmington gauge crested at 17.08 ft. All of these crests are above flood stage. Four roads were closed for a period during the course of the flooding in Bucks County. PA 532 in Newtown Township, PA 32 in Lower and Upper Makefield Townships, PA 332 in Northampton Township, and PA 413 in Middletown Township.	None Reported
12/28/2023	SHELLY. Flood - PA 309 was closed due to flooding.	None Reported
12/28/2023	WASHINGTON CROSSING. Flood - PA-32 was closed for a period between Taylorsville and Washington Crossing due to flooding.	None Reported
12/28/2023	SHELLY. Flood - PA-309 was closed due to flooding between Cherry Road and Zion Hill Road.	None Reported
12/28/2023	STANWOOD. Flood - Across southeast Pennsylvania and northern Delaware, flooding occurred on the Brandywine River, the Schuylkill River, the Christina River, Red Clay Creek, and White Clay Creek. The Langhorne gauge crested at 9.50 ft. The Coochs Bridge gauge crested at 12.03 ft. The Langhorne gauge crested at 9.50 ft. The Downingtown gauge crested at 10.34 ft. The Newark gauge crested at 13.25 ft. The Wooddale gauge crested at 6.95 ft. The Chadds Ford gauge crested at 10.25 ft. The Wooddale gauge crested at 6.95 ft. The Graterford gauge crested at 16.30 ft. The Chester gauge crested at 8.19 ft. The Philadelphia gauge crested at 11.27 ft. The Norristown gauge crested at 14.94 ft. The Langhorne gauge crested at 13.87 ft. All of these crests are above flood stage.	None Reported

Date	Location & Description	Reported Damage ($)*
1/10/2024	LANGHORNE BUEHL ARPT. Flood - Across southeast Pennsylvania and northern Delaware, flooding occurred on the Brandywine River, the Schuylkill River, the Christina River, Red Clay Creek, and White Clay Creek. The Coochs Bridge gauge crested at 12.52 ft. The Langhorne gauge crested at 13.91 ft. The Langhorne gauge crested at 13.91 ft. The Downingtown gauge crested at 11.41 ft. The Newark gauge crested at 15.14 ft. The Chadds Ford gauge crested at 9.03 ft. The Wooddale gauge crested at 9.03 ft. The Graterford gauge crested at 16.30 ft. The Chester gauge crested at 12.55 ft. The Philadelphia gauge crested at 12.13 ft. The Pottstown gauge crested at 13.65 ft. The Norristown gauge crested at 16.29 ft. The Wilmington gauge crested at 17.39 ft. All of these crests are above flood stage.	None Reported
8/6/2024	STANWOOD GARDENS. Flash Flood - A street flooded to the point of being impassable in Bensalem.	None Reported
8/6/2024	WEST BRISTOL. Flash Flood - There were several reports of roads being impassable due to flooding in Bristol. The roof of a commercial building also collapsed due to the water load on the roof.	100,000
5/14/2025	CORNWELLS HGTS. Flash Flood - High flood waters closed Station Avenue in both directions between Railroad Avenue and Bristol Pike.	None Reported
5/16/2025	YARDLEY. Flash Flood – Rushing water over roadways.	None Reported
5/31/2025	CORNWELL HGTS. Flash Flood - Station Avenue was closed in Bensalem due to flash flooding. Vehicles were inundated.	20,000
6/30/2025	ANDALUSIA. Flash Flood - A vehicle in flood water under an overpass on Station Ave needed water rescue.	10,000
7/1/2025	ANDALUSIA. Flood - A vehicle became stranded in flood water under an overpass on Station Ave due to flooding.	10,000
7/8/2025	BELMONT HILLS. Flash Flood - Flash flooding and lane closures were reported on US 1 Southbound.	None Reported
7/8/2025	DAVISVILLE. Flash Flood - Flash flooding and water rescues were reported in both the Lower and Upper Southampton area.	None Reported
7/8/2025	BATH ADDITION. Flash Flood - Flash flooding and road closures were reported around Bensalem.	None Reported
7/8/2025	BELMONT HILLS. Flash Flood - Flash flooding and road closures were reported in and around Trevose.	None Reported
7/14/2025	LEVITTOWN. Flash Flood - Flash flooding occurred on numerous roadways throughout Levittown.	None Reported
7/31/2025	TREVOSE. Flash Flood - Flash flooding was reported in Southampton Township. Second Street Pike and Street Road were closed due to three to four feet of water on the roadways.	None Reported
7/31/2025	TREVOSE. Flash Flood - Flash flooding was reported in Southampton Township. Stump Road and Bustleton Pike were closed due to flooding.	None Reported
7/31/2025	TREVOSE. Flash Flood - A vehicle was stranded in flood water on Brookside Drive. The occupant of the vehicle was rescued.	10,000
7/31/2025	TREVOSE. Flash Flood - Industrial Blvd in Upper Southampton Township was closed due to flash flooding. Up to three feet of water ended up on the roadway.	None Reported
7/31/2025	TREVOSE. Flash Flood - Multiple water rescues were needed at the intersection of County Line Road and Pine Road.	30,000
7/31/2025	TREVOSE. Flash Flood - Multiple water rescues were needed due to flooded vehicles at the intersection of County Line Road and Buck Road.	30,000

*Reported damages may be underestimated and do not necessarily reflect total loss.

The NFIP identifies properties that frequently experience flooding. Floods are the most common and costly natural disaster. 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 provides flood insurance to individuals in communities that are members of the program. Membership in the program is contingent on the community adopting and enforcing floodplain management and development

regulations. The NFIP is based on the voluntary participation of communities of all sizes. In the context of this program, a "community" is a political entity – whether an incorporated city, town, township, borough, or village, or an unincorporated area of a county or parish – that has legal authority to adopt and enforce floodplain management ordinances for the area under its jurisdiction.

National Flood Insurance is available only in communities that apply for participation in the NFIP and agree to implement prescribed flood mitigation measures. Newly participating communities are admitted to the NFIP's Emergency Program. Most of these communities quickly earn "promotion" to the Regular Program.

The Emergency Program is the initial phase of a community's participation in the NFIP. In return for the local government's agreeing to adopt basic floodplain management standards, the NFIP allows local property owners to buy modest amounts of flood insurance coverage. In return for agreeing to adopt more comprehensive floodplain management measures, an Emergency Program community can be "promoted" to the Regular Program. Local policyholders immediately become eligible to buy greater amounts of flood insurance coverage. All but four participating municipalities in Bucks County are in the Regular Program. The four municipalities that do not participate in the NFIP – Dublin, Ivyland, Richlandtown, and Telford Boroughs – do not have SFHAs within their jurisdiction.

The minimum floodplain management requirements 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 flood proof 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 4.4.4.4 below indicates municipal participation in the NFIP. All municipalities but four in Bucks County are actively participating in the NFIP. One municipality – Trumbauersville Borough – was sanctioned by the NFIP in May 2000. While Trumbauersville Borough currently maintain an active FIRM, they do not actively participate in the NFIP program.

Table 4.4.4-4 Bucks County Municipal Participation in the National Flood Insurance Program (FEMA, 2026).

Community	Participation Status	CID	Initial Firm Identified	Current Effective Map Date
Bedminster Township	Participating	421049	12/01/83	03/16/15
Bensalem Township	Participating	420181	07/17/78	03/21/17
Bridgeton Township	Participating	420182	9/30/77	3/16/15
Bristol Borough	Participating	420183	12/18/79	3/21/17
Bristol Township	Participating	420984	9/29/78	3/21/17
Buckingham Township	Participating	420985	3/15/79	3/21/17
Chalfont Borough	Participating	420184	12/28/76	3/21/17
Doylestown Borough	Participating	421410	6/1/84	3/21/17
Doylestown Township	Participating	420185	9/29/78	3/21/17

Table 4.4.4-4 Bucks County Municipal Participation in the National Flood Insurance Program (FEMA, 2026).

Community	Participation Status	CID	Initial Firm Identified	Current Effective Map Date
Dublin Borough	Not Participating	-	-	-
Durham Township	Participating	420186	8/15/78	3/16/15
East Rockhill Township	Participating	420187	8/1/77	3/16/15
Falls Township	Participating	420188	9/30/80	3/21/17
Haycock Township	Participating	421127	9/3/80	3/16/15
Hilltown Township	Participating	420189	1/30/81	3/21/17
Hulmeville Borough	Participating	420190	9/30/77	3/21/17
Ivyland Borough	Not Participating	-	-	-
Langhorne Borough	Participating	421074	7/2/80	3/16/15
Langhorne Manor Borough	Participating	422336	2/15/84	3/16/15
Lower Makefield Township	Participating	420191	9/30/77	3/21/17
Lower Southampton Township	Participating	420192	3/15/77	3/21/17
Middletown Township	Participating	420193	12/4/79	3/21/17
Milford Township	Participating	422337	6/1/82	3/16/15
Morrisville Borough	Participating	420194	9/30/77	3/16/15
New Britain Borough	Participating	420986	4/2/79	3/21/17
New Britain Township	Participating	420987	9/30/77	3/21/17
New Hope Borough	Participating	420195	12/15/77	3/16/15
Newtown Borough	Participating	420196	12/18/79	3/21/17
Newtown Township	Participating	421084	12/18/79	3/21/17
Nockamixon Township	Participating	420197	11/2/77	3/16/15
Northampton Township	Participating	420988	2/15/80	3/21/17
Penndel Borough	Participating	422678	5/18/99	3/16/15
Perkasie Borough	Participating	420198	3/1/77	3/16/15
Plumstead Township	Participating	420199	9/29/78	3/21/17
Quakertown Borough	Participating	420200	7/5/77	3/16/15
Richland Township	Participating	421095	6/15/81	3/16/15
Richlandtown Borough	Not Participating	-	-	-
Riegelsville Borough	Participating	420201	4/17/78	3/16/15
Sellersville Borough	Participating	420203	2/15/78	3/16/15
Silverdale Borough	Participating	422338	1/5/84	3/16/15
Solebury Township	Participating	420202	4/15/77	3/16/15
Springfield Township	Participating	420204	1/3/79	3/16/15
Telford Borough	Not Participating	-	-	-
Tinicum Township	Participating	420205	2/1/79	3/16/15
Trumbauersville Borough	Sanctioned	422681	5/18/00	3/16/15
Tullytown Borough	Participating	420206	2/1/80	3/21/17
Upper Makefield Township	Participating	420207	10/17/78	3/21/17
Upper Southampton Township	Participating	420989	4/3/78	3/21/17
Warminster Township	Participating	420990	3/1/78	3/16/15
Warrington Township	Participating	420208	9/29/78	3/21/17

Table 4.4.4-4 Bucks County Municipal Participation in the National Flood Insurance Program (FEMA, 2026).

Community	Participation Status	CID	Initial Firm Identified	Current Effective Map Date
Warwick Township	Participating	420209	9/29/78	3/16/15
West Rockhill Township	Participating	421123	7/5/84	3/16/15
Wrightstown Township	Participating	421045	8/15/78	3/21/17
Yardley Borough	Participating	420210	8/1/77	3/16/15

In addition, Regular Program communities are eligible to participate in the NFIP's Community Rating System (CRS). Under the CRS, policyholders can receive premium discounts of 5 to 45 percent as their cities and towns adopt more comprehensive flood mitigation measures. Four communities in Bucks County are currently participating in the CRS: Lower Makefield Township, Upper Makefield Township, Warwick Township, and Yardley Borough (FEMA, 2026).

Information on NFIP premiums and coverage, prior claims, and substantial damage claims provide additional information on past flood occurrences. Table 4.4.4-5 lists this information for each community in Bucks County.

Table 4.4.4-5 NFIP Premiums and Coverage and Prior Claims (FEMA, 2026)

Community	Policies In Force	Total Premium and Coverage	Prior Claims	Total Amount of Paid Claims
Bedminster Township	16	$5,306,000	10	$196,489
Bensalem Township	171	$50,873,000	308	$5,921,641
Bridgeton Township	48	$14,244,000	209	$7,012,414
Bristol Borough	160	$58,000,000	65	$2,085,356
Bristol Township	383	$124,585,000	370	$7,618,681
Buckingham Township	46	$17,911,000	40	$918,819
Chalfont Borough	23	$9,174,000	19	$234,826
Doylestown Borough	32	$11,264,000	17	$237,174
Doylestown Township	43	$12,603,000	39	$377,701
Dublin Borough*	-	-	-	-
Durham Township	11	$4,617,000	81	$3,111,592
East Rockhill Township	5	$2,443,000	8	$179,419
Falls Township	58	$19,401,000	105	$975,501
Haycock Township	8	$2,678,000	11	$525,135
Hilltown Township	11	$4,510,000	8	$29,436
Hulmeville Borough	20	$6,861,000	132	$2,077,689
Ivyland Borough*	-	-	-	-
Langhorne Borough	2	$563,000	14	$140,596
Langhorne Manor Borough	0	$0	68	$1,583,686
Lower Makefield Township	219	$81,990,000	227	$5,426,661
Lower Southampton Township	48	$18,600,000	161	$2,957,431
Middletown Township	185	$51,818,000	282	$5,459,694
Milford Township	21	$7,518,000	27	$225,737
Morrisville Borough	35	$9,758,000	16	$139,187
New Britain Borough	3	$1,108,000	0	$0

Community	Policies In Force	Total Premium and Coverage	Prior Claims	Total Amount of Paid Claims
New Britain Township	27	$11,437,000	13	$276,959
New Hope Borough	117	$55,843,000	399	$15,973,431
Newtown Borough	6	$2,400,000	7	$14,882
Newtown Township	39	$14,133,000	18	$234,715
Nockamixon Township	10	$2,923,000	22	$892,593
Northampton Township	75	$31,070,000	117	$1,811,163
Penndel Borough	-		0	$0
Perkasie Borough	23	$9,948,000	49	$3,601,904
Plumstead Township	26	$9,990,000	73	$2,747,810
Quakertown Borough	98	$29,644,000	81	$4,581,072
Richland Township	23	$7,128,000	22	$297,842
Richlandtown Borough*	-		-	-
Riegelsville Borough	59	$15,620,000	123	$2,331,312
Sellersville Borough	13	$5,381,000	69	$2,584,891
Silverdale Borough*	-		-	-
Solebury Township	68	$29,517,000	249	$8,538,166
Springfield Township	9	$3,018,000	28	$628,724
Telford Borough*	-		-	-
Tinicum Township	64	$24,088,000	288	$11,810,726
Trumbauersville Borough*	-		-	-
Tullytown Borough	3	$1,425,000	2	$6,887
Upper Makefield Township	105	$40,159,000	346	$14,277,101
Upper Southampton Township	54	$17,311,000	89	$2,057,034
Warminster Township	53	$19,969,000	76	$1,013,318
Warrington Township	52	$19,374,000	129	$2,531,867
Warwick Township	44	$15,593,000	21	$341,642
West Rockhill Township	8	$3,283,000	31	$454,905
Wrightstown Township	12	$4,167,000	16	$633,366
Yardley Borough	130	$47,961,000	777	$25,098,190
TOTAL	2,666	$937,207,000	5,295	$150,334,958

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 4.4.4-6 and throughout the plan 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 percent 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 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.

As of January 2026, there are 857 repetitive loss properties Bucks County. Yardley Borough has the most repetitive loss properties (167). The communities in Table 4.4.4-6 with zeros had been listed in the 2021 plan has having repetitive losses, but were not included in the 2026 report. The data available for this update did not indicate if these properties were mitigated or removed for another reason. The net change between the 2021 HMP and the 2026 HMP was in increase of

Table 4.4.4-6 Total Repetitive Loss and Severe Repetitive Loss Properties in Bucks County. Data from PA RL and SRL Inventory as of January 9th, 2026 (PEMA, 2026).

Municipalities	Repetitive Loss Properties
Bensalem Township	39
Bridgeton Township	55
Bristol Borough	6
Bristol Township	25
Buckingham Township	5
Chalfont Borough	0
Doylestown Borough	0
Doylestown Township	0
Durham Township	17
Falls Township	7
Haycock Township	0
Horsham Township	0
Hulmeville Borough	13
Hunlock Township	0
Langhorne Borough	6
Langhorne Manor Borough	0
Lower Makefield Township	54
Lower Moreland Township	0
Lower Southampton Township	21
Mercer Township	0
Middletown Borough	0
Middletown Township	31
Milford Township	4

Municipalities	Repetitive Loss Properties
Morrisville Borough	0
New Britain Township	0
New Hope Borough	84
Nockamixon Township	4
Northampton Township	15
Perkasie Borough	0
Plumstead Township	11
Quakertown Borough	9
Richland Township	0
Riegelsville Borough	40
Sellersville Borough	13
Solebury Township	42
Southampton Township	0
Springfield Township	4
Tinicum Township	71
Upper Makefield Township	73
Upper Mt. Bethel Township	0
Upper Southampton Township	9
Warminster Township	9
Warrington Township	18
Warwick Township	0
West Rockhill Township	0
Wrightstown Township	0
Yardley Borough	167
Grand Total	**857**

4.4.4.5 Potential for Future Occurrence

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. The 1- and 0.2 percent-annual-chance-floods are delineated on the Bucks County FIRM. Areas subject to 2 percent- and 10 percent-annual-chance-events are not shown on FIRMs, however, water surface elevations associated with these events are included in the flood source profiles contained in the FIS Report. The most recent FIS for each county in Pennsylvania is available from the FEMA Map Service Center (http://www.msc.fema.gov). Table 4.4.4.7 lists a range of flood recurrence intervals and associated probabilities of occurrence.

Table 4.4.4-7 Recurrence Intervals and Associated Probabilities of Occurrence (USGS, 2021c).

Recurrence Interval	Chance of Occurrence in any Given Year (%)
10 year	10
50 year	2

100 year	1
500 year	0.2

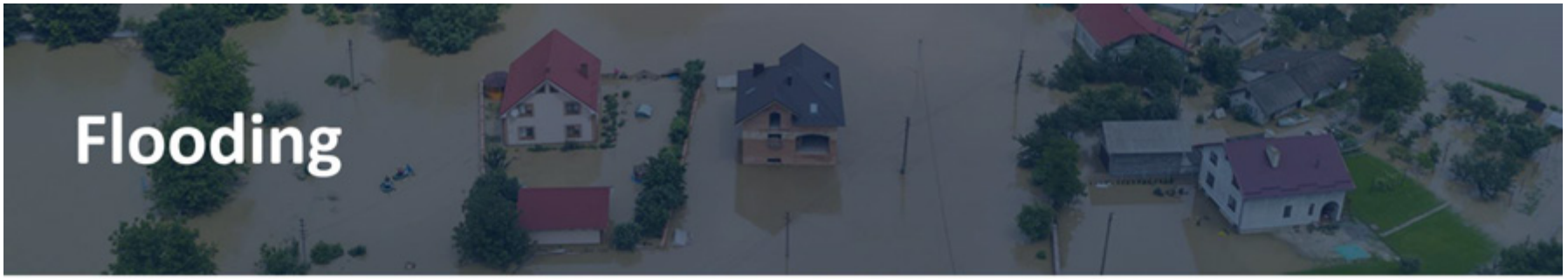
In Bucks County, flooding occurs commonly and can occur during any season. However, the possibility of flooding is greatly reduced during the winter months. Although most severe floods are attributable to rainfall alone, the spring floods can be compounded by snowmelt and moving ice. The major floods in the late summer and fall are often associated with tropical storms moving up the Atlantic coastline.

The Pennsylvania Climate Impact Assessment predicts that the mean annual precipitation change for the eastern part of the state, including Bucks County, is projected to increase by 10-12% by 2041-2070 (PADEP, 2021a). Additionally, there has been an increase in North Atlantic hurricane activity over the last several decades due to natural variability and climate change which in turn magnifies the intensity of tropical cyclones. This hurricane activity has also been consistently occurring prior to the established hurricane season in the Atlantic. Since 2015 the NHC has identified at least one named storm each year in May or earlier. These tropical storms often result in flood events in Pennsylvania and Bucks County.

The Climate Mapping for Resilience and Adaptation (CRMA) Tool provides a county-level assessment report for flooding, shown in Figure 4.4.4-3 below. According to CRMA, the average annual precipitation is expected to increase while the number of days per year with precipitation may decrease. The annual days that exceed the 99th percentile precipitation is projected to increase as well. Lastly, the number of days with a maximum temperature below 32 degrees Fahrenheit is projected to decrease. These projections combine to show that future precipitation may be more intense and during the winter months it will be less likely to turn into snow.

Some increase in the severity and frequency of flooding may also result due to planned or recent development within the floodplains of the various streams, as well as increased intensity and frequency of rain events. Therefore, the future occurrence of floods in Bucks County can be characterized as highly likely as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

Figure 4.4.4-3 Bucks County Flooding Hazard Assessment Report (CRMA, 2025)



Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		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	**46"** 44 - 48	**48"** 44 - 53	**49"** 44 - 53	**49"** 45 - 56	**49"** 45 - 54	**50"** 44 - 55	**51"** 45 - 58
Days per year with precipitation (wet days)	**181 days** 176 - 186	**181 days** 172 - 191	**181 days** 166 - 190	**180 days** 167 - 193	**179 days** 161 - 193	**180 days** 167 - 191	**177 days** 151 - 195
Maximum period of consecutive wet days	**11 days** 10 - 12	**11 days** 10 - 13	**11 days** 10 - 13	**11 days** 9 - 13	**11 days** 9 - 13	**11 days** 10 - 13	**11 days** 9 - 14
Annual days with:							
Annual days with total precipitation > 1inch	**7 days** 6 - 7	**7 days** 6 - 9	**8 days** 6 - 9	**8 days** 6 - 10	**8 days** 6 - 10	**8 days** 6 - 10	**9 days** 7 - 12
Annual days with total precipitation > 2 inches	**1 days** 1 - 1	**1 days** 1 - 1	**1 days** 1 - 2	**1 days** 1 - 1	**1 days** 1 - 1	**1 days** 1 - 2	**1 days** 1 - 2
Annual days with total precipitation > 3 inches	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0	**0 days** 0 - 0
Annual days that exceed 99th percentile precipitation	**6 days** 5 - 8	**7 days** 6 - 9	**8 days** 7 - 10	**8 days** 7 - 10	**9 days** 7 - 11	**9 days** 8 - 11	**10 days** 9 - 12
Days with maximum temperature below 32 °F	**17 days** 15 - 19	**11 days** 3 - 16	**10 days** 4 - 15	**8 days** 2 - 13	**7 days** 3 - 12	**6 days** 1 - 11	**2 days** 0 - 7

N/A = Data Not Available for the selected area

4.4.4.6 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 applicable local municipality, showing the SFHA, addressable structures, critical facilities, and transportation routes within it, are included in Appendix D. Appendix D is For Official Use Only, and is not publicly available. These maps were created using FEMA Countywide data from the current effective FIRMS.

Table 4.4.4-8 displays the 2023 population estimates per municipality that lives within the SFHA. Bristol Township has the most people living in the SFHA (3,191). Riegelsville Borough has the largest percentage of people living in the SFHA (53%). Some structures and infrastructure in each jurisdiction with SFHAs are at risk of flood damage. Table 4.4.4-8 also displays the total number of structures and critical facilities located within the SFHA. Approximately 3% of all addressable structures (6,603 structures) in Bucks County are located within the SFHA and are most vulnerable to flood losses. Bristol Township also has the most structures located in the SFHA (1,011), and Riegelsville Borough also has the highest percentage of structures located in the SFHA (39%) and are therefore most vulnerable to the 1%-annual-chance flood event. Most municipalities in Bucks County have 4% or less of their structures located in the SFHA. Municipalities with more than 4% of their structures in the SFHA are Bridgeton Township, Bristol Borough, Bristol Township, Durham Township, Hulmeville Borough, New Hope Borough, Quakertown Borough, Riegelsville Borough, Tinicum Township, Upper Makefield Township, and Yardley Borough. A complete listing of critical facilities is in Appendix E. Similarly, Bristol Borough has the largest number of critical facilities, 5 in total, in the SFHA and the largest percentage with 26%.

Table 4.4.4-9 shows the number of structures in the SFHA by generalized land use type. Unsurprisingly, most vulnerable structures are residential properties with 4,036 out of the total 6,603 structures being residential. In January 2026, there were 2,666 NFIP policies in force, a decrease from 3,896 in May 2018. However, claims for flood damages increased to 5,295 have been made since 1978 for these structures. Cumulative NFIP payments for flood damages have exceeded $150 million (PEMA, 2026).

Historic resources including landmark buildings, historic structures and sites, commercial and residential districts, rural resources, archaeological and cultural sites, and the historic environment can be impacted by disaster events. Historic and cultural resources can have unique vulnerabilities to hazard events. Depending on the resource, vulnerability to certain hazards may be greater and/or less than that of other assets in the County. For example, historic paper documents may not be impacted by an earthquake or severe winter storms, but historic properties have the potential to be more significantly impacted by these events than newer structures constructed to comply with modern building codes and development regulations.

Table 4.4.4-8 Total Number of Structures and Critical Facilities Located Within the SFHA

Municipality	Total Structures in Municipality	Structures in SFHA*	Percent Of Structures in SFHA	Total Estimated 2020 Population	Population in SFHA†	Percent Population in SFHA	Total Critical Facilities in Municipality	Total Critical Facilities in SFHA	Percent Critical Facilities in SFHA
Bedminster Township	3,278	36	1%	7,518	51	1%	13	0	0%
Bensalem Township	22,234	462	2%	62,819	1,346	2%	66	1	2%
Bridgeton Township	790	215	27%	1,234	143	12%	3	0	0%
Bristol Borough	4,024	326	8%	9,861	626	6%	19	5	26%
Bristol Township	20,102	1,011	5%	54,369	3,191	6%	62	2	3%
Buckingham Township	8,367	37	0%	20,847	48	0%	22	0	0%
Chalfont Borough	1,788	73	4%	4,253	256	6%	8	1	13%
Doylestown Borough	3,486	87	2%	8,300	934	11%	23	0	0%
Doylestown Township	6,807	77	1%	17,971	509	3%	30	1	3%
Dublin Borough	741	0	0%	2,177	0	0%	4	0	0%
Durham Township	656	63	10%	1,094	91	8%	1	0	0%
East Rockhill Township	2,652	38	1%	5,819	28	0%	9	0	0%
Falls Township	11,954	133	1%	34,672	679	2%	62	2	3%
Haycock Township	1,232	52	4%	2,201	119	5%	2	0	0%
Hilltown Township	6,428	8	0%	16,395	152	1%	13	0	0%
Hulmeville Borough	410	51	12%	982	179	18%	3	0	0%
Ivyland Borough	359	0	0%	955	0	0%	5	0	0%
Langhorne Borough	568	0	0%	1,643	0	0%	4	0	0%
Langhorne Manor Borough	349	2	1%	1,496	26	2%	4	0	0%
Lower Makefield Township	13,771	429	3%	33,224	955	3%	29	3	10%
Lower Southampton Township	8,340	136	2%	20,487	485	2%	23	1	4%
Middletown Township	17,420	349	2%	45,967	750	2%	52	1	2%
Milford Township	4,430	112	3%	10,238	520	5%	12	0	0%
Morrisville Borough	3,241	101	3%	9,809	294	3%	13	0	0%
New Britain Borough	1,151	8	1%	2,836	10	0%	9	0	0%
New Britain Township	4,937	33	1%	12,223	317	3%	15	1	7%
New Hope Borough	1,446	296	20%	2,612	450	17%	8	1	13%
Newtown Borough	1,054	1	0%	2,268	9	0%	3	0	0%

Municipality	Total Structures in Municipality	Structures in SFHA*	Percent Of Structures in SFHA	Total Estimated 2020 Population	Population in SFHA†	Percent Population in SFHA	Total Critical Facilities in Municipality	Total Critical Facilities in SFHA	Percent Critical Facilities in SFHA
Newtown Township	8,544	27	0%	19,904	116	1%	31	0	0%
Nockamixon Township	1,827	65	4%	3,379	25	1%	8	0	0%
Northampton Township	15,081	95	1%	39,915	1,627	4%	37	0	0%
Penndel Borough	743	1	0%	2,515	0	0%	5	0	0%
Perkasie Borough	3,546	40	1%	9,120	352	4%	8	0	0%
Plumstead Township	5,957	65	1%	14,038	322	2%	25	0	0%
Quakertown Borough	3,259	307	9%	9,359	1,417	15%	22	4	18%
Richland Township	6,621	163	2%	13,858	189	1%	11	2	18%
Richlandtown Borough	447	0	0%	1,353	0	0%	3	0	0%
Riegelsville Borough	465	181	39%	847	449	53%	2	0	0%
Sellersville Borough	1,914	40	2%	4,567	317	7%	6	1	17%
Silverdale Borough	337	0	0%	805	0	0%	3	0	0%
Solebury Township	4,322	161	4%	8,708	115	1%	11	1	9%
Springfield Township	2,719	42	2%	5,172	76	1%	8	1	13%
Telford Borough	763	0	0%	2,199	0	0%	1	0	0%
Tinicum Township	2,352	317	13%	3,818	295	8%	10	0	0%
Trumbauersville Borough	386	1	0%	883	0	0%	4	0	0%
Tullytown Borough	900	40	4%	2,268	121	5%	8	2	25%
Upper Makefield Township	3,775	261	7%	8,861	376	4%	9	1	11%
Upper Southampton Township	6,233	69	1%	15,269	203	1%	24	0	0%
Warminster Township	13,677	57	0%	33,603	274	1%	40	0	0%
Warrington Township	9,377	66	1%	25,639	550	2%	26	1	4%
Warwick Township	6,284	44	1%	14,851	294	2%	16	0	0%
West Rockhill Township	2,502	21	1%	5,446	45	1%	14	0	0%
Wrightstown Township	1,497	33	2%	3,286	0	0%	5	0	0%
Yardley Borough	1,350	371	27%	2,605	855	33%	6	0	0%
TOTAL	256,893	6,603	3%	646,538	20,186	3%	860	32	4%

** Calculated by overlaying Bucks County GIS structure data and FEMA's SFHA.*

† Calculated by selecting the 2020 Census Block Population that intersect the SFHAs in order to provide an approximation of populations living near the SFHA.

Table 4.4.4-9 Structure and Population Vulnerability to Floods in Bucks County (Bucks County GIS, 2024)

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Bedminster Township	6	0	0	1	0	0	2	3	1	2	2	2	17	36
Bensalem Township	0	32	10	1	0	0	5	303	7	24	0	2	78	462
Bridgeton Township	0	9	0	1	0	0	2	187	2	5	0	1	8	215
Bristol Borough	0	99	10	8	0	0	6	183	0	7	7	1	5	326
Bristol Township	0	28	17	9	0	0	19	772	1	44	9	5	107	1,011
Buckingham Township	2	3	0	0	0	0	0	10	0	2	1	3	16	37
Chalfont Borough	0	13	0	0	0	0	7	34	0	7	1	2	9	73
Doylestown Borough	0	23	0	0	0	0	0	59	0	2	1	0	2	87
Doylestown Township	2	5	0	1	0	0	2	21	0	9	2	4	31	77
Dublin Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	7	4	1	0	0	0	0	19	0	7	0	5	20	63
East Rockhill Township	2	1	0	0	0	0	2	9	0	0	0	15	9	38
Falls Township	1	7	3	2	0	1	5	77	1	1	2	8	25	133
Haycock Township	6	0	0	0	0	0	3	11	1	2	0	11	18	52
Hilltown Township	2	0	0	0	0	0	0	1	0	0	1	0	4	8
Hulmeville Borough	0	4	0	0	0	0	0	34	0	8	1	0	4	51
Ivyland Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Manor Borough	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Lower Makefield Township	0	0	0	3	0	0	8	241	3	3	6	5	160	429
Lower Southampton Township	0	22	1	0	0	0	4	98	0	2	2	0	7	136
Middletown Township	0	13	2	0	0	0	7	212	0	6	4	1	104	349
Milford Township	8	1	0	0	0	0	3	33	0	9	3	16	39	112
Morrisville Borough	0	1	2	1	0	0	5	71	2	2	4	1	12	101
New Britain Borough	0	2	0	0	0	0	0	2	0	1	0	0	3	8
New Britain Township	5	1	0	0	0	0	4	11	0	0	0	1	11	33
New Hope Borough	0	76	0	5	0	0	3	190	1	2	1	5	13	296
Newtown Borough	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Newtown Township	0	5	0	0	0	0	0	5	0	2	2	0	13	27
Nockamixon Township	1	2	0	0	0	0	1	19	1	2	1	9	29	65
Northampton Township	2	6	0	2	0	0	3	42	0	5	0	4	31	95
Penndel Borough	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Perkasie Borough	0	3	1	0	0	0	5	20	0	3	0	1	7	40
Plumstead Township	1	6	0	1	0	0	1	22	0	2	7	2	23	65
Quakertown Borough	0	21	19	16	0	0	7	225	4	3	0	0	12	307
Richland Township	6	8	0	2	0	0	1	57	0	9	4	2	74	163
Richlandtown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	1	13	0	0	0	0	3	154	0	4	0	1	5	181
Sellersville Borough	0	9	0	3	5	0	1	18	0	3	1	0	0	40
Silverdale Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	2	9	0	4	0	0	2	87	0	7	1	3	46	161
Springfield Township	4	2	0	1	0	0	0	13	0	5	1	0	16	42
Telford Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tinicum Township	14	3	1	2	0	1	7	173	4	6	0	12	94	317
Trumbauersville Borough	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Tullytown Borough	0	6	11	1	0	0	2	11	0	2	2	1	4	40
Upper Makefield Township	6	2	0	2	0	0	8	147	0	3	1	7	85	261
Upper Southampton Township	0	2	0	0	0	0	0	47	0	1	0	0	19	69
Warminster Township	0	3	1	2	0	0	1	41	0	1	1	0	7	57
Warrington Township	1	0	0	0	0	0	3	45	0	0	2	4	11	66
Warwick Township	0	1	0	0	0	0	0	17	1	2	5	1	17	44
West Rockhill Township	2	0	1	0	0	0	0	6	0	2	3	0	7	21
Wrightstown Township	1	1	0	0	0	0	0	14	0	0	0	0	17	33
Yardley Borough	0	14	0	0	0	0	3	291	0	2	1	2	58	371
Grand Total	**82**	**461**	**80**	**68**	**5**	**2**	**135**	**4,036**	**29**	**209**	**79**	**137**	**1,280**	**6,603**

Table 4.4.4-10 shows the number of manufactured homes located in the SFHA in each municipality. Manufactured homes are more vulnerable to flood risk because they can be washed out if the proper protection measures are not taken. FEMA recommends anchoring or elevation techniques to protect manufactured homes from flood risk. More information for these techniques can be found online: https://www.fema.gov/manufactured-mobile-home. Falls Township has the greatest number of manufactured homes in the SFHA (10), while Buckingham Township has the highest percentage of manufactured homes in the SFHA (18%). The remaining municipalities that have manufactured homes in the SFHA are Bensalem Township (7), Bridgeton Township (4), Bristol Township (2), and Richland Township (3). Overall, there are a total of 26 manufactured homes located in the SFHA in Bucks County, accounting for 1% of the total manufactured homes within the planning area.

Table 4.4.4-10 Manufactured Home Flood Vulnerability in Bucks County (US Census, 2025) (FEMA, 2017a).

Municipality	Total Manufactured Homes	Total Manufactured Homes in SHFA	Percent Manufactured Homes in SHFA
Bedminster Township	7	0	0%
Bensalem Township	499	7	1%
Bridgeton Township	23	4	17%
Bristol Borough	0	0	0%
Bristol Township	11	2	18%
Buckingham Township	74	0	0%
Chalfont Borough	0	0	0%
Doylestown Borough	0	0	0%
Doylestown Township	103	0	0%
Dublin Borough	0	0	0%
Durham Township	5	0	0%
East Rockhill Township	12	0	0%
Falls Township	928	10	1%
Haycock Township	12	0	0%
Hilltown Township	129	0	0%
Hulmeville Borough	0	0	0%
Ivyland Borough	0	0	0%
Langhorne Borough	0	0	0%
Langhorne Manor Borough	0	0	0%
Lower Makefield Township	0	0	0%
Lower Southampton Township	238	0	0%
Middletown Township	1	0	0%
Milford Township	70	0	0%
Morrisville Borough	0	0	0%
New Britain Borough	1	0	0%
New Britain Township	1	0	0%
New Hope Borough	0	0	0%
Newtown Borough	0	0	0%
Newtown Township	0	0	0%

Municipality	Total Manufactured Homes	Total Manufactured Homes in SHFA	Percent Manufactured Homes in SHFA
Nockamixon Township	20	0	0%
Northampton Township	2	0	0%
Penndel Borough	0	0	0%
Perkasie Borough	0	0	0%
Plumstead Township	6	0	0%
Quakertown Borough	0	0	0%
Richland Township	530	3	1%
Richlandtown Borough	0	0	0%
Riegelsville Borough	0	0	0%
Sellersville Borough	0	0	0%
Silverdale Borough	0	0	0%
Solebury Township	0	0	0%
Springfield Township	25	0	0%
Telford Borough	0	0	0%
Tinicum Township	13	0	0%
Trumbauersville Borough	0	0	0%
Tullytown Borough	6	0	0%
Upper Makefield Township	0	0	0%
Upper Southampton Township	0	0	0%
Warminster Township	0	0	0%
Warrington Township	0	0	0%
Warwick Township	0	0	0%
West Rockhill Township	60	0	0%
Wrightstown Township	0	0	0%
Yardley Borough	0	0	0%
Grand Total	**2,776**	**26**	**1%**

Bucks County is also vulnerable to flood risk on Toxic Release Inventory facilities. Section 4.3.17 describes Bucks County risk to Hazardous Materials Release in depth. Additional information on flood vulnerability and losses in Bucks County, including the 1%-annual-chance flood event results from Hazus, FEMA's loss estimation software, is provided in Section 4.4.3: Potential Loss Estimates.

4.4.4.7 Flood Vulnerability and Historic Resources

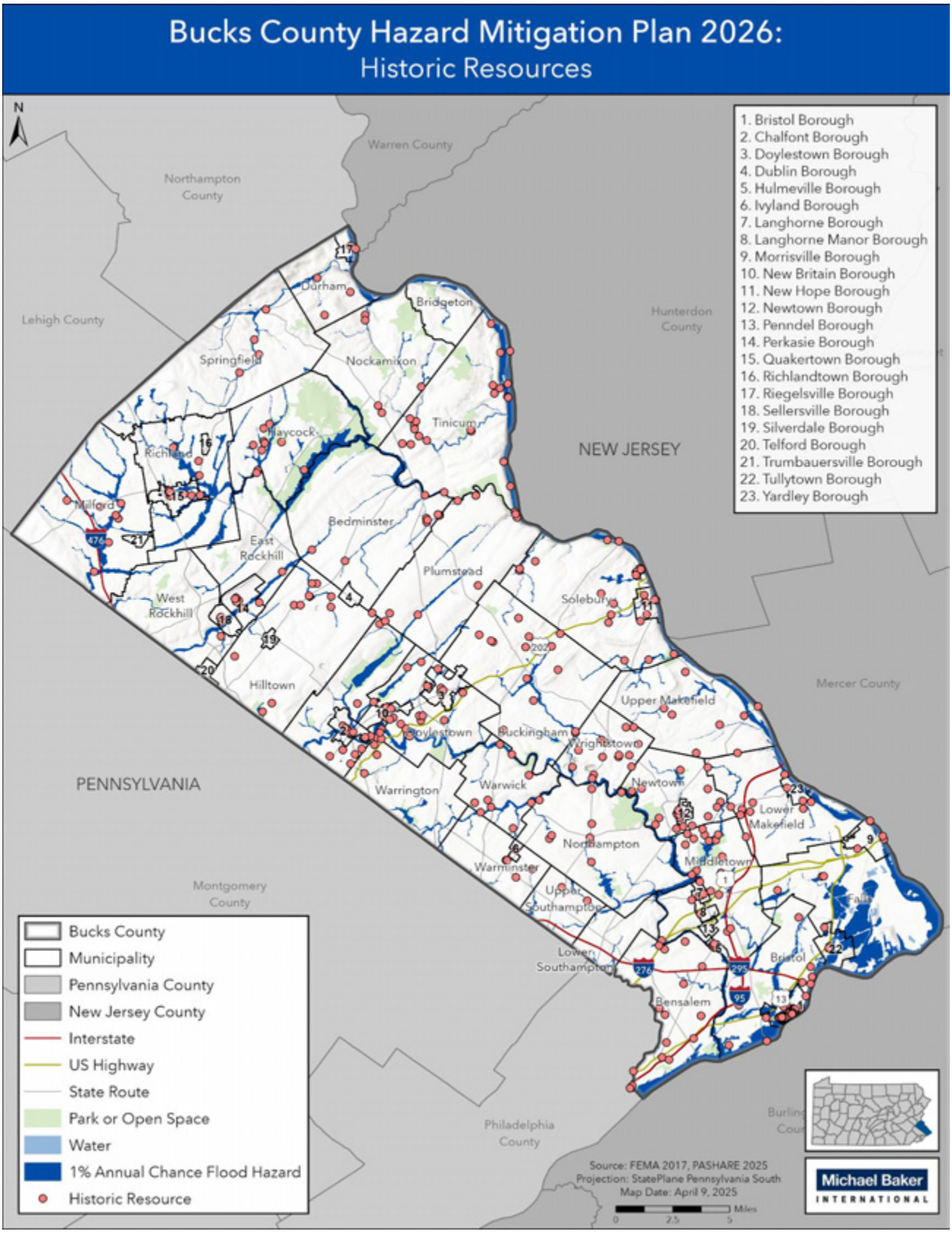
Flood vulnerability is described in terms of what community assets, structures, and infrastructure are situated in locations where flooding is anticipated. For purposes of assessing vulnerability, this plan focuses on assets that are in the Special Flood Hazard Area (SFHA), or the area that would be flooded by a 1-percent-annual-chance flood. This flood frequency was chosen because information about the extent and depth of the 1-percent-annual-chance flood is available for all municipalities countywide, thus providing a consistent basis for analysis.

Bucks County's older and historic places make important contributions to its communities' overall quality of life, economy, and sense of place. In the wake of several disasters in recent years including hurricanes Sandy and Irene and Tropical Storm Lee, the Pennsylvania State Historic Preservation Office (PA SHPO) and the Pennsylvania Emergency Management Agency (PEMA) are encouraging counties to integrate historic preservation considerations into local hazard mitigation plans. By prioritizing historic resources for mitigation, local officials and hazard mitigation planners can help preserve communities' historic built environments—and sense of place—for many years to come.

The Pennsylvania Historical and Museum Commission (PHMC) has been collecting information on historic resources in Pennsylvania for the greater part of a century. According to the PHMC's Cultural Resources Geographic Information System, Bucks County has 19 historic resources listed in the National Register of Historic Places and 371 historic resources that are eligible to be listed (PHMC, 2021a). The National Register of Historic Places is the nation's official list of properties recognized for their significance in American history, architecture, archeology, engineering, and culture. To be eligible, a property typically must be at least 50 years old, retain a high degree of integrity, and have some level of historic significance. To be officially listed, a property must be documented and evaluated according to uniform criteria established by the National Park Service. It is important to note that as of January 2021, the database was moved to "read-only" status, and is no longer updated with new historic resources, archaeological sites, surveys, or reports.

Currently, Bucks County has seven buildings located in the SFHA. Figure 4.4.4-2 shows the location of historic resources while Table 4.4.4-11 lists the number and type of flood-prone historic resources in each municipality. Bedminster Township, Buckingham Township, Haycock Township, Lower Makefield Township, Riegelsville Township, Springfield Township, and Tinicum Township all have one historic building located in their respective SFHA.

Figure 4.4.4-4 Map Showing the Location of Historic Resources in Relation to Water Bodies Throughout Bucks County



Historic districts may be of interest for hazard mitigation as they typically include a cluster of historic resources in a community. Bucks County has many historic districts that overlap with the SFHA. Table 4.4.4-11 provides a list of historic districts and whether they intersect the SFHA.

Table 4.4.4-11 Historic Districts and Their Vulnerability to Flood

Historic District Name	Does This District Intersect the SHFA?
Bristol Historic District	Yes
Bristol Industrial Historic District	No
Brownsburg Village Historic District	Yes
Buckmanville Historic District	No
Carversville Historic District	Yes
Center Bridge Historic District	Yes
Chalfont Historic District	Yes
Churchville Historic District	Yes
Cuttalossa Valley Historic District	Yes
Dolington Village Historic District	No
Doylestown Historic District	Yes
Dyerstown Historic District	Yes
Eakin, John, Farm	Yes
Fallsington Historic District	Yes
Fonthill, Mercer Museum and Moravian Pottery and Tile Works	No
Fordhook Farm	No
Forest Grove Historic District	No
Gardenville--North Branch Rural Historic District	Yes
Harriman Historic District	No
Holicong Village Historic District	Yes
Honey Hollow Watershed	Yes
Hulmeville Historic District	Yes
Ivyland Historic District	Yes
Langhorne Historic District	No
Lumberville Historic District	Yes
Mechanicsville Village Historic District	No
New Hope Village District	Yes
Newtown Historic District	Yes
Newtown Historic District (Boundary Increase)	Yes
Newtown Historic District (Boundary Increase: North and South Extensions)	No
Penns Park Historic District	No
Phillips Mill Historic District	Yes
Point Pleasant Historic District	Yes
Quakertown Historic District	Yes
Ridge Valley Rural Historic District	Yes
Shaw Historic District	No
Spring Valley Historic District	Yes
Springdale Historic District	Yes
Springtown Historic District	Yes

Historic District Name	Does This District Intersect the SHFA?
Tyler, George F., Mansion	Yes
Uhlerstown Historic District	Yes
Upper Aquetong Valley Historic District	No
Village of Edgewood Historic District	No
Wycombe Village Historic District	Yes
Yardley Historic District	Yes

After Hurricane Sandy struck Bucks County in October 2012, the Pennsylvania Historical and Museum Commission (PHMC) received $1.5 million in grant funds to support repairs on historic properties that were damaged by Hurricane Sandy. The grant money is supporting the integration of mitigation planning into historic resource survey, the inclusion of historic properties into mitigation planning at both the state and local level, the development of model guidance related to historic properties, the opportunity for grants to property owners or nonprofit organizations to repair National Register eligible or listed historic properties damaged by the hurricane, and the offering of training and education programs related to disasters (PHMC, 2021b).

Table 4.4.4-12 Number of Flood-Prone Historical Resources by Municipality (

Municipality	Total Historic Resources	Historic Resources in SFHA	Percent of Historic Resources in SFHA
Bedminster Township	9	3	33%
Bensalem Township	13	1	8%
Bristol Borough	323	1	0%
Bristol Township	11	5	45%
Buckingham Township	23	6	26%
Chalfont Borough	12	1	8%
Doylestown Borough	4	0	0%
Doylestown Township	18	1	6%
Durham Township	3	0	0%
East Rockhill Township	3	3	100%
Falls Township	3	0	0%
Haycock Township	8	0	0%
Hilltown Township	12	2	17%
Hulmeville Borough	7	0	0%
Ivyland Borough	1	0	0%
Langhorne Borough	3	0	0%
Langhorne Manor Borough	1	0	0%
Lower Makefield Township	9	1	11%
Middletown Township	20	1	5%
Milford Township	7	2	29%
Morrisville Borough	5	4	80%
New Britain Borough	4	0	0%
New Britain Township	12	1	8%
New Hope Borough	6	2	33%
Newtown Borough	7	1	14%

Municipality	Total Historic Resources	Historic Resources in SFHA	Percent of Historic Resources in SFHA
Newtown Township	14	0	0%
Nockamixon Township	5	0	0%
Northampton Township	8	1	13%
Perkasie Borough	6	1	17%
Plumstead Township	8	4	50%
Quakertown Borough	11	2	18%
Richland Township	3	0	0%
Riegelsville Borough	3	2	67%
Sellersville Borough	6	0	0%
Solebury Township	25	11	44%
Springfield Township	4	1	25%
Tinicum Township	23	14	61%
Tullytown Borough	11	0	0%
Upper Makefield Township	8	1	13%
Upper Southampton Township	2	0	0%
Warminster Township	4	0	0%
Warrington Township	4	0	0%
Warwick Township	9	2	22%
West Rockhill Township	1	0	0%
Wrightstown Township	14	1	7%
Yardley Borough	2	1	50%

4.4.5 Hailstorm

Hail precipitation is often produced at the front of a severe thunderstorm system or in conjunction with a tornado event when ice crystals form within a low-pressure front as warm air rises into the upper atmosphere and is cooled (NOAA, 2025). Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice.

4.4.5.1 Location and Extent

Hailstorm events can occur in all areas of Bucks County. Neither the duration of the storm nor the extent of the area affected by such an occurrence can be predicted. Hail precipitation is often produced at the front of a severe thunderstorm or in conjunction with a tornado event. Hailstorms occur when ice crystals form within a low-pressure front due to the rapid rise of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice. Hailstones are formed most commonly in thunderstorms with intense updraft, high liquid water content, large vertical extent, large water droplets, and cloud layers below freezing (NOAA NSSL, 2025).

4.4.5.2 Range of Magnitude

Hail is described qualitatively and quantitatively by its size and can range from 0.2 inches to 4.5 inches, as shown in Table 4.4.5-1. The size of hail is dependent on the strength of the upward air movement along the front of a thunderstorm, called the updraft. Weaker updrafts create smaller hailstones while strong updrafts provide a longer amount of time for hailstone nuclei to grow in diameter (NOAA NSSL, 2025). Bucks County has experienced hail ranging in size from 0.75 to 2.00 inches in diameter (NOAA NCEI, 2025).

Table 4.4.5-1 Hailstone Size and Relationship to Updraft Speed (NOAA NSSL,2025).

Hailstone Size	Measurement (Inches)	Updraft Speed (MPH)
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 are at risk for serious injury if they don't seek immediate shelter. Since hail precipitation usually occurs during thunderstorm events, the impacts of other hazards associated with thunderstorms (i.e. strong winds, intense precipitation, etc.) often occur simultaneously (NOAA NSSL, 2025).

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.

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

Table 4.4.5-2 Most Likely Lifelines Impacted by Hailstorm

LIFELINES	NOTES
Transportation	Hailstorms can cause severe vehicular damage and may render roadways temporarily impassable. This may impact mass transit and railways.

4.4.5.3 Previous Occurrence

Figure 4.4.5-1 shows a map of the number of recorded hailstorm events in Bucks County between 1975 and 2025. A hailstorm event is defined as a storm with hail of .75 inches or greater in diameter. According to PEMA, approximately 96 percent of hailstorm events occurred during the months of April, May, June, July, August, and September. In addition, approximately 87% of historic events occurred during the afternoon or evening. Both results are consistent with the relationship between hail and thunderstorms, which most often occur during late spring, summer, and early fall months.

NOAA reports 58 hail events in Bucks County from 1975-2025. This includes damage estimates for all hailstorms reported by local field offices. PEMA determined that these events have caused a total of $400,000 in crop damage and no property damage has been reported due to hailstorms in Bucks County. No death or injuries have resulted as a hailstorm in the County during the 1950-2025 time period. Table 4.4.5-3 provides a snapshot of events from 2000-2025.

Figure 4.4.5-1 Number of Hailstorm Events in Bucks County from 1975-2025 (NOAA NCEI, 2025).

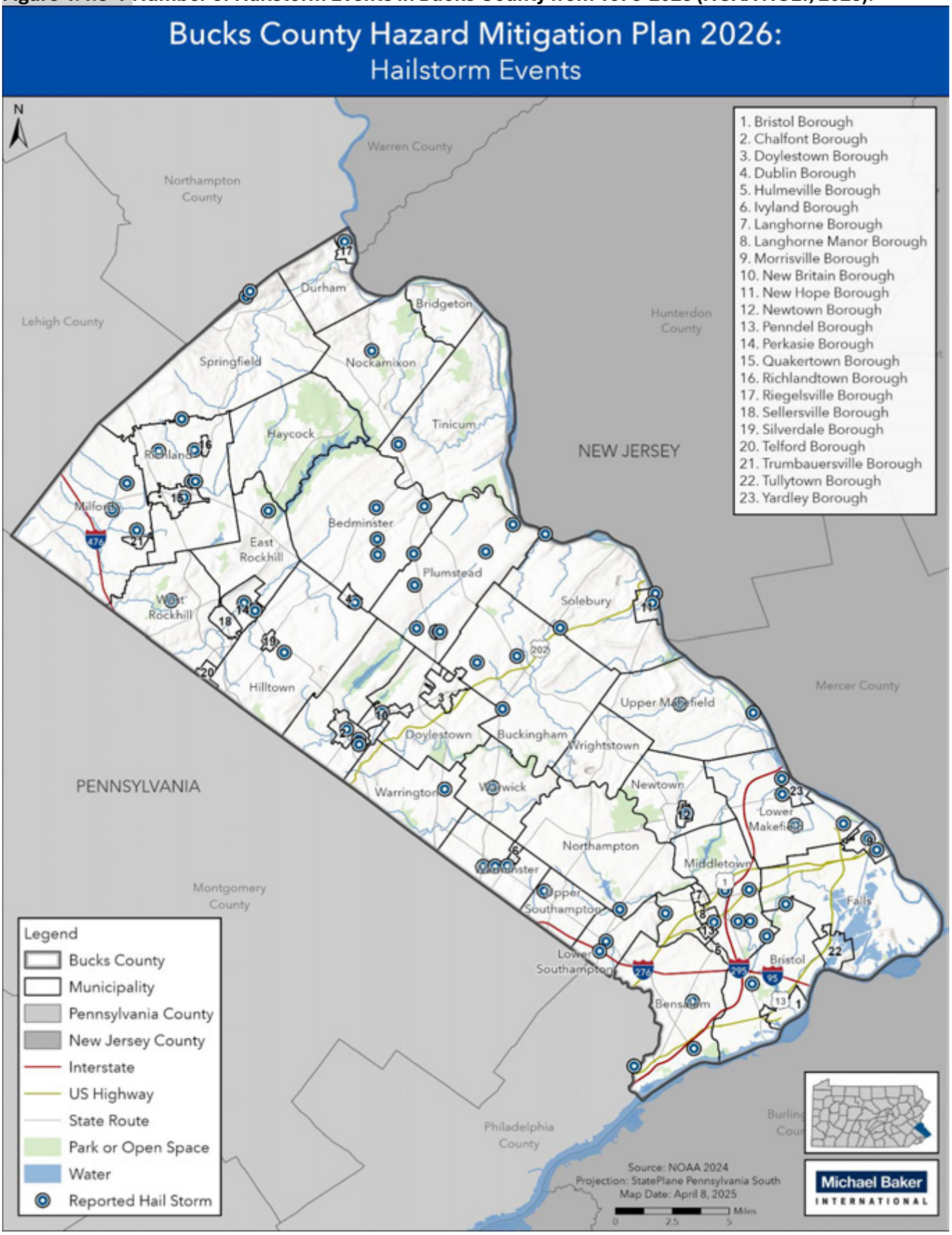


Table 4.4.5-3 Previous Hail Events in Bucks County Between 2000 and 2020 (NOAA NCEI, 2025).

Location	Date	Magnitude (In)	Property Damage ($)	Crop Damage ($)
Quakertown	5/13/2000	2	0	0
Chalfont	5/13/2000	0.88	0	0
Levittown	5/13/2000	0.75	0	0
Chalfont	5/24/2000	0.88	0	0
Levittown	7/16/2000	0.75	0	0
Buckingham Station	5/2/2002	0.75	0	0
Warminster	5/31/2002	0.75	0	0
Southampton	5/31/2002	0.75	0	0
Langhorne	3/21/2003	2	0	0
Doylestown	5/18/2004	0.88	0	0
Milford Square	5/24/2004	1.75	0	0
Pt Pleasant	5/24/2004	1.5	0	0
Springtown	5/24/2004	1	0	0
Warminster	8/11/2004	1	0	0
Buckingham Station	8/4/2005	0.88	0	0
Trevose	6/29/2006	0.75	0	0
Perkasie	8/7/2006	0.75	0	0
Perkasie	8/26/2006	0.75	0	0
Warminster	8/26/2006	1	0	0
Andalusia	6/12/2007	0.88	0	0
Langhorne	6/12/2007	0.88	0	0
Ferndale	8/17/2007	1	0	0
Plumsteadville	5/31/2008	0.75	0	0
Quakertown	3/29/2009	0.88	0	0
Quakertown	6/15/2009	1.75	0	0
Morrisville	7/16/2009	1	0	0
Ferndale	7/26/2009	1.5	0	400,000
Ferndale	5/27/2010	0.75	0	0
Danboro	5/15/2011	1	0	0
Stoopville	6/1/2011	1	0	0
Perkasie	6/9/2011	0.75	0	0
New Britain	6/9/2011	0.75	0	0
Newtown	8/18/2011	1	0	0
Furlong	8/18/2011	0.75	0	0
Trevose	8/21/2011	0.88	0	0
Chalfont	5/24/2012	1	0	0
Argus	5/24/2012	1	0	0
Quakertown	5/24/2012	0.88	0	0
Dublin	6/29/2012	0.75	0	0

Location	Date	Magnitude (In)	Property Damage ($)	Crop Damage ($)
Warrington	7/4/2012	0.75	0	0
New Hope	7/28/2012	0.75	0	0
Washington Crossing	7/28/2012	0.88	0	0
Trumbauersville	6/19/2014	1	0	0
Springtown	8/21/2014	0.75	0	0
Jamison	6/21/2016	1	0	0
Yardley	8/18/2017	0.75	0	0
Quakertown	5/29/2019	1	0	0
California	5/29/2019	2	0	0
Bedminster	5/29/2019	1	0	0
Quakertown	5/29/2019	1.5	0	0
Lumberville	5/29/2019	1.75	0	0
California	5/29/2019	1	0	0
Stanwood Gardens	5/29/2019	1	0	0
Warminster	5/29/2019	0.75	0	0
Stanwood Gardens	5/29/2019	1	0	0
Langhorne Buehl Arpt	7/6/2020	0.75	0	0
Langhorne Manor	7/6/2020	0.88	0	0
Levittown	7/6/2020	1.25	0	0
Fairless Hills	7/6/2020	1	0	0
Levittown	7/6/2020	1.75	0	0
Stanwood Gardens	7/6/2020	1	0	0
Levittown	7/6/2020	1	0	0
Ottsville	7/6/2020	0.75	0	0
Bedminster	5/26/2021	0.88	0	0
Chalfont	6/4/2021	0.88	0	0
New britain	6/4/2021	0.88	0	0
Silverdale	6/4/2021	1	0	0
Morrisville	4/1/2023	1	0	0
Parktown estates	4/1/2023	1	0	0
Lahaska	4/15/2023	0.75	0	0
Bon air	4/15/2023	0.75	0	0
Bedminster	7/10/2023	0.75	0	0
Weisel	7/10/2023	1	0	0
Plumsteadville	8/12/2023	1	0	0
Wismer	8/12/2023	1	0	0
Plumsteadville	9/8/2023	0.75	0	0
Danboro	9/8/2023	1	0	0
Danboro	9/8/2023	1	0	0
Pipersville	9/8/2023	1	0	0

Location	Date	Magnitude (In)	Property Damage ($)	Crop Damage ($)
Note that countywide notes the event occurred in multiple locations.				

4.4.5.4 Potential for Future Occurrence

It is not possible to predict the formation of a hailstorm with more than a few days' lead time. The past occurrences in the County described above, however, indicate that this event is one that can happen several times in any given year, most likely during the late spring and summer months. NOAA's Storm Prediction Center illustrates the probability of hail events across the United States estimated over a 30-year period (1982-2011) based on severe weather reports. According to the Storm Prediction Center hail events are most likely to occur in May, June and July with 1% probability of a hail event occurring. Therefore, the future occurrence of hailstorms in Bucks County can be considered possible as defined by the Risk Factor methodology probability criteria (See Table 4.6 -1).

4.4.5.5 Vulnerability Assessment

All of Bucks County, 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.

As a hazard, damage to crops and vehicles are typically the most significant impacts of hailstorms. Damage to trees, shrubbery, 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.

Table 4.4.5-4 Expected Annual Losses to Hail by Census Tract (FEMA NRI, 2026)

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100102	Bensalem Township	$995.57	Very Low
42017100103	Bensalem Township	$893.46	Very Low
42017100104	Bensalem Township	$759.78	Very Low
42017100105	Bensalem Township	$569.41	Very Low
42017100201	Bensalem Township	$1,089.70	Very Low
42017100206	Bensalem Township	$1,504.50	Very Low
42017100207	Bensalem Township	$152.40	Very Low
42017100208	Bensalem Township	$531.79	Very Low
42017100209	Bensalem Township		
42017100210	Bensalem Township	$464.18	Very Low
42017100211	Bensalem Township	$7,949.75	Relatively Low
42017100212	Bensalem Township	$470.16	Very Low
42017100213	Bensalem Township	$401.33	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100214	Bensalem Township	$581.53	Very Low
42017100302	Bristol Township	$532.31	Very Low
42017100303	Bristol Township	$3,560.23	Relatively Low
42017100304	Bristol Township	$587.99	Very Low
42017100306	Bristol Township	$444.12	Very Low
42017100307	Bristol Township	$538.07	Very Low
42017100401	Bristol Township	$515.57	Very Low
42017100402	Bristol Township	$1,216.92	Very Low
42017100403	Bristol Township	$873.03	Very Low
42017100404	Bristol Township	$538.57	Very Low
42017100406	Bristol Township	$4,753.03	Relatively Low
42017100407	Bristol Township	$716.68	Very Low
42017100408	Bristol Township	$669.56	Very Low
42017100500	Bristol Borough	$932.20	Very Low
42017100600	Bristol Borough	$13,933.94	Relatively Low
42017100700	Bristol Borough	$2,871.56	Very Low
42017100803	Middletown Township	$990.66	Very Low
42017100804	Middletown Township	$627.96	Very Low
42017100805	Middletown Township	$2,394.97	Very Low
42017100807	Middletown Township	$7,471.63	Relatively Low
42017100808	Middletown Township	$961.47	Very Low
42017100809	Middletown Township	$332.44	Very Low
42017100811	Middletown Township	$477.24	Very Low
42017100900	Middletown Township	$645.10	Very Low
42017101100	Penndel Borough	$4,981.48	Relatively Low
42017101401	Lower Southampton Township	$368.16	Very Low
42017101403	Lower Southampton Township	$682.79	Very Low
42017101404	Lower Southampton Township	$3,749.38	Relatively Low
42017101405	Lower Southampton Township	$2,884.11	Very Low
42017101503	Upper Southampton Township	$2,987.52	Very Low
42017101504	Upper Southampton Township	$681.33	Very Low
42017101505	Upper Southampton Township	$552.20	Very Low
42017101506	Upper Southampton Township	$549.13	Very Low
42017101603	Warminster Township	$3,315.71	Very Low
42017101605	Warminster Township	$3,244.42	Very Low
42017101607	Warminster Township	$559.70	Very Low
42017101609	Warminster Township	$124.32	Very Low
42017101610	Warminster Township	$3,043.79	Very Low
42017101611	Warminster Township	$668.59	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017101802	Warrington Township	$857.53	Very Low
42017101803	Warrington Township		
42017101805	Warrington Township	$430.23	Very Low
42017101807	Warrington Township	$497.94	Very Low
42017101808	Warrington Township	$829.61	Very Low
42017101809	Warrington Township	$8,004.88	Relatively Low
42017101810	Warrington Township	$466.86	Very Low
42017101900	Chalfont Borough	$1,988.79	Very Low
42017102002	New Britain Township	$1,592.09	Very Low
42017102003	New Britain Township	$616.32	Very Low
42017102004	New Britain Township	$532.44	Very Low
42017102102	Hilltown Township	$2,276.71	Very Low
42017102104	Hilltown Township	$665.63	Very Low
42017102300	East Rockhill Township	$1,640.86	Very Low
42017102401	Perkasie Borough	$1,177.24	Very Low
42017102402	Perkasie Borough	$2,213.21	Very Low
42017102500	Sellersville Borough, West Rockhill Township	$1,866.30	Very Low
42017102600	Telford Borough	$1,257.82	Very Low
42017102700	West Rockhill Township	$1,755.94	Very Low
42017102801	Milford Township	$488.12	Very Low
42017103101	Quakertown Borough	$1,212.05	Very Low
42017103102	Quakertown Borough	$308.28	Very Low
42017103103	Quakertown Borough	$1,169.89	Very Low
42017103300	Haycock Township	$945.02	Very Low
42017103400	Springfield Township	$751.11	Very Low
42017103700	Nockamixon Township	$809.49	Very Low
42017103800	Bridgeton Township	$526.77	Very Low
42017103900	Tinicum Township	$507.72	Very Low
42017104000	Bedminster Township	$811.76	Very Low
42017104100	Dublin Borough	$1,026.43	Very Low
42017104201	Plumstead Township	$2,179.04	Very Low
42017104203	Plumstead Township	$1,104.17	Very Low
42017104204	Plumstead Township	$3,360.50	Very Low
42017104301	Solebury Township	$518.56	Very Low
42017104303	Solebury Township	$1,974.58	Very Low
42017104304	Solebury Township	$705.88	Very Low
42017104400	New Hope Borough	$1,325.10	Very Low
42017104502	Buckingham Township	$1,275.04	Very Low
42017104503	Buckingham Township	$2,371.63	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017104505	Buckingham Township	$570.60	Very Low
42017104506	Buckingham Township	$840.65	Very Low
42017104601	Doylestown Township	$552.19	Very Low
42017104603	Doylestown Township	$779.95	Very Low
42017104604	Doylestown Township	$757.62	Very Low
42017104701	Doylestown Borough, Doylestown Township	$782.74	Very Low
42017104702	Doylestown Borough	$517.04	Very Low
42017104703	Doylestown Borough	$666.05	Very Low
42017104800	New Britain Borough	$1,382.35	Very Low
42017104901	Warwick Township	$2,611.74	Very Low
42017104902	Warwick Township	$1,726.27	Very Low
42017105003	Northampton Township	$1,148.32	Very Low
42017105004	Northampton Township	$1,353.67	Very Low
42017105006	Northampton Township	$818.56	Very Low
42017105008	Northampton Township	$1,030.79	Very Low
42017105009	Northampton Township	$1,278.08	Very Low
42017105010	Northampton Township	$2,403.88	Very Low
42017105011	Northampton Township	$485.68	Very Low
42017105012	Northampton Township	$1,147.35	Very Low
42017105013	Northampton Township	$852.07	Very Low
42017105100	Wrightstown Township	$620.13	Very Low
42017105202	Newtown Township	$4,119.02	Relatively Low
42017105203	Newtown Township	$2,384.73	Very Low
42017105206	Newtown Township	$774.12	Very Low
42017105207	Newtown Township	$1,017.77	Very Low
42017105208	Newtown Township	$734.52	Very Low
42017105300	Newtown Borough	$1,520.22	Very Low
42017105401	Upper Makefield Township	$556.26	Very Low
42017105402	Upper Makefield Township	$1,419.11	Very Low
42017105505	Lower Makefield Township	$2,243.57	Very Low
42017105506	Lower Makefield Township	$1,127.00	Very Low
42017105507	Lower Makefield Township	$932.62	Very Low
42017105508	Lower Makefield Township	$1,307.43	Very Low
42017105509	Lower Makefield Township	$712.03	Very Low
42017105510	Lower Makefield Township	$940.36	Very Low
42017105511	Lower Makefield Township	$529.27	Very Low
42017105600	Yardley Borough	$2,181.86	Very Low
42017105702	Morrisville Borough	$513.39	Very Low
42017105704	Morrisville Borough, Falls Township	$935.70	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017105801	Falls Township	$1,461.92	Very Low
42017105805	Falls Township	$1,911.12	Very Low
42017105807	Falls Township	$1,245.95	Very Low
42017105808	Falls Township	$1,064.72	Very Low
42017105809	Falls Township	$355.73	Very Low
42017105810	Falls Township	$3,724.15	Relatively Low
42017105811	Falls Township	$396.98	Very Low
42017105812	Falls Township	$2,810.76	Very Low
42017105900	Tullytown Borough	$564.92	Very Low
42017106000	Middletown Township, Hulmeville Borough	$2,287.57	Very Low
42017106100	Langhorne Manor Borough, Langhorne Borough	$241.61	Very Low
42017106201	Warminster Township	$829.63	Very Low
42017106202	Warminster Township, Ivyland Borough	$875.04	Very Low
42017106300	Hilltown Township, Silverdale Borough	$822.06	Very Low
42017106401	Richland Township	$437.47	Very Low
42017106402	Milford Township, Trumbauersville Borough	$2,751.14	Very Low
42017106500	Richland Township, Richlandtown Borough	$2,475.65	Very Low
42017106600	Durham Township, Riegelsville Borough	$502.13	Very Low
42017980000	Falls Township	$568.22	Very Low
TOTAL		**$214,984.48**	

4.4.5.6 Equity in Vulnerable Communities

In terms of equity, unhoused populations may be most at risk of adverse impacts of hailstorms due to their lack of consistent, adequate shelter. Rural areas of the county may be disproportionately impacted by hailstorms due to crop impacts.

4.4.6 Hurricane, Tropical Storm, Nor'easter

Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise.

4.4.6.1 Location and Extent

Tropical storms impacting Bucks County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. Cyclones with maximum sustained winds of less than 39 miles per hour 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). Bucks County is located about 50 miles inland from the Delaware Bay and approximately 45 miles inland from the Atlantic Coast, meaning it is in an area of Pennsylvania where tropical storms could track inland causing heavy rainfall and strong winds.

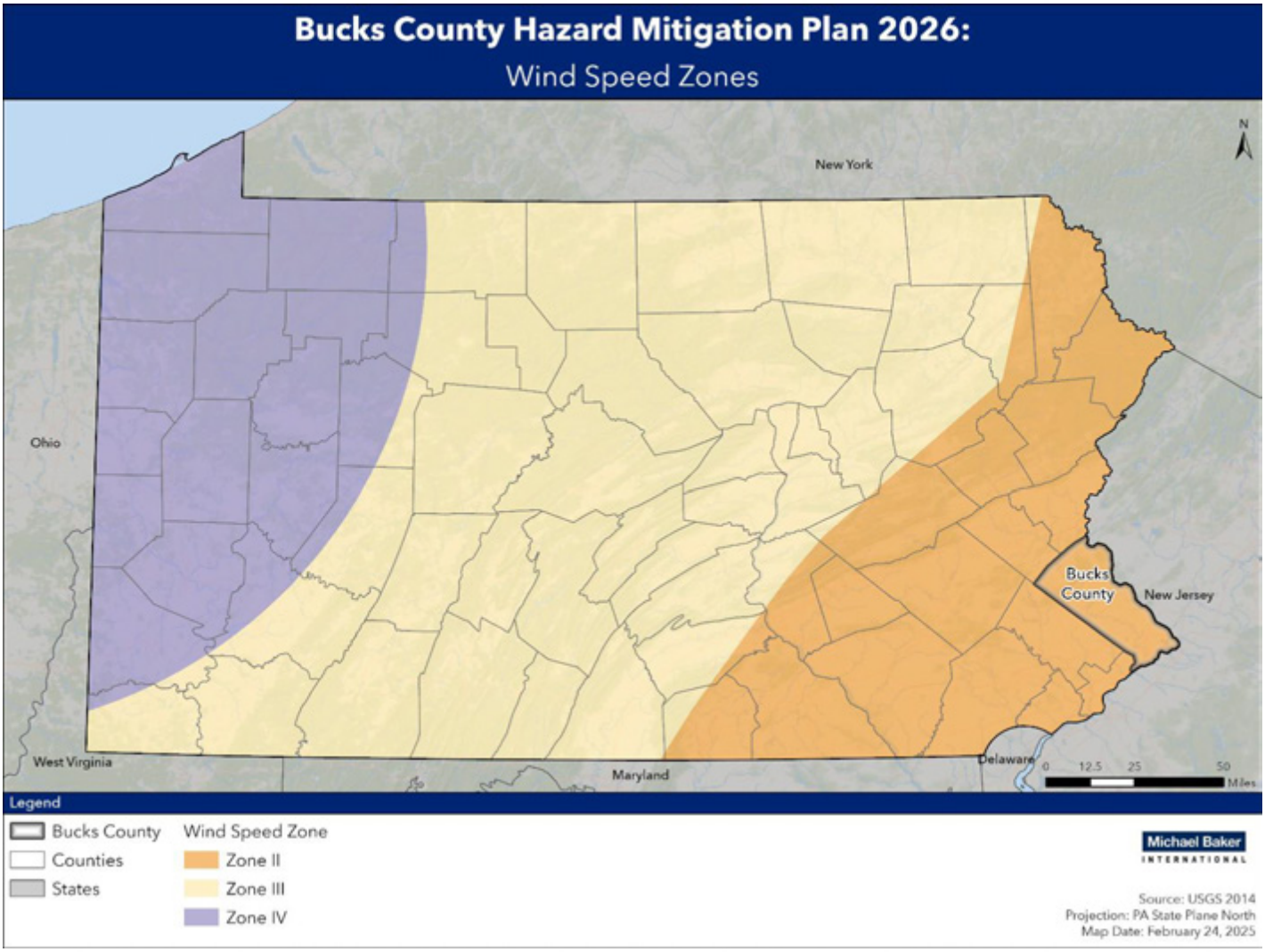
Nor'easters are extra-tropical storms which typically develop from low-pressure centers off the Atlantic Coast during the winter months. Potential threats from these storms include powerful winds, heavy rainfall/snow, storm surges, coastal and inland flooding, and huge crashing waves (NOAA NESDIS, n.d.). Extra-tropical is a term used to describe a hurricane or tropical storm with a cyclone that has lost its 'tropical' characteristics. While an extra-tropical storm denotes a change in weather pattern and how the storm is gathering energy, it may still have northeast winds that are tropical storm or hurricane force (Morgan, 2014). Nor'easters can also produce heavy precipitation in the form of rain, snow, or ice.

Hurricanes, tropical storms, and nor'easters are regional events that can impact areas as large as hundreds or thousands of miles across through the life the storm. Therefore, all communities within Bucks County are equally subject to the impacts of hurricanes, tropical storms, and nor'easters that track through or near the region. Areas in Bucks County which are subject to flooding, wind, and winter storm damage are particularly vulnerable in these situations.

The map below shows wind speed zones developed by the American Society of Civil Engineers. This information is based on 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.

Bucks County falls in Zone II which is classified as the 160-mph wind zone. This means design wind speeds for shelters and critical facilities should be able to withstand a three second gust of up to 160 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. In Bucks County, all new residential and commercial structures are required to be constructed per the International Building Code, which requires structures to be designed to a 90-mph wind speed. Therefore, the impact to future development due to high wind events is expected to be moderate to extreme, depending on the magnitude of wind speed. Figure 4.3.6-1 also illustrates that Bucks County falls entirely within the identified Hurricane Susceptibility Region.

Figure 4.4.6-1 Design Wind Speeds for Community Shelters Across the United States (FEMA, 2014).



4.4.6.2 Range of Magnitude

4.1.1.1 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 that can lead to damaging floods, and northeast winds, which, when combined with waterlogged soils can cause trees and utility poles to fall. Nor'easters can also bring damaging rain and wind but because they often occur during the winter months, they bring the additional threat of snow and ice associated with winter storms. Heavy snow can cause roof collapse in older homes, and ice presents a threat of slipping and tree branch collapse. More information on the range of magnitude of winter storms can be found in Section 4.3.14.

4.1.1.2 Tropical cyclones strengths are measured by windspeed; with the most common cause of death being storm surge. Bucks County does have the Delaware River, that may be affected by storm surge in Philadelphia and in the lowest ends of the County (per the MEOW modeling). However, the most frequent cause of extensive damage is wind; which can be anticipated based on 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), which are combined to estimate potential damage. Table 4.4.6-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as "major" hurricanes. While major hurricanes are the least common storm event (they comprise only 20 of all tropical cyclones making landfall), they account for the most damage in the United States (over 70 percent of damage). The intensity of a storm is also impacted by its orientation, location of landfall, and speed. The likelihood of these damages occurring in Bucks County is assessed in Section 4.3.6.4, Future Occurrence.

Table 4.4.6-1 Saffir-Simpson Scale Categories with Associated Wind Speeds and Damages (NHC, n.d).

Storm Category	Wind Speed (MPH)	Description of Damages
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	>157	**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.

It is important to recognize the potential for flooding events during hurricanes, tropical storms, and nor'easters; the risk assessment and associated impact for these events is included in Section 4.3.4. Wind impacts in Bucks County generally include downed trees and utility poles, which can spark widespread utility interruptions. Wind impacts are

particularly an issue for manufactured homes and other manufactured housing; these structures are often not well-anchored and are highly susceptible to wind damage in a hurricane, tropical storm, or nor'easter.

The worst-case hurricane, tropical storm, or Nor'easter event in Bucks County was Hurricane Diane, whose center of circulation passed over Bucks County in 1955 and resulted in a Presidential Disaster Declaration. Diane made landfall in North Carolina on August 17, taking a west-northwest track that cut through central Virginia, Maryland, southeast Pennsylvania, New Jersey, and New York. The storm tracked into south-central Pennsylvania, turning eastward and soaking eastern and southeastern Pennsylvania, including Bucks County. The state storm summary for Diane reported that "the Hurricane Flood of 1955, which affected 6,600 square miles, 'was the most disastrous flood ever to strike eastern Pennsylvania'" (Gelber, 2002). This storm is considered the ninth most costly hurricane event (adjusted costs to 1994 dollars), with cumulative damages of $7 million in the Northeastern United States.

The potential impacts of hurricanes, tropical storms, or a nor'easter on community lifelines are detailed in Table 4.4.6-2 below.

Table 4.4.6-2 Most Likely Lifelines Impacted by Hurricanes, Tropical Storms, or Nor'easter

Lifeline	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.

4.4.6.3 Previous Occurrence

NOAA's Coastal Services Center maintains records of all coastal storms occurring in the United States since the 1850s. Table 4.4.6-3 lists all coastal storms having centers of circulation to pass through or within 30 nautical miles of Bucks County. Typically, when these storms reach Bucks County, they have lost their hurricane speed winds, so structural damage is usually not as bad as coastal communities may experience. The exception to this is the unnamed 1903 event, which retained its hurricane-force winds as it passed over the southern portion of the County.

According to the Historic Hurricane Tracks by NOAA, other than Hurricane Ida in 2021, no new tropical storms, extratropical storms, or hurricanes have circulated through or within 30 nautical miles of Bucks County since 2020.

Table 4.4.6-3 Previous Tropical Storm Events with Centers of Circulation Within 30 Nautical Miles of Bucks County (NOAA Historical Hurricane Tracks, 2026; NOAA, 2026)

Year	Event	Strength In / Near Bucks County
2021	Ida	Hurricane
2020	Isaias	Tropical Storm
2020	Fay	Tropical Storm
2012	Sandy	Extratropical Storm
2011	Irene	Tropical Storm
2008	Hanna	Tropical Storm
1996	Bertha	Tropical Storm
1988	Chris	Extratropical Storm
1971	Doria	Tropical Storm
1960	Brenda	Tropical Storm
1955	Diane	Tropical Storm
1952	Able	Tropical Storm
1945	Not Named	Extratropical Storm
1934	Not Named	Extratropical Storm
1929	Not Named	Extratropical Storm
1924	Not Named	Extratropical Storm
1915	Not Named	Tropical Storm
1903	Not Named	Category 1 Hurricane/Tropical Storm
1899	Not Named	Extratropical Storm
1893	Not Named	Tropical Storm
1888	Not Named	Tropical Storm
1874	Not Named	Tropical Storm
1872	Not Named	Tropical Storm
1867	Not Named	Tropical Depression/Extratropical Storm
1866	Not Named	Extratropical Storm
1863	Not Named	Tropical Storm
1861	Not Named	Tropical Storm

Bucks County was hit by Hurricane Ida on September 2, 2021. Ida caused widespread damage from heavy rain, flooding, three EF-1 tornadoes, and even the death of one resident in Milford Township. Overall, the storm resulted in 4 to 8 inches of rain countywide with some areas receiving 10 inches. Numerous water rescues were required throughout the night of the storm with more than 2,000 emergency calls placed to Bucks County 911 (Bucks County, 2021a). Hundreds of homes and businesses were damaged with an estimated $9.4 million in damage to public infrastructure (Bucks County, 2021b). Following the storm, Governor Tom Wolf declared a disaster with the Biden Presidency approving.

Tropical Storm Isaias passed through Bucks County on August 4, 2020. Bringing heavy rain and a confirmed EF2 tornado to the area, Isaias left 100,000 residents and businesses without power, downed trees, flooding, and property damage. The tornado hit Doylestown Hospital where the Children's Village, a preschool and daycare on the grounds of Doylestown Health campus, is located. Part of the roof at Children's Village was torn off while

approximately 135 children were inside. Four children and two staff members were slightly injured during the incident. The hospital is considered a critical facility and it sustained minor damage and cars were flipped in its parking lot. The tropical storm brought five to seven inches of rain to Bucks. The lower end of the county saw more of heavy wind damage, and the upper end of the county saw higher amounts of flooding (King, 2020). After the storm, Governor Tom Wolf declared a disaster from Berks to Philadelphia, with counties approved for the U.S. Small Business Administration loans. With the disaster declaration, homeowners, renters, and businesses impacted by the flooding in Berks, Philadelphia, Bucks, Chester, Delaware, Lancaster, Lebanon, Lehigh, Montgomery, and Schuylkill counties became eligible for low-interest disaster loans (PEMA, 2020b).

It is important to note that a number of hurricane, tropical storm, and nor'easter events have impacted the County without tracking through it; these storm events include Tropical Storm Agnes (1972), Hurricane Floyd (1999), Tropical Storm Allison (2001), Tropical Depression Frances (2004), Tropical Depression Ivan (2004), Hurricane Katrina (2005), Hurricane Irene (2011), Tropical Storm Lee (2011), and Hurricane Sandy (2012). Each of these storm events resulted in a Presidential Disaster Declaration. In the last decade, Bucks County was impacted by flooding related to Hurricane Irene and Tropical Storm Lee during the end of August and beginning of September 2011. In 2012, Bucks County was impacted by Hurricane Sandy as it traveled through the area. The area experienced downed trees, flooding, and utility interruption. A day after the storm passed, PECO reported 170,000 customers without power throughout the county (Bucks County, 2012). Figure 4.4.6-2 includes two pictures illustrating some of the damage that was done in Bucks County from Hurricane Sandy.

Figure 4.4.6-2 Photos of Hurricane Sandy Aftermath in Bucks County (Bucks County Courier Times, 2013).

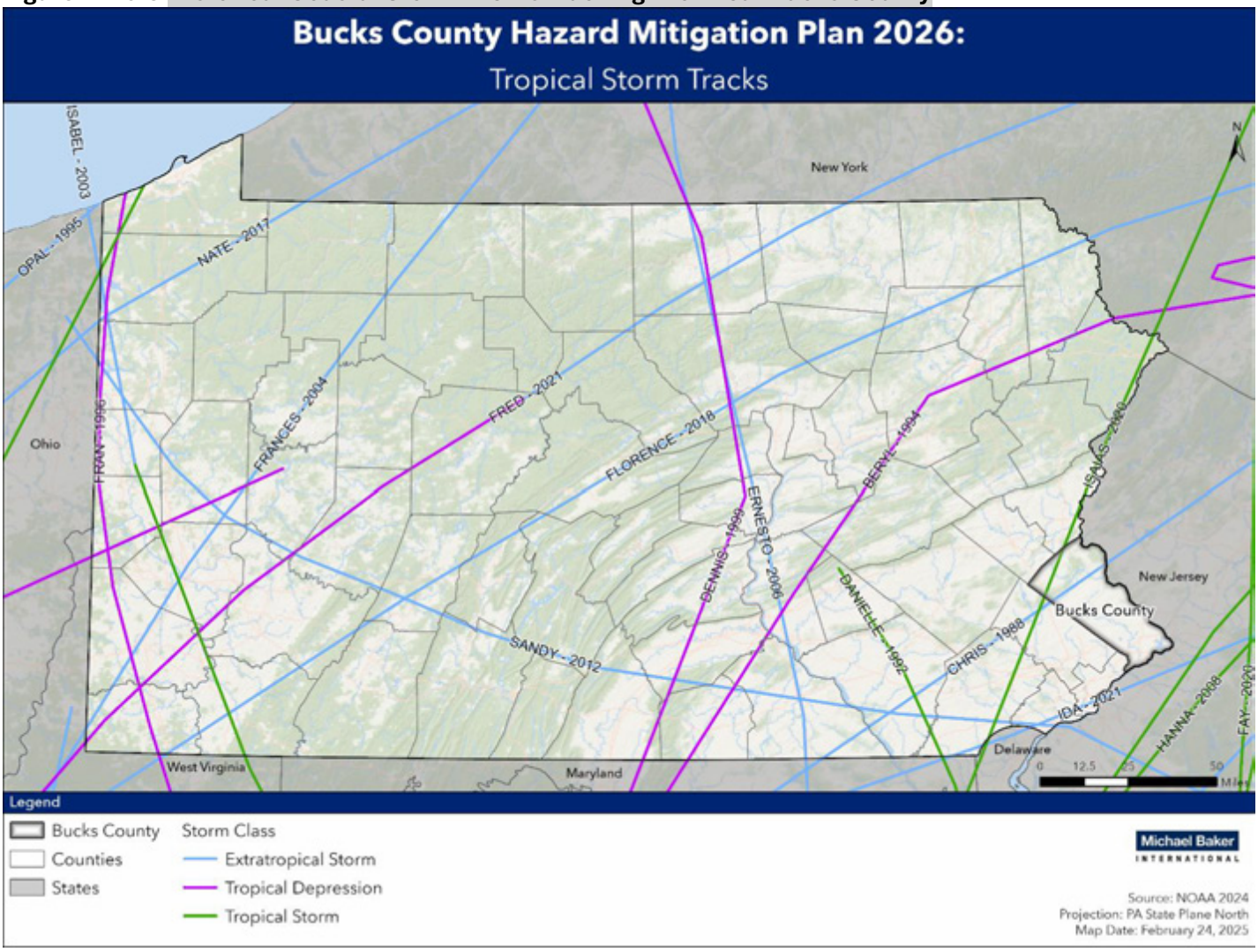
Trees fell across the county, including on this car in Bristol Township.

The Bristol Wharf experienced flooding and roof damage.

Figure 4.4.6-3 shows the tracking the historic coastal storms which have passed through or near Bucks County. As previously stated, even if a storm did not pass through Bucks County, the wind and rain from the storm could have still impacted the county, as was the case recently with Hurricane Ida. The NOAA NCEI database does not track

nor'easters as a separate weather event; they are tracked as high wind, heavy snow, and/or coastal flooding events, so a complete listing is not available. However, other sources provide record of nor'easters in the County. For instance, a nor'easter affected much of Pennsylvania and several other states between Washington, D.C. and Boston, Massachusetts from January 6-8, 1996, resulting in Presidential Disaster Declaration 1085. Blizzard conditions included heavy snow, strong winds, and very cold temperatures (NWS, 1996). About a week later, unseasonably high temperatures and rainfall melted the thick snowpack left by the Nor'easter and resulted in Presidential Disaster Declaration 1993 for flooding (NCEI, 2014). More recently, there was a nor'easter that took place on December 16, 2020, and brought a range of 3-6 inches of snow accumulation to Bucks County with an upwards of 8-9 inches of accumulation in the County. The heavy snow combined with high winds left power outages across Bucks County. More broadly, Bucks, Lehigh, and Northampton counties reported a total of 27 crashes and 154 disabled vehicles in a 20-hour timeframe (Blanchard, 2020).

Figure 4.4.6-3 Historical Coastal Storm Events Tracking in or Near Bucks County



4.4.6.4 Potential for Future Occurrence

Although hurricanes, tropical storms, and nor'easters can cause flood events consistent with 1 percent- and 0.2 percent- level frequency, their probability of occurrence is measured relative to wind speed. Hurricane activity in

the North Atlantic has increased since the 1970s, with storms migrating northward and generating more destructive potential (Kossin et al. 2017 & Shortle et al. 2015). 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 future occurrence of hurricanes, tropical storms, and nor'easters can be considered possible, as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1). It is difficult to assign a probability to the future occurrence of hurricanes, tropical storms, and nor'easters in Bucks County; however, the storm events are possible in the county.

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.

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. A 2017 study from the University of Pennsylvania found that homes built in Florida after the implementation of a statewide building code in 2002 experienced significantly less damage (Done, Simmons, Czajkowski, 2018). In addition to those impacts, storm activity has been occurring before the official start of hurricane season (June 1st) more and more frequently, potentially signaling an extended season each year (Truchelut, et al. 2022).
Although Bucks County is not likely to experience the severe high winds faced in more coastal communities during a nor'easter, the county is subject to heavy snow, ice, and blizzard conditions.

4.4.6.5 Vulnerability Assessment

A vulnerability assessment for hurricanes, tropical storms, and nor'easters focuses on the impacts of flooding and severe wind. Therefore, the assessment for flood-related vulnerability is addressed in Section 4.3.4. In addition, mobile/manufactured homes are vulnerable to hurricanes, tropical storms, and nor'easters. Section 4.3.12 discusses vulnerability to wind damage; Table 4.3.12-5 identifies the number of manufactured homes per community. The County is also vulnerable to severe winter weather impacts caused by nor'easters which are evaluated in Section 4.3.14.

4.4.7 Landslide

In a landslide, masses of rock, earth or debris move down a slope. Landslides can be caused by a variety of factors, including earthquakes, storms, fire, and human modification of land. Areas that are prone to landslide hazards include previous landslide areas, areas on or at the base of slopes, areas in or at the base of drainage hollows, developed hillsides with leach field septic systems, and areas recently burned by forest or brush fires. (PA DCNR, 2018 and US Geological Survey (USGS), 2018).

4.4.7.1 Location and Extent

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 of slopes due to construction, erosion, earthquakes, and changes in groundwater levels. Mudflows, mudslides, rock falls, rockslides, and rock topples are all forms of a landslide. Landslides usually occur in areas of Bucks County with moderate to steep slopes and during high precipitation. Many slope failures are associated with precipitation events – periods of sustained above-average precipitation, specific rainstorms, or snowmelt events. Areas experiencing erosion, decline in vegetation cover, and earthquakes are also susceptible to landslides. Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil water content, and removing vegetation cover. The geologic instabilities that cause landslides to occur are often exacerbated by highway projects in which the earth is cut, and soil is loosened.

The USGS identifies all of Bucks County as falling into the low incidence and susceptibility zone (Figure 4.4.7-1). The Low Incidence zone, meaning that these areas have low susceptibility to landslides with a low incidence of occurrence. The other zones identified on the map are: Low Incidence/Moderate Susceptibility zone, meaning that these areas have moderate susceptibility to landslides with a low incidence of occurrence; Low Incidence/High Susceptibility zone, meaning that these areas have high susceptibility to landslides with a low incidence of occurrence; Moderate Incidence zone, meaning that this area has moderate susceptibility to landslides with a moderate incidence of occurrence; Moderate Incidence/High Susceptibility zone, meaning these areas have high susceptibility to landslides with a moderate incidence of occurrence; and High Incidence zone, meaning that these areas have high susceptibility to landslides with a high incidence of occurrence.

A slope greater than 7% (approximately around 15 degrees) needs special considerations for building roads according to common engineering practice, and a slope of 15% (approximately around 25 degrees) is generally unstable and highly sensitive to surface changes. Slopes greater than 25% are very unstable. Figure 4.4.7-2 identifies areas of differing slope degrees throughout Bucks County.

Bucks County is located within a low landslide hazard zone, but if a landslide does occur it is more likely to occur in hill and valley areas. Areas of steep slopes associated with the banks of major watercourses in the County including the Delaware River or Neshaminy Creek could collapse under heavy rainfall to produce a localized landslide; Steep slopes may also be prevalent among many of roads cut into hillsides. The potential of damage to lives or property from this type of natural hazard is significant.

Figure 4.4.7-1 Map of General Landslide Hazard Areas in Pennsylvania

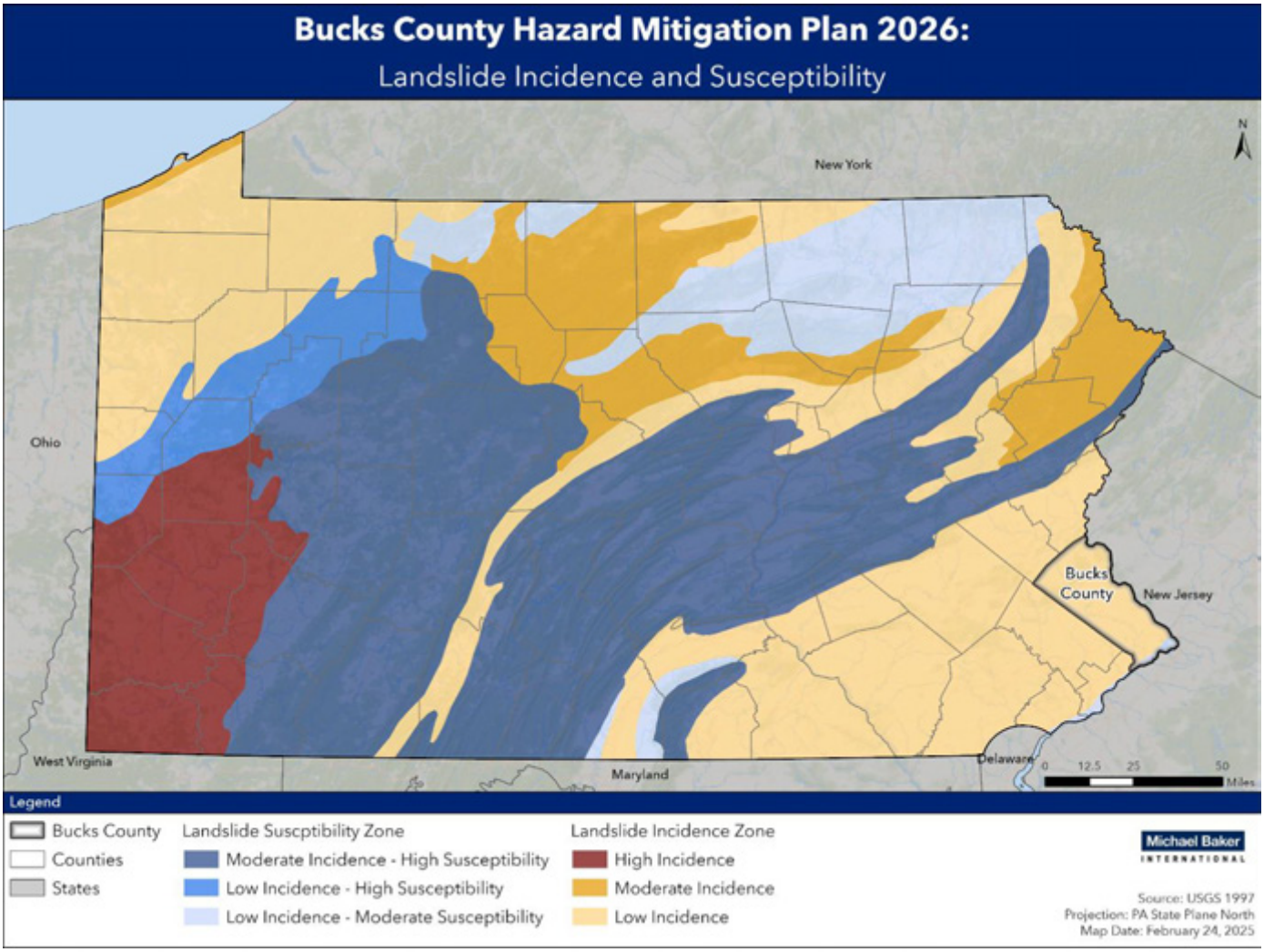
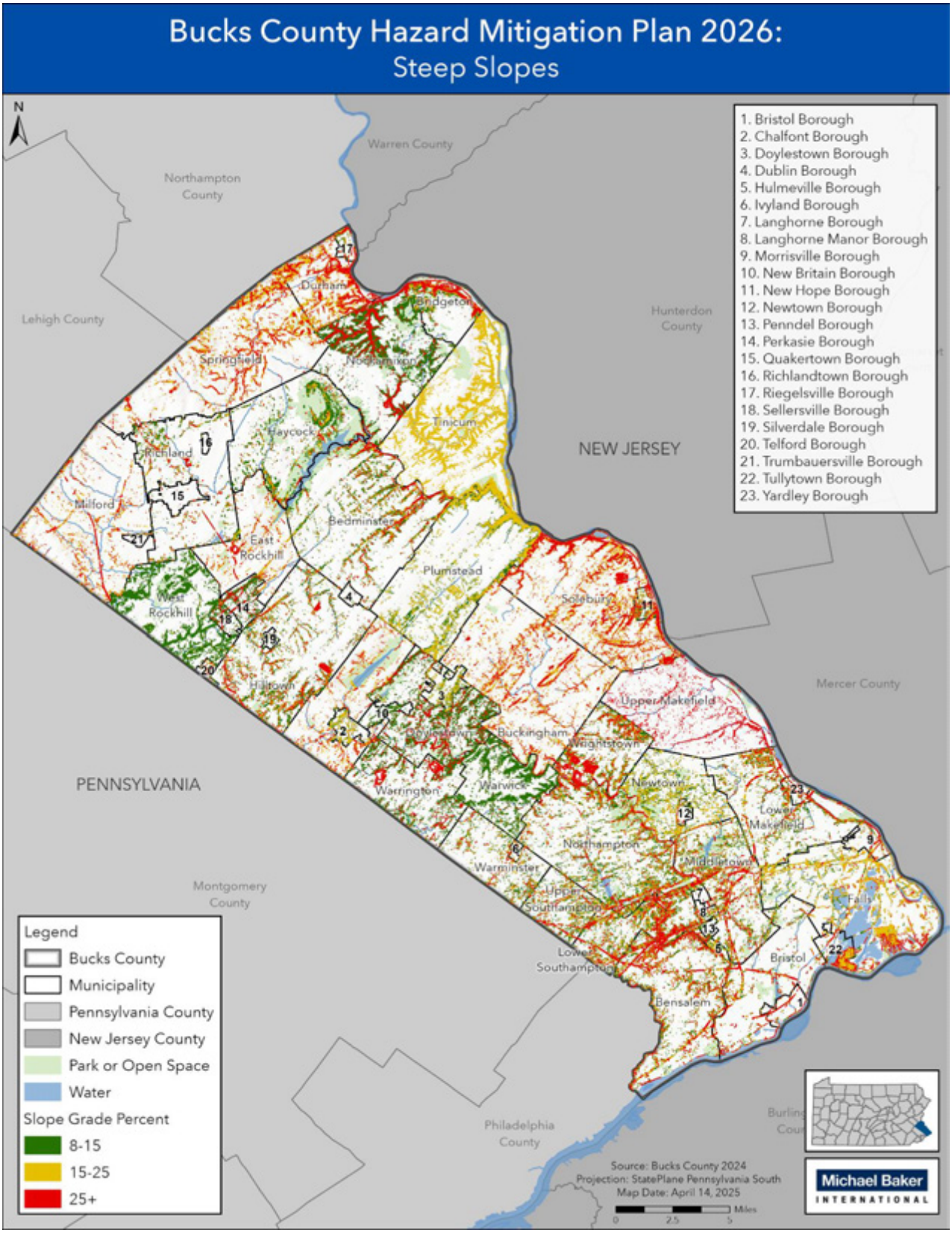


Figure 4.4.7-2 Map of General Landslide Susceptibility Based on Slope in Bucks County Municipalities



4.4.7.2 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

The worst-case scenario for a landslide in Bucks County would be a landslide with a sudden onset, leaving residents of a downslope area without warning before it caused severe damage to assets and potentially endangered lives. In addition, a major landslide could impact transportation networks, preventing effective response to the scene of the incident.

The following community lifelines are affected by landslides:

Lifelines	Notes
	Roadways have potential from damage from landslides.

4.4.7.3 Previous Occurrence

A comprehensive inventory of landslides events in Pennsylvania does not exist. The NOAA NCEI database captures landslides as they occur in conjunction with severe storms; the NOAA NCEI database reports several landslides and mudslides in Bucks County. In September 2008, State Route 611 in Durham Township was closed for over 24 hours when flash flooding caused a large mudslide on the highway. The event also caused a man-made rock fall when a 170-year-old stone wall collapsed under the weight of water cascading off steep cliffs that hug the southbound side of River Road. A nearby homeowner saw hundreds of rocks carried into his property by the floodwaters. Flooding in April 2011 caused a mudslide in Plumstead Township, partially blocking the intersection of State Route 32 and Point Pleasant Pike (NOAA NCEI, 2021). Additionally, flash flooding in August 2018 caused a landslide on the Pennsylvania Turnpike's Northeast Extension just North of Quakertown, closing a portion of the road for more than two hours (Salamone, 2018). The NCEI has no documentation of any landslide or mudslide occurring since the 2021 HMP.

4.4.7.4 Potential for Future Occurrence

Given that damage due to landslide in Bucks County has been minimal and more focused on road closures than damage, the future occurrence of landslides can be considered likely as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1). However, mismanaged intense development in steeply sloped areas could increase their frequency of occurrence.

Additionally, periods of intense rain or snowmelt will heighten the risk of landslides. The probability of large-scale future landslide events in Bucks County is considered low due to the County's position over the Piedmont Province with the majority of the County over the Gettysburg-Newark Lowland Section, a general topography of rolling lowlands, shallow valleys, and isolated hills (DCNR, 2018). A small portion of Lower Bucks is located over the Piedmont Upland Section, which includes topography of broad, rounded to flat-topped hills and shallow valleys. The south edge of Bucks County is located in the Lowland and Intermediate Upland Section in the Atlantic Coastal Plain Province, which includes topography of flat upper terrace surface cut by shallow valleys. These are geological formations with low to isolated moderate locations of landslide potential.

4.4.7.5 Vulnerability Assessment

Any landslide events that do occur in Bucks County would take place in steeply sloped areas. In addition, places where landforms have been altered for purposes of highway construction or other development may be uniquely vulnerable to landslide hazards. This is especially true if development is located at the base or crest of cliffs or near large highway cut-outs. These areas should be considered vulnerable to landslides, particularly if mitigation measures have not been implemented.

A landslide might cause a structure to collapse or might cause minor damages such as broken windows. A landslide might cause a roadway to be temporarily blocked. Transportation routes throughout the County located at the base or crest of cliffs should be considered vulnerable to this hazard.

Table 4.4.7-2 details the number of structures and critical facilities in each municipality that are in areas with steep slopes and may, therefore, experience damages should a landslide occur. According to PEMA, Bucks County is not among the top vulnerable Pennsylvania Counties to landslide by numbers of vulnerable people and buildings. There are no vulnerable populations, buildings, or exposed building values that are likely to be impacted by a landslide. However, smaller landslide events could still occur within the planning area. While the occurrence of a massive, devastating landslide is unlikely, the impacts can greatly impact a community.

Bensalem Township has the largest number of structures in steep slope areas over 15% (22,234), while Durham Township has the greatest percentage of structures in these areas (7%). This vulnerability assessment also measures the number and percentage of critical facilities in steep slope areas across Bucks County. Lower Southampton Township has the largest number of critical facilities in steep slope areas over 15% (2). Durham has the highest percentage of critical facilities (100%) in steep slopes areas of 15%. These municipalities are all more vulnerable to landslide events based on their existing topography and the location of their structures and critical facilities. It is much more likely that a landslide event will occur in a steep slope area over 15%. While all

municipalities have some steep slope areas, those with the most structures and critical facilities on this geography are more likely to incur damages from a landslide event.

Table 4.4.7-1 lists the number of structures in each municipality located in areas susceptible to landslide by land use type. The land use type displaying the greatest vulnerability to landslide hazards is residential.

Table 4.4.7-1 Landslide Vulnerability for Bucks County (Bucks County GIS, 2024) (DHS, 2025)

Municipality	Total Structures	Structures on Steep Slopes	PCT Structures on Steep Slopes	Total Population	Total Population in Steep Slopes (Above 15% Grade)	PCT Total Population in Steep Slope	Total Critical Facilities	CFs in Steep Slopes	PCT CFs in Steep Slopes
Bedminster Township	3,278	18	1%	7,518	0	0%	13	1	8%
Bensalem Township	22,234	136	1%	62,819	685	1%	66	0	0%
Bridgeton Township	790	12	2%	1,234	6	0%	3	0	0%
Bristol Borough	4,024	5	0%	9,861	68	1%	19	0	0%
Bristol Township	20,102	36	0%	54,369	130	0%	62	0	0%
Buckingham Township	8,367	56	1%	20,847	172	1%	22	0	0%
Chalfont Borough	1,788	10	1%	4,253	0	0%	8	0	0%
Doylestown Borough	3,486	10	0%	8,300		0%	23	0	0%
Doylestown Township	6,807	28	0%	17,971	190	1%	30	0	0%
Dublin Borough	741	0	0%	2,177		0%	4	0	0%
Durham Township	656	44	7%	1,094	210	19%	1	1	100%
East Rockhill Township	2,652	15	1%	5,819		0%	9	0	0%
Falls Township	11,954	5	0%	34,672	32	0%	62	0	0%
Haycock Township	1,232	1	0%	2,201		0%	2	0	0%
Hilltown Township	6,428	23	0%	16,395	40	0%	13	0	0%
Hulmeville Borough	410	3	1%	982	60	6%	3	0	0%
Ivyland Borough	359	0	0%	955		0%	5	0	0%
Langhorne Borough	568	0	0%	1,643		0%	4	0	0%
Langhorne Manor Borough	349	0	0%	1,496		0%	4	0	0%
Lower Makefield Township	13,771	52	0%	33,224	66	0%	29	0	0%
Lower Southampton Township	8,340	98	1%	20,487	556	3%	23	2	9%
Middletown Township	17,420	82	0%	45,967	408	1%	52	0	0%
Milford Township	4,430	24	1%	10,238	13	0%	12	0	0%
Morrisville Borough	3,241	6	0%	9,809	79	1%	13	0	0%
New Britain Borough	1,151	7	1%	2,836		0%	9	0	0%
New Britain Township	4,937	28	1%	12,223	433	4%	15	1	7%
New Hope Borough	1,446	59	4%	2,612	196	8%	8	0	0%
Newtown Borough	1,054	0	0%	2,268		0%	3	0	0%

Municipality	Total Structures	Structures on Steep Slopes	PCT Structures on Steep Slopes	Total Population	Total Population in Steep Slopes (Above 15% Grade)	PCT Total Population in Steep Slope	Total Critical Facilities	CFs in Steep Slopes	PCT CFs in Steep Slopes
Newtown Township	8,544	22	0%	19,904	69	0%	31	0	0%
Nockamixon Township	1,827	18	1%	3,379	20	1%	8	0	0%
Northampton Township	15,081	71	0%	39,915	2016	5%	37	0	0%
Penndel Borough	743	2	0%	2,515	57	2%	5	0	0%
Perkasie Borough	3,546	18	1%	9,120	493	5%	8	0	0%
Plumstead Township	5,957	42	1%	14,038	51	0%	25	0	0%
Quakertown Borough	3,259	0	0%	9,359		0%	22	0	0%
Richland Township	6,621	8	0%	13,858	13	0%	11	0	0%
Richlandtown Borough	447	0	0%	1,353		0%	3	0	0%
Riegelsville Borough	465	10	2%	847	11	1%	2	0	0%
Sellersville Borough	1,914	7	0%	4,567	26	1%	6	0	0%
Silverdale Borough	337	0	0%	805		0%	3	0	0%
Solebury Township	4,322	111	3%	8,708	191	2%	11	0	0%
Springfield Township	2,719	29	1%	5,172	169	3%	8	0	0%
Telford Borough	763	0	0%	2,199		0%	1	0	0%
Tinicum Township	2,352	46	2%	3,818	156	4%	10	1	10%
Trumbauersville Borough	386	0	0%	883		0%	4	0	0%
Tullytown Borough	900	2	0%	2,268		0%	8	0	0%
Upper Makefield Township	3,775	16	0%	8,861	112	1%	9	0	0%
Upper Southampton Township	6,233	15	0%	15,269		0%	24	0	0%
Warminster Township	13,677	84	1%	33,603	0	0%	40	0	0%
Warrington Township	9,377	32	0%	25,639	127	0%	26	0	0%
Warwick Township	6,284	43	1%	14,851	985	7%	16	0	0%
West Rockhill Township	2,502	11	0%	5,446	287	5%	14	0	0%
Wrightstown Township	1,497	33	2%	3,286	14	0%	5	0	0%
Yardley Borough	1,350	9	1%	2,605	175	7%	6	0	0%
Total	**256,893**	**1,387**	**1%**	**646,538**	**8,316**	**1%**	**860**	**6**	**1%**

Table 4.4.7-2 Structures in Landslide Zone by Land Use Type per Municipality for Bucks County (Bucks County GIS, 2024)

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Bedminster Township	0	0	0	0	0	0	1	5	0	0	1	0	11	18
Bensalem Township	0	4	0	1	0	0	3	75	4	6	0	0	43	136
Bridgeton Township	0	0	0	0	0	0	0	2	0	0	0	0	10	12
Bristol Borough	0	1	0	3	0	0	0	1	0	0	0	0	0	5
Bristol Township	0	1	1	0	0	0	0	23	0	0	0	0	11	36
Buckingham Township	0	2	0	0	0	0	0	40	0	0	1	0	13	56
Chalfont Borough	0	0	0	0	0	0	0	9	0	1	0	0	0	10
Doylestown Borough	0	4	0	0	0	0	0	5	0	0	1	0	0	10
Doylestown Township	0	6	0	1	0	1	0	14	0	0	0	1	5	28
Dublin Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	1	0	0	1	0	0	0	13	0	0	1	1	27	44
East Rockhill Township	1	0	0	0	0	0	0	4	0	0	0	0	10	15
Falls Township	1	0	0	0	0	0	0	1	0	0	1	0	2	5
Haycock Township	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Hilltown Township	1	0	0	0	0	0	0	18	0	1	1	0	2	23
Hulmeville Borough	0	0	0	0	0	0	0	3	0	0	0	0	0	3
Ivyland Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Manor Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Makefield Township	0	0	0	0	0	0	1	9	0	1	0	0	41	52
Lower Southampton Township	0	5	1	0	0	0	0	83	0	1	0	0	8	98
Middletown Township	0	3	0	0	0	0	0	56	2	3	1	0	17	82
Milford Township	1	0	0	0	0	0	1	9	0	3	0	0	10	24
Morrisville Borough	0	2	0	0	0	0	0	2	0	0	0	0	2	6
New Britain Borough	0	4	0	0	0	0	0	3	0	0	0	0	0	7
New Britain Township	1	0	1	1	0	0	1	21	0	0	0	0	3	28
New Hope Borough	0	6	0	1	0	0	0	46	0	0	0	0	6	59
Newtown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newtown Township	0	1	0	0	0	0	0	17	0	3	0	0	1	22
Nockamixon Township	0	1	0	0	0	0	0	4	0	0	0	0	13	18
Northampton Township	1	1	0	0	0	0	0	62	0	1	0	0	6	71
Penndel Borough	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Perkasie Borough	1	1	0	3	0	0	1	5	0	1	1	0	5	18
Plumstead Township	0	0	0	0	0	1	1	25	0	0	1	0	14	42
Quakertown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Richland Township	1	0	0	0	0	0	0	5	0	0	0	0	2	8
Richlandtown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	0	0	0	0	0	0	0	8	0	0	0	0	2	10
Sellersville Borough	0	0	0	0	0	0	0	4	0	0	0	0	3	7
Silverdale Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	0	0	0	1	0	0	0	59	0	2	0	0	49	111
Springfield Township	0	0	0	0	0	0	0	12	0	0	1	0	16	29
Telford Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tinicum Township	0	0	0	0	0	0	0	17	0	0	0	0	29	46
Trumbauersville Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tullytown Borough	0	0	1	0	0	0	0	0	0	0	1	0	0	2
Upper Makefield Township	0	0	0	0	0	0	0	1	0	1	0	0	14	16
Upper Southampton Township	0	1	0	0	0	0	0	9	0	1	0	0	4	15
Warminster Township	0	0	0	0	0	0	0	84	0	0	0	0	0	84
Warrington Township	0	0	0	0	0	0	1	29	0	1	0	0	1	32
Warwick Township	1	0	0	0	0	0	0	19	0	0	0	0	23	43
West Rockhill Township	0	0	0	0	0	1	0	2	0	0	0	0	8	11
Wrightstown Township	0	0	0	0	0	4	1	11	0	0	2	0	15	33
Yardley Borough	0	1	0	0	0	0	0	1	0	0	0	1	6	9
Total	**10**	**44**	**4**	**12**	**0**	**7**	**11**	**816**	**6**	**26**	**13**	**3**	**435**	**1,387**

Table 4.4.7-3 Expected Annual Losses to Landslide by Census Tract (FEMA NRI, 2026)

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100102	Bensalem Township	$2.12	Very Low
42017100103	Bensalem Township	$0.04	Very Low
42017100104	Bensalem Township	$10.37	Very Low
42017100105	Bensalem Township	$0.04	Very Low
42017100201	Bensalem Township	$1.90	Very Low
42017100206	Bensalem Township	$4.56	Very Low
42017100207	Bensalem Township	$0.01	Very Low
42017100208	Bensalem Township	$0.13	Very Low
42017100209	Bensalem Township		
42017100210	Bensalem Township	$0.17	Very Low
42017100211	Bensalem Township	$227.60	Relatively Low
42017100212	Bensalem Township	$0.17	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100213	Bensalem Township	$2.48	Very Low
42017100214	Bensalem Township	$0.29	Very Low
42017100302	Bristol Township	$0.06	Very Low
42017100303	Bristol Township	$127.41	Very Low
42017100304	Bristol Township	$0.59	Very Low
42017100306	Bristol Township	$0.08	Very Low
42017100307	Bristol Township	$17.61	Very Low
42017100401	Bristol Township	$0.49	Very Low
42017100402	Bristol Township	$9.03	Very Low
42017100403	Bristol Township	$1.10	Very Low
42017100404	Bristol Township	$0.16	Very Low
42017100406	Bristol Township	$1,050.13	Relatively Low
42017100407	Bristol Township	$0.33	Very Low
42017100408	Bristol Township	$0.31	Very Low
42017100500	Bristol Borough	$0.82	Very Low
42017100600	Bristol Borough	$33.41	Very Low
42017100700	Bristol Borough	$8.46	Very Low
42017100803	Middletown Township	$0.76	Very Low
42017100804	Middletown Township	$0.73	Very Low
42017100805	Middletown Township	$1.32	Very Low
42017100807	Middletown Township	$11.02	Very Low
42017100808	Middletown Township	$0.43	Very Low
42017100809	Middletown Township	$0.00	Very Low
42017100811	Middletown Township	$0.08	Very Low
42017100900	Middletown Township	$0.10	Very Low
42017101100	Penndel Borough	$5.56	Very Low
42017101401	Lower Southampton Township	$0.00	Very Low
42017101403	Lower Southampton Township	$0.01	Very Low
42017101404	Lower Southampton Township	$166.55	Relatively Low
42017101405	Lower Southampton Township	$89.16	Very Low
42017101503	Upper Southampton Township	$4.83	Very Low
42017101504	Upper Southampton Township	$0.40	Very Low
42017101505	Upper Southampton Township	$0.03	Very Low
42017101506	Upper Southampton Township	$13.85	Very Low
42017101603	Warminster Township	$4.02	Very Low
42017101605	Warminster Township	$109.93	Very Low
42017101607	Warminster Township	$0.11	Very Low
42017101609	Warminster Township	$0.01	Very Low
42017101610	Warminster Township	$81.67	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017101611	Warminster Township	$0.08	Very Low
42017101802	Warrington Township	$38.26	Very Low
42017101803	Warrington Township		
42017101805	Warrington Township	$0.06	Very Low
42017101807	Warrington Township	$0.15	Very Low
42017101808	Warrington Township	$19.34	Very Low
42017101809	Warrington Township	$81.17	Very Low
42017101810	Warrington Township	$0.26	Very Low
42017101900	Chalfont Borough	$13.72	Very Low
42017102002	New Britain Township	$1.41	Very Low
42017102003	New Britain Township	$0.25	Very Low
42017102004	New Britain Township	$0.13	Very Low
42017102102	Hilltown Township	$12.36	Very Low
42017102104	Hilltown Township	$0.23	Very Low
42017102300	East Rockhill Township	$17.52	Very Low
42017102401	Perkasie Borough	$4.62	Very Low
42017102402	Perkasie Borough	$20.08	Very Low
42017102500	Sellersville Borough, West Rockhill Township	$3.76	Very Low
42017102600	Telford Borough	$0.92	Very Low
42017102700	West Rockhill Township	$6.43	Very Low
42017102801	Milford Township	$0.11	Very Low
42017103101	Quakertown Borough	$22.15	Very Low
42017103102	Quakertown Borough	$0.03	Very Low
42017103103	Quakertown Borough	$3.40	Very Low
42017103300	Haycock Township	$16.19	Very Low
42017103400	Springfield Township	$0.22	Very Low
42017103700	Nockamixon Township	$0.19	Very Low
42017103800	Bridgeton Township	$0.36	Very Low
42017103900	Tinicum Township	$0.95	Very Low
42017104000	Bedminster Township	$0.30	Very Low
42017104100	Dublin Borough	$0.50	Very Low
42017104201	Plumstead Township	$7.05	Very Low
42017104203	Plumstead Township	$1.29	Very Low
42017104204	Plumstead Township	$21.66	Very Low
42017104301	Solebury Township	$0.17	Very Low
42017104303	Solebury Township	$5.25	Very Low
42017104304	Solebury Township	$2.57	Very Low
42017104400	New Hope Borough	$2.71	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017104502	Buckingham Township	$9.72	Very Low
42017104503	Buckingham Township	$3.31	Very Low
42017104505	Buckingham Township	$0.22	Very Low
42017104506	Buckingham Township	$0.43	Very Low
42017104601	Doylestown Township	$0.02	Very Low
42017104603	Doylestown Township	$1.07	Very Low
42017104604	Doylestown Township	$1.55	Very Low
42017104701	Doylestown Borough, Doylestown Township	$0.09	Very Low
42017104702	Doylestown Borough	$0.27	Very Low
42017104703	Doylestown Borough	$0.31	Very Low
42017104800	New Britain Borough	$0.71	Very Low
42017104901	Warwick Township	$22.46	Very Low
42017104902	Warwick Township	$1.56	Very Low
42017105003	Northampton Township	$0.37	Very Low
42017105004	Northampton Township	$5.12	Very Low
42017105006	Northampton Township	$0.12	Very Low
42017105008	Northampton Township	$0.18	Very Low
42017105009	Northampton Township	$0.74	Very Low
42017105010	Northampton Township	$5.43	Very Low
42017105011	Northampton Township	$0.82	Very Low
42017105012	Northampton Township	$0.40	Very Low
42017105013	Northampton Township	$0.30	Very Low
42017105100	Wrightstown Township	$0.06	Very Low
42017105202	Newtown Township	$64.74	Very Low
42017105203	Newtown Township	$38.69	Very Low
42017105206	Newtown Township	$1.78	Very Low
42017105207	Newtown Township	$1.03	Very Low
42017105208	Newtown Township	$0.44	Very Low
42017105300	Newtown Borough	$0.54	Very Low
42017105401	Upper Makefield Township	$0.35	Very Low
42017105402	Upper Makefield Township	$2.10	Very Low
42017105505	Lower Makefield Township	$1.79	Very Low
42017105506	Lower Makefield Township	$0.95	Very Low
42017105507	Lower Makefield Township	$0.36	Very Low
42017105508	Lower Makefield Township	$1.32	Very Low
42017105509	Lower Makefield Township	$0.35	Very Low
42017105510	Lower Makefield Township	$1.06	Very Low
42017105511	Lower Makefield Township	$0.90	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017105600	Yardley Borough	$7.81	Very Low
42017105702	Morrisville Borough	$0.40	Very Low
42017105704	Morrisville Borough, Falls Township	$0.13	Very Low
42017105801	Falls Township	$2.02	Very Low
42017105805	Falls Township	$2.61	Very Low
42017105807	Falls Township	$4.88	Very Low
42017105808	Falls Township	$3.92	Very Low
42017105809	Falls Township	$0.05	Very Low
42017105810	Falls Township	$1.88	Very Low
42017105811	Falls Township	$0.06	Very Low
42017105812	Falls Township	$10.84	Very Low
42017105900	Tullytown Borough	$0.14	Very Low
42017106000	Middletown Township, Hulmeville Borough	$17.98	Very Low
42017106100	Langhorne Manor Borough, Langhorne Borough	$0.04	Very Low
42017106201	Warminster Township	$3.83	Very Low
42017106202	Warminster Township, Ivyland Borough	$0.35	Very Low
42017106300	Hilltown Township, Silverdale Borough	$0.95	Very Low
42017106401	Richland Township	$0.06	Very Low
42017106402	Milford Township, Trumbauersville Borough	$61.05	Very Low
42017106500	Richland Township, Richlandtown Borough	$8.54	Very Low
42017106600	Durham Township, Riegelsville Borough	$0.01	Very Low
42017980000	Falls Township	$0.00	Very Low
TOTAL		**$2,595.52**	

4.4.7.6 Equity in Vulnerable Communities

The entire county faces very low risk to landslides. There is no evidence to indicate there is disparity in exposure or risk that makes any subset of the population disproportionately at risk to landslide impacts.

4.4.8 Lightning Strike

Lightning is a rapid discharge of electrical energy in the atmosphere. When the charge difference between the ground and the cloud becomes too large, a conductive channel of air develops between the cloud and the ground, and a small amount of charge (step leader) starts moving toward the ground. When it nears the ground, an upward leader of opposite charge connects with the step leader. At the instant this connection is made, a powerful discharge occurs between the cloud and the ground. This discharge is seen as a bright flash of lightning. A bolt of lightning can reach temperatures approaching 50,000°F.

4.4.8.1 Location and Extent

Lightning events occur across the entire Commonwealth. Different areas experience varying event frequencies, but in all cases, lightning strikes occur primarily during the summer months. 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.

More than 100,000 thunderstorms occur in the United States each year, with lightning striking more than 25 million points on the ground during that same period. This causes an average of 20 fatalities and hundreds of injuries each year (NOAA NWS, 2021c). Lightning can occur with all thunderstorms, of which the entire county is susceptible. Lightning fatalities are most common during the summer and during the afternoon and evening.

4.4.8.2 Range of Magnitude

Because lightning damage is largely unreported, statistics vary considerably. The insurance industry, however, estimates 6.5 percent of all property/casualty claims are related to lightning strikes (CUNA, 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. In statistics kept from 1959-1994, Pennsylvania was reported to have the largest number of damage reports due to lightning of any state, with 1,441 (Curran, 1999).

Each year, lightning is responsible for the deaths of almost fifty people, injuries to several hundred more, and millions of dollars in property damage in the United States (NOAA NWS, 2021d). In many cases, heart damage, inflated lungs, or brain damage have resulted from lightning strikes, leading to death. Loss of consciousness, amnesia, paralysis, and burns are reported by many who have survived. Deaths and injuries to livestock and other animals, thousands of forest and brush fires, as well as millions of dollars in damage to buildings, communications systems, power lines, and electrical systems are also the result of lightning.

The worst-case scenario for lightning strikes in Bucks County would be an electrical storm that endangered lives while also causing secondary effects such as starting a wildfire or interrupting utility and communication transmissions.

4.4.8.3 Previous Occurrence

Records from the NCEI show that there were 507 lightning events in the 67 counties across Pennsylvania between 1950 and 2020 (NOAA NCEI, 2021). A lightning "event" is defined as a lightning strike that results in fatality, injury, and/or property or crop damage (NOAA NWS, 2016).

Calculated as both deaths and injuries, Pennsylvania ranked third among all states with 644 casualties from 1959 to 1994. This represents approximately 5% of casualties, which occurred throughout the U.S. over that 35-year period. Total deaths caused by lightning from 1959 to 2017 were collected for each state, ranking Pennsylvania ninth (134 deaths) in the country (NOAA NWS, 2018). In 2020 alone, Pennsylvania had 2 deaths from lightning strikes (NOAA NWS, 2021e).

Pennsylvania ranked first among all states in the U.S. with 1,441 damage reports. However, it is unclear what the total dollar value is for these damages, and there is no account of the spatial distribution of damages below the state level (NOAA NWS, 1997). In 2019, Pennsylvania ranked eighth in the nation for number of homeowner's insurance claims for lightning losses, with 2,838 claims. These claims valued approximately $27.3 million, with each claim costing an average of $9,600 (III, 2021).

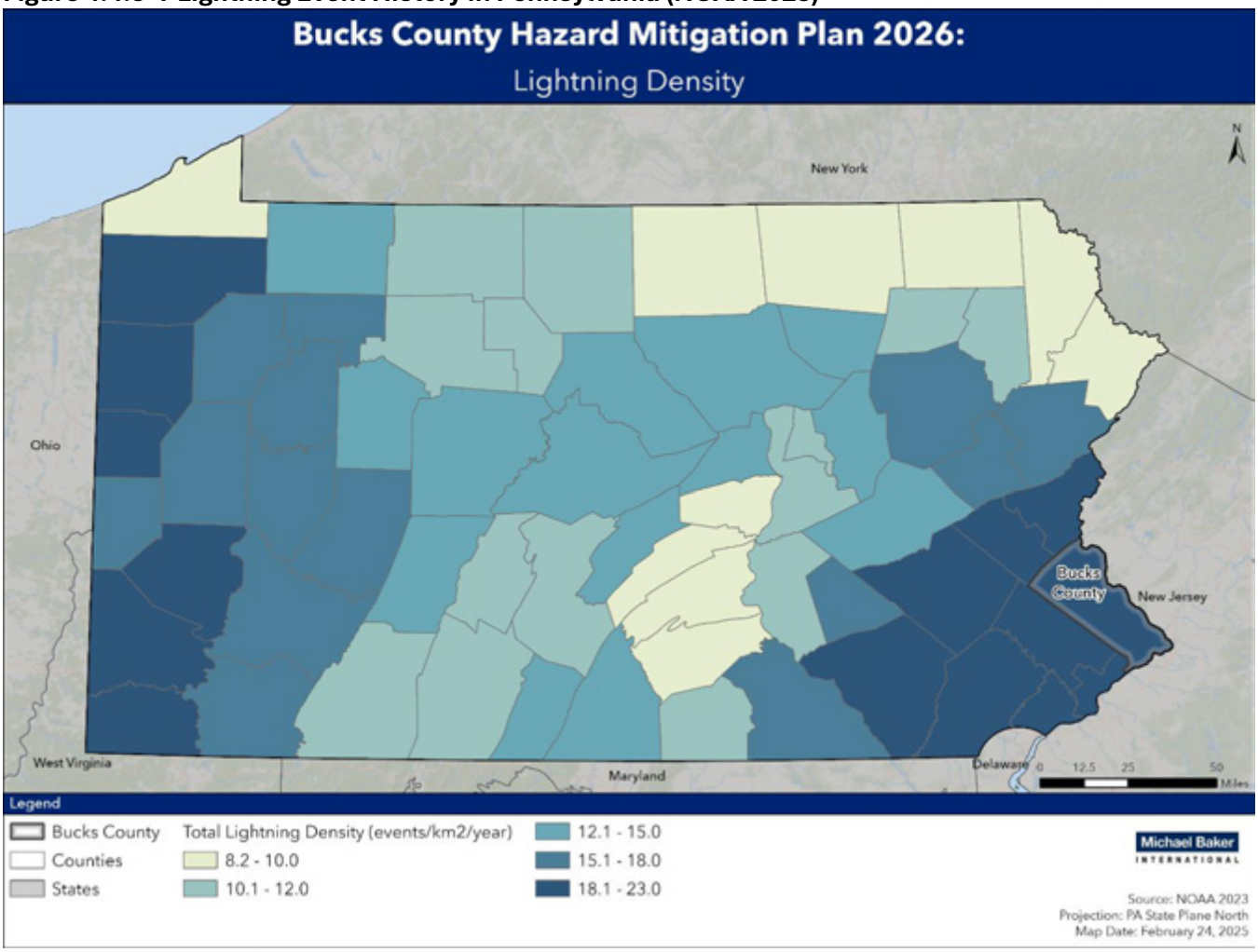
As a result of lightning, 20 people in Bucks County have suffered injuries and property damages totaled over $3.53 million. Figure 4.4.8-1 depicts the historic yearly average of lightning strikes in Bucks County relative to other areas of the Commonwealth. Data on lightning strikes from 2000 through 2025 in Bucks County is presented as Table 4.4.8-1. There have been three lightning strikes recorded since the 2021 HMP update. Two resulted in structural fires, and one caused some bricks to fall off a building. No injuries or fatalities were reported.

Table 4.4.8-1 Past Lightning Strike Events in Bucks County (NOAA NCEI, 2026).

County	Location	Date	Deaths	Injuries	Property Damage ($)	Crop Damage ($)
Bucks County	Doylestown	5/13/2000	0	0	0	0
Bucks County	Milford Square	10/4/2000	0	0	$20,000	0
Bucks County	Quakertown	10/4/2000	0	0	$1,000	0
Bucks County	Perkasie	6/30/2001	0	7	$100,000	0
Bucks County	Perkasie	6/30/2001	0	0	0	0
Bucks County	Plumsteadville	5/2/2002	0	0	0	0
Bucks County	Bristol	6/6/2002	0	1	0	0
Bucks County	Bristol	7/19/2002	0	0	0	0
Bucks County	Woodside	8/2/2002	0	0	0	0
Bucks County	Quakertown	8/13/2003	0	0	0	0
Bucks County	Croydon	8/27/2003	0	0	0	0
Bucks County	Bristol	8/30/2003	0	0	$50,000	0
Bucks County	New Hope	8/21/2004	0	0	0	0
Bucks County	Warrington	6/29/2005	0	0	$250,000	0
Bucks County	Quakertown	7/1/2005	0	0	0	0

County	Location	Date	Deaths	Injuries	Property Damage ($)	Crop Damage ($)
Bucks County	Wrightstown	7/27/2005	0	0	$200,000	0
Bucks County	Hilltown	8/8/2005	0	0	$1,000	0
Bucks County	Langhorne	8/14/2005	0	0	$1,000	0
Bucks County	Buckingham Station	8/14/2005	0	0	$25,000	0
Bucks County	Buckingham Station	8/7/2006	0	0	$100,000	0
Bucks County	Silverdale	5/16/2007	0	0	$1,000	0
Bucks County	Dolington	5/21/2008	0	0	$25,000	0
Bucks County	Doylestown	5/31/2008	0	0	$10,000	0
Bucks County	Yardley Farms	7/23/2008	0	0	$5,000	0
Bucks County	Yardley Farms	7/23/2008	0	2	0	0
Bucks County	Silverdale	7/27/2008	0	0	$100,000	0
Bucks County	Silverdale	8/18/2009	0	0	$10,000	0
Bucks County	Sellersville	3/14/2010	0	0	$10,000	0
Bucks County	Morrisville	5/31/2010	0	0	$10,000	0
Bucks County	Levittown	6/24/2010	0	0	$5,000	0
Bucks County	New Hope	7/12/2010	0	0	$500,000	0
Bucks County	West Bristol	5/16/2012	0	0	$250,000	0
Bucks County	Woodbourne	7/15/2012	0	0	$250,000	0
Bucks County	Wrightstown	7/28/2012	0	0	$5,000	0
Bucks County	Neshaminy	8/9/2012	0	0	$10,000	0
Bucks County	Blooming Glen	7/23/2013	0	0	$10,000	0
Bucks County	Brick Tavern	6/13/2014	0	0	$25,000	0
Bucks County	Trumbauersville	6/19/2014	0	0	$5,000	0
Bucks County	Trumbauersville	6/19/2014	0	0	$1,000	0
Bucks County	Farm School	6/19/2014	0	0	$2,000	0
Bucks County	Chalfont	6/19/2014	0	0	$100,000	0
Bucks County	Stanwood	7/2/2014	0	0	$500,000	0
Bucks County	Bristol Arpt	7/2/2014	0	0	$500,000	0
Bucks County	Doylestown	7/8/2014	0	0	$2,000	0
Bucks County	Newtown	7/23/2014	0	0	$1,000	0
Bucks County	Rockhill	7/25/2016	0	0	$10	0
Bucks County	Perkasie Penridge Ar	7/25/2016	0	0	$10	0
Bucks County	Springtown	7/25/2016	0	0	$10	0
Bucks County	Holland	8/7/2019	0	0	0	0
Bucks County	Trevose	8/18/2019	0	9	0	0
Bucks County	Stanwood Gardens	6/16/2023	0	0	$10,000	0
Bucks County	Blooming Glen	8/12/2023	0	0	$10,000	0
Bucks County	West Bristol	6/30/2025	0	0	$1,000	0

Figure 4.4.8-1 Lightning Event History in Pennsylvania (NOAA 2023)



4.4.8.4 Potential for Future Occurrence

Lightning strikes the earth about 100 times every second. Each year in the United States, approximately 400 people are struck (about one for every 86,000 lightning flashes in the U.S.), and 17,400 fires are caused by lightning. July is the peak month for lightning strikes in the United States. The probability of a lightning strike on a given building is a function of the object's lightning-attractive area (e.g., a tall metal pole is more likely to be struck by lightning than a shorter non-conductive objects).

The future occurrence of lightning and thunderstorm activity in Bucks County is anticipated, and the susceptibility to damage from these severe storms will remain unchanged. However, the probability of lightning strike events resulting in multiple casualties or extensive structural damage is considered highly likely according to the Risk Factor Methodology (see Table 4.6-1).

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. According to the 2021 Pennsylvania Climate Impacts Assessment Update, thunderstorms are projected to increase

in frequency (PADEP, 2021c). 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, 2021b).

4.4.8.5 Vulnerability Assessment

The environmental impacts most often associated with lightning strikes include damage to or death of trees and ignition of wildfires. During the years of 2000 – 2025, the NOAA NCEI Storm Events Database reported 43 lightning events in the county which caused 0 deaths, 22 injuries, property damage of $3,106,000, and $0 in crop damage (NOAA NCEI, 2026).

In general, the area of Bucks County is equally vulnerable to lightning, and the impact of lightning would likely be greatest on structures, although there is also risk of injury and death. The worst-case scenario would be a lightning event causing significant property damage and massive injury or death.

Losses due to lightning can be lessened by installing surge protection on critical electronic, lighting, 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.

4.4.8.6 Equity In Vulnerable Communities

The greatest exposure to lightening occurs when individuals are outside during storm events. The highest population with equity concerns for this hazard are individuals that do not have authority to retreat when a storm is approaching. This includes, but is not limited to, farm and construction workers, youth athletes, and others whose job or organization requires individuals to be outside.

4.4.9 Pandemic and Infectious Disease

Pandemic is defined as a disease outbreak affecting or attacking many people across an extensive region, including several countries, and/or continent(s). It is further described as extensively epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale (US Department of Homeland Security (US DHS), 2022). Infectious diseases are also highly virulent, and can be spread from person-to-person.

4.4.9.1 Location and Extent

Pandemic is defined as a disease affecting or attacking the population of an extensive region, including several countries, and/or continent(s). It is further described as an extensive epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale (USDHS, 2022). Infectious diseases are highly virulent and 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 County. 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 will depend on the mode of transmission of a given illness. Pandemic events can also occur after other natural disasters, particularly floods, when there is the potential for bacteria to grow and contaminate water (Van Seventer & Hochberg, 2017).

Bucks County is primarily concerned with the possibility of 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. Different strands of influenza mutate over time and replace older strands of the virus and thus have drastically different effects.

Different strands of influenza mutate over time and replace older stands of the virus and thus 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, infects birds. A recent strain, H5N1, has caused concern due to its ability to pass from wild birds to poultry then on to people. This virus has killed more than half of the people infected with it, although the avian flu is less like to infect humans.
In late 2019 and early 2020, a novel coronaviarus spread into a worldwide pandemic. Named COVID-19, this type of coronavirus is a new virus that causes respiratory illness, is extremely contagious even prior to exhibiting symptoms or if the infected person is asymptomatic and can be fatal. 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, 2024).

Flu-like in nature, symptoms of the virus include fever, cough, shortness of breath, and diarrhea. This virus became a great concern due to its high rates of transmission, and a high incidence of mortality. In extreme COVID cases that require hospitalization, patients require ventilators to support breathing and may pass away from the virus or related reasons (CDC, 2025).

In extreme COVID-19 cases that require hospitalization, patients require ventilators to support breathing and may pass away from COVID-19 or COVID-19 related reasons. Governor Tom Wolf issued the first stay-at-home order on March 23, 2021 for seven counties, which was then expanded for all 67 counties on April 1st. Schools were moved to virtual settings, non-essential businesses were closed, and all essential state services were continued operation (WGAL News 8, 2020). Bucks County adopted all state-level restrictions and guidelines to slow the spread of the virus. All COVID-19 mitigation orders were removed in May 2021 (Brooks, 2021) with the mask mandate ending in June 2021 (6abc, 2021).

Starting January 2021, vaccines were being distributed in phases based off of vulnerable populations as well as those who are frequently exposed:

- Phase 1A: long-term care facility residents, health care personnel, persons ages 65 and older, persons ages 16-64 with high risk conditions defined by the CDC, and persons potentially exposed to infectious material that can transmit disease to healthcare personnel and patients, teachers, child care workers, and frontline groups.
- Phase 1B: Opened on April 5, 2021 – people in congregate settings that are not specified as long-term care facilities, persons receiving home and community-based services, correctional officers and other workers serving people in congregate care settings not included in Phase 1A, education workers not covered in Phase 1A – including those in higher education, U.S. Postal Service workers, manufacturing workers, clergy and other essential support for houses of worship, and public transit workers
- Phase 1C: Opened on April 12, 2021 – essential workers in transportation and logistics, water and wastewater, food service, housing construction, finance including bank tellers, information technology, communications, energy including nuclear reactors, legal services, federal, state, county, and local government workers including county election workers, elected officials, and members of the judiciary and their staff, media, public safety, and public health workers.
- Phase 2: Opened on April 13, 2021 – all individuals not previously covered who are 12 and older and do not have a contraindication to the vaccine are eligible (PA DOH, 2021a).

The Bucks County's COVID-19 clinics officially closed on September 30, 2022.

4.4.9.2 Range of Magnitude

The magnitude of a pandemic or infectious disease threat in Bucks County 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 (USDHHS, 2017).

In terms of lives lost, the impact various pandemic influenza outbreaks have had globally over the last century has declined (Table 4.4.9-1). The severity of illness from the 2009 H1N1 influenza flu virus varied, with the gravest cases occurring mainly among those considered at high risk. High risk populations considered more vulnerable include children, the elderly, pregnant women, 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 swine flu in 2009 recovered without needing medical treatment (CDC, 2010).

The 1918 Spanish flu pandemic was the worst-case pandemic event in the 20th century for both Pennsylvania and worldwide. County data is unavailable, and mortality figures were probably under-reported, it is recorded that there were over 60,000 deaths in the Commonwealth (Shetty & Ahern, 2018). Infection rates were much worse in denser cities, which should be a high priority for response actions in future flu events.

First reaching the commonwealth in March 2020, COVID-19 became another worst-case pandemic. This virus quickly became a great concern in 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. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness (WHO, n.d.). 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 PCC 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. 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 (s).

Table 4.4.9-1 Potential Impacts of Pandemic and Infectious Diseases on Lifelines

LIFELINES	NOTES
	Anticipate both causal and cascading impacts where community safety is threatened due to disease, with the administration of government services being negatively impacted because of widespread illness. Mitigation for this lifeline should be focused on developing response plans to ensure services are able to be administered even during potential staffing shortages or regulations.
	Anticipate a cascading relationship for the Food, Water, Shelter lifeline in response and recovery. Widespread disease outbreaks and resulting staffing issues will cause issues at different points along the commercial food supply chain. Agricultural production may be impacted as well.
	Anticipate a causal and cascading relationship for the Health and Medical lifeline in response and recovery due to direct impacts from the increase in patients, potential staffing issues, and supply chain disruptions that may also result as disease impacts become more widespread. Mitigation actions for this lifeline should be focused on stockpiling critical resources and developing procedures to respond to emergency staffing issues.

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 summarized in Table 4.4.9-2.

Table 4.4.9-2 List of Previous Significant Outbreaks of Influenza Over the Past Century (Global Security, 2009) (WHO, 2025).

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
2019 - Present	COVID-19	7.1 million

Deaths occurred in the United States as a result of the Spanish Flu, Asian Flu, and Hong Kong Flu outbreaks. The Spanish Flu claimed 500,000 lives in the United States. There were 350,000 cases and 8,000 deaths in Pennsylvania. Most deaths resulting from the Asian flu occurred between September 1957 and March 1958; there were about 70,000 deaths in the United States and approximately 15 percent of the population of Pennsylvania was affected. In Bucks County there have been over 53,000 confirmed cases and 1,330 deaths as of July 19, 2021 (PA DOH, 2021). The first cases of the Hong Kong Flu in the United States were detected in September 1968 with deaths peaking between December 1968 and January 1969 (Global Security, 2009).

Table 4.4.9-3 lists the number of seasonal flu cases in Bucks County from the 2014/2015 flu season. There has been an increase in cases each flu season in recent years. The CDC marked the 2014-2015 flu season as severe, with over 590,000 hospitalizations, and an estimated 51,300 deaths across all ages (CDC, 2015). The 2017-2018 flu season was another severe season. The CDC 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. The CDC also noted that the flu became widespread in all states and jurisdictions at the same time. The CDC estimated that 45 million Americans were affected by the flu, and the country experienced around 61,000 influenza deaths (CDC, 2018). The sharp increase in cases for the 2019/2020 season may be related to COVID-19 (CDC, 2021b). The CDC notes that due to COVID, there was an overall increase in the number of flu tests. This reveals that there may be undetected cases in the county each year, so an increase in total tests very likely leads to an increase in number of flu cases (CDC, 2020). According to the Pennsylvania Department of Health (DOH), there were 1,684 confirmed cases in Bucks County during the most recent influenza season from September 2025 to January 2026 (PA DOH, 2026).

Table 4.4.9-3 Confirmed Flu Cases in Bucks County by Flu Season (PA DOH, 2021b)

Flu Season	Number of Confirmed Cases
2014/15	1,756
2015/16	1,359
2016/17	2,244
2017/18	4,148
2018/19	2,918

Flu Season	Number of Confirmed Cases
2019/20	3,604
2020/21	
2021/22	
2022/23	
2023/24	6,398
2024/25	9,893
2025/26	1,684

The COVID-19 outbreak began in China in November 2019. According to a report published by the CDC on June 5, 2020, the first case of COVID-19 in the United States occurred on January 15, 2020, when a person traveled from Wuhan, China to Seattle and fell ill four days later. Small community spreading of the virus occurred during the second half of January and early February, prior to the more widespread outbreak of the virus in late February of 2020 (Jorden MA, Rudman SL, et al, 2020). The virus became more widespread the US in late February 2020, and most counties in Pennsylvania were affected by March 2020. Table 4.4.9-4 below displays the cumulative case counts for COVID-19 from 2020-2023 for Bucks County.

Table 4.4.9-4 Confirmed Flu Cases in Bucks County by Flu Season (PA DOH, 2025)

Year	Number of Confirmed Cases
2020	30,790
2021	92,919
2022	151,658
2023	157,948

4.4.9.3 Potential for 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 Pennsylvanians do not have natural immunity to. While it is unlikely that pandemics and infectious diseases will affect the county, 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 may be a driving cause in any dramatic changes or shifts in viruses and other diseases by potentially creating favorable conditions for transmission through milder winters, earlier spring seasons, and warmer temperatures. One way this benefits the spread of infectious diseases is through expanding the habitats of mosquitoes and allowing them more time to reproduce. In addition, different fungi are now able to survive in new environments, and the narrowing differences between environmental temperatures and human body temperatures means fungi may become more adapted to survive in humans (CDC, 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 as a result 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. Since 2019, the Asian long horned tick have been discovered in Pennsylvania possibly due to changing environmental conditions that allow them to survive (PennState Extension, 2023). Some health threats that the CDC believes climate change will increase the risk of are:

- Anaplasmosis and 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 Pennsylvania, 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 Pennsylvanians 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 according to the Risk Factor Methodology (see Table 4.6-1).

4.4.9.4 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 five years old, pregnant women, and people of any age with certain chronic medical conditions. Such conditions include but are not limited to diabetes, heart disease, asthma and kidney disease (CDC, 2021c). Schools, colleges, convalescent centers, and other institutions serving those younger than five 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 a large number of people living in close quarters. All communities in Bucks County are considered vulnerable to a pandemic event, with the likely greatest impact at the county level occurring in Doylestown, the county seat. As stated in previous plans, the highest concentration of schools, retirement homes, and senior centers are found in Bristol Township, Bensalem, and Middletown Township. There are some occupation-specific risks that may make some employees more vulnerable. For example, those working in direct patient care situations and front line essential jobs such as retail, are more likely to be exposed to a pandemic disease.

The environmental impacts of pandemics and infectious disease threats are still being determined. Many countries noted environmental benefits to everyone sheltering-in-place due to reduced commuting pollution and overall an increase in air quality. The County has identified “mask trash” from discarded face masks as a new form of litter that may have impacts on storm drains and otherwise still being determined. 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. Research of COVID-19 suggests that public transportation has greatly increased the transmission of this and other past viruses, bringing this vulnerability to light.

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). With Pennsylvania's economy so integral to the national economy, economic losses from a pandemic or infectious disease threat could be significant.

There were immense losses due to the COVID-19 pandemic. Thousands of individuals were laid off across the commonwealth at non-essential businesses were forced to close. In just one week, over three million Americans filed for unemployment; the greatest amount ever. The accommodation and food services industry suffered the highest number of jobs lost. Professional services, construction, and manufacturing have all been subsidized at greater rates, allowing for lower amounts of jobs lost. Tourism and hospitality industries have suffered in high density areas; however, remote destinations in Bucks County are less susceptible to this trend as they are deemed safe to visit. The majority of COVID-19 aid packages have been distributed to allow some industries to continue operations (Klein & Smith, 2021).

4.4.9.5 Equity in Vulnerable Communities

Equity considerations during pandemics and infectious disease outbreaks are crucial as there are a number of populations at an increased risk. Those living with chronic medical conditions, older adults, and young children may be particularly susceptible to the effects of pandemics and infectious disease outbreaks. 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.

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. Households with inadequate broadband connection will have inequitable access to both remote work and remote learning. Having measures and protections in place for these groups is essential to mitigate and reduce the extensivity of this hazard.

4.4.10 Radon Exposure

Radon is a radioactive gas produced by the breakdown of uranium in soil and rock that can lead to lung cancer in people exposed over a long period of time. Approximately 40% of homes in Pennsylvania have radon levels above this guideline level (PA DEP, 2022b). Three sources of radon in houses are now recognized (PA DEP, 2021a): radon in soil air that flows into the house; radon dissolved in water from private wells and exsolved during water usage (This is rarely a problem in Pennsylvania.); and radon emanating from uranium rich building materials (e.g., concrete blocks or gypsum wallboard) (This is not known to be a problem in Pennsylvania.).

4.4.10.1 Location and Extent

Radioactivity caused by airborne radon has been recognized for many years as an important component in the natural background radioactivity exposure of humans, but it was not until the 1980s that the wide geographic distribution of elevated values in houses and the possibility of extremely high radon values in houses were recognized. In 1984, routine monitoring of employees leaving the Limerick nuclear power plant near Reading, PA, showed that the readings on Mr. Stanley Watras frequently exceeded expected radiation levels, yet only natural, non-fission-product radioactivity was detected on him. Radon levels in his home were detected around 2,500 pCi/L (pico Curies per Liter), much higher than the 4 pCi/L guideline of the Environmental Protection Agency or even the 67 pCi/L limit for uranium miners. As a result of this event, the Reading Prong section of Pennsylvania where Watras lived became the focus of the first large-scale radon scare in the world.

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.

The distribution of radon is correlated with the distribution of radium (i.e. 226Ra), its immediate radioactive parent, and with uranium, its original ancestor. Due to the short half-life of radon, the distance that radon atoms can travel form their parent before decay is generally limited to distances of feet or tens of feet.

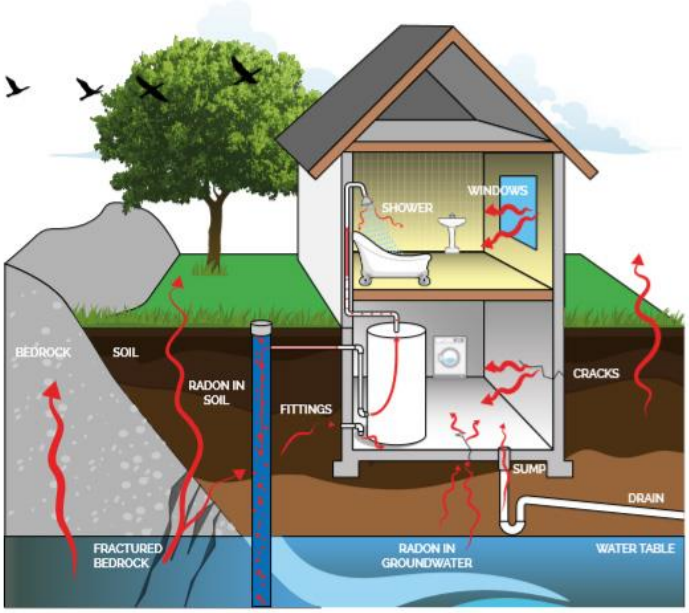
Three sources of radon are now recognized in houses (shown in Figure 4.4.10-1):

- Radon in soil air that flows into the house;
- Radon dissolved in water from private wells and exsolved during water usage; this is rarely a problem in Pennsylvania; and

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

High radon levels were initially thought to be exacerbated in houses that are tightly sealed, but it is now recognized that rates of 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 <0.1pCi/L), then an appreciable fraction of the air may be drawn in from the soil or fractures bedrock through the foundation and slab beneath the house, or through cracks in openings for pipes, sumps, and similar features (see figure 4.3.10-1). Soil gas typically contains from a few hundred to a few thousand pCi/L of radon; therefore, even a small rate of soil gas inflow can lead to elevated radon concentrations in a house.

Figure 4.4.10-1 Sketch of Radon Entry Points into a House (Specification Online, 2019).



The radon concentration of soil gas depends on 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.

Each county in Pennsylvania is classified as having a low, moderate, or high radon hazard potential. Bucks County is classified as having a high hazard, meaning that the predicted indoor radon level is greater than 4 pCi/L (see Figure 4.3.10-2).

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 parts per million (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 Pennsylvania, such localities occupy an insignificant area.
- Areas of common rocks having higher than average uranium content (5 to 50 ppm). In Pennsylvania, 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 Pennsylvania, 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 Bucks County, although high test results may be a result of multiple factors. Figures 4.3.10-3 – 4.3.10-6 show the radon test data available for Bucks County by zip code. Many communities have average basement radon readings of over the threshold of action of 4 pCi/L, but none appear to have readings higher than 11-23 pCi/L.

The highest recorded basement radon readings in Bucks County were 4,022.0 pCi/L Coopersburg, 1,219.3 in East Greenville, 891.6 in Upper Gwynedd, and 803.2 in Richboro. First floor average radon levels were substantially lower than average test results for basements, but a few communities still exceeded the 4 pCi/L threshold, which is shown in Figure 4.3.10-4. Additionally, maximum first floor radon levels were much lower than those for basements, but all exceeded the threshold of action. Communities with no data available did not have a sufficient sample size.

Figure 4.4.10-2 Radon Hazard Zones in Pennsylvania

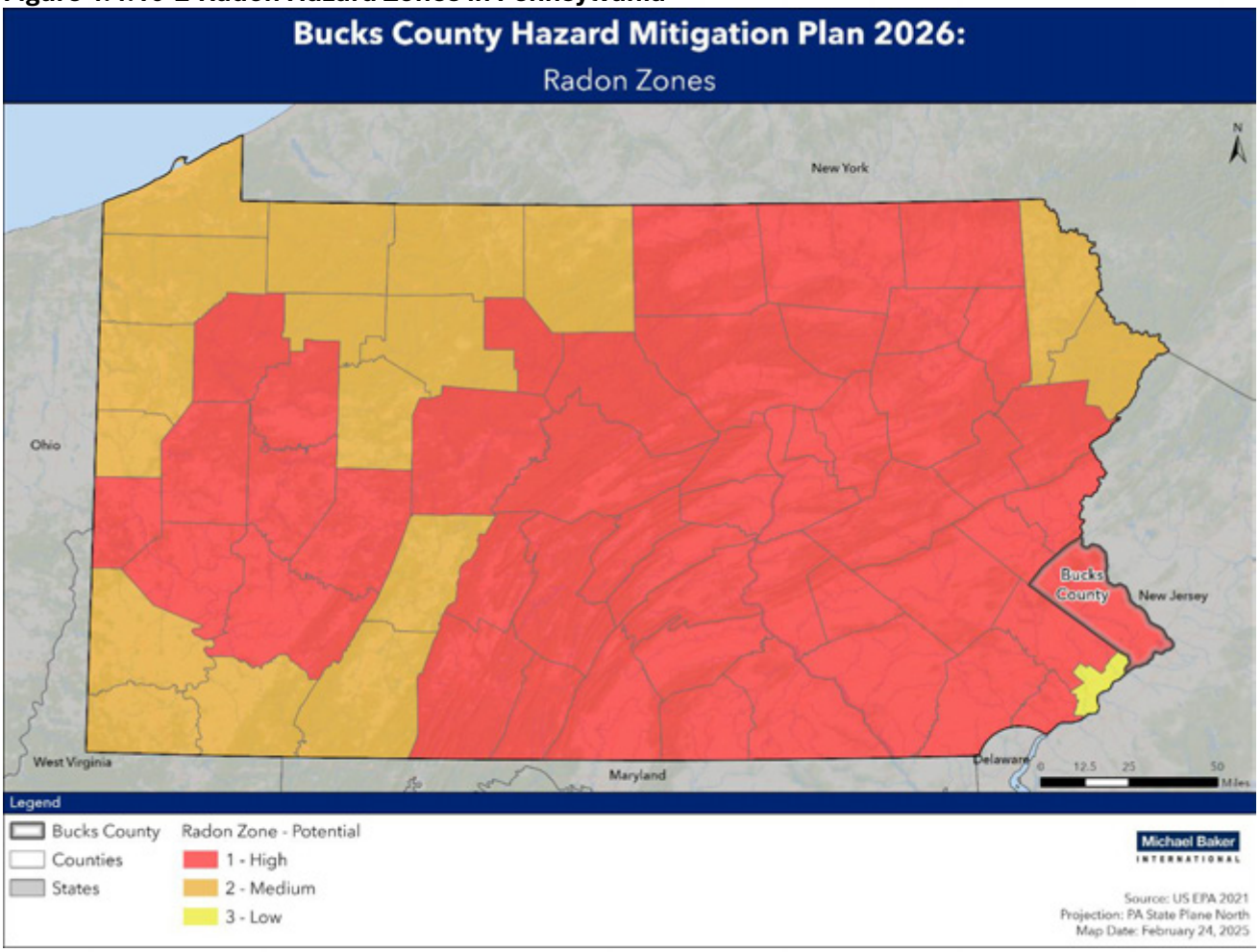


Figure 4.4.10-3 Bucks County Average Basement Radon Test Results

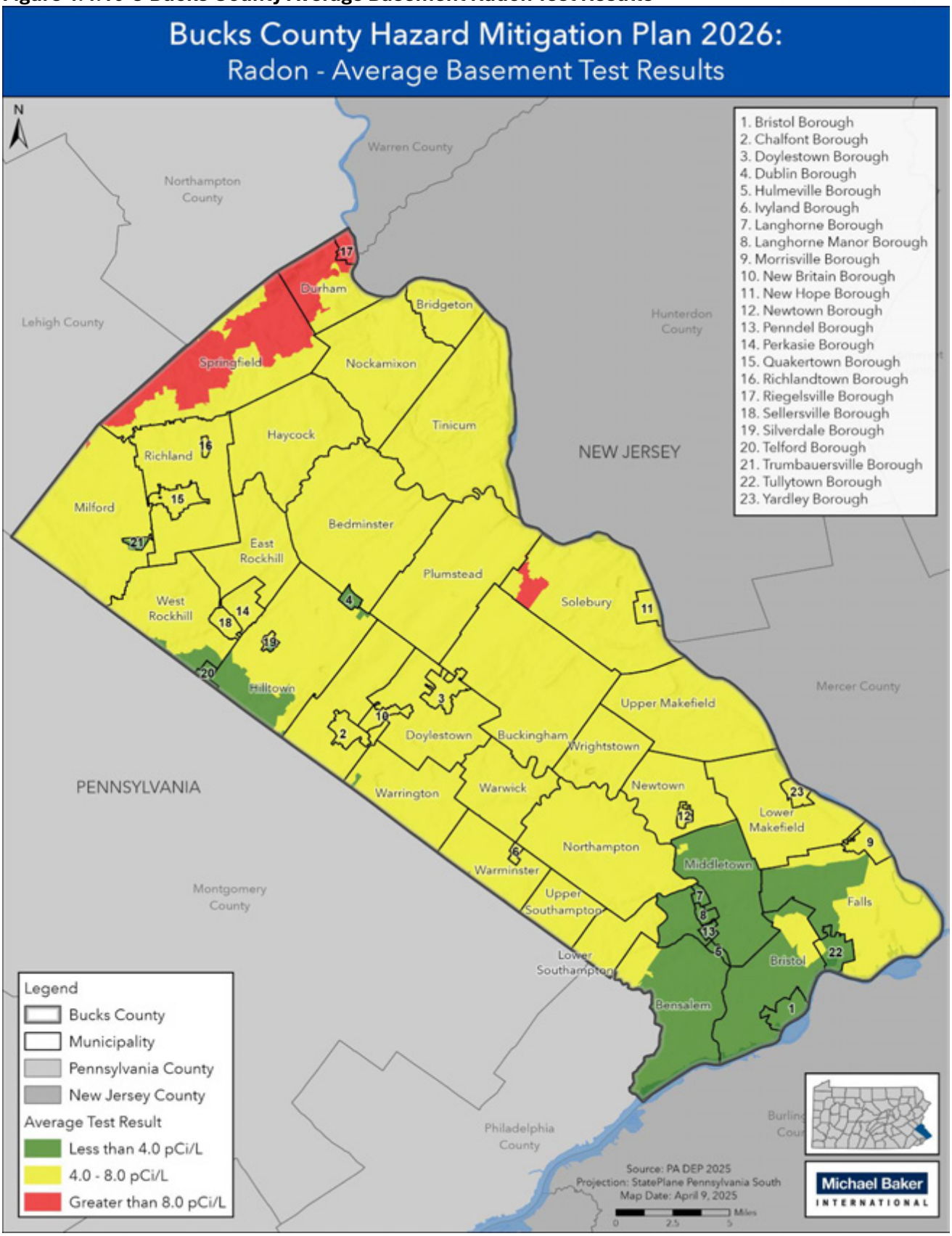


Figure 4.4.10-4 Bucks County Maximum Basement Radon Test Results

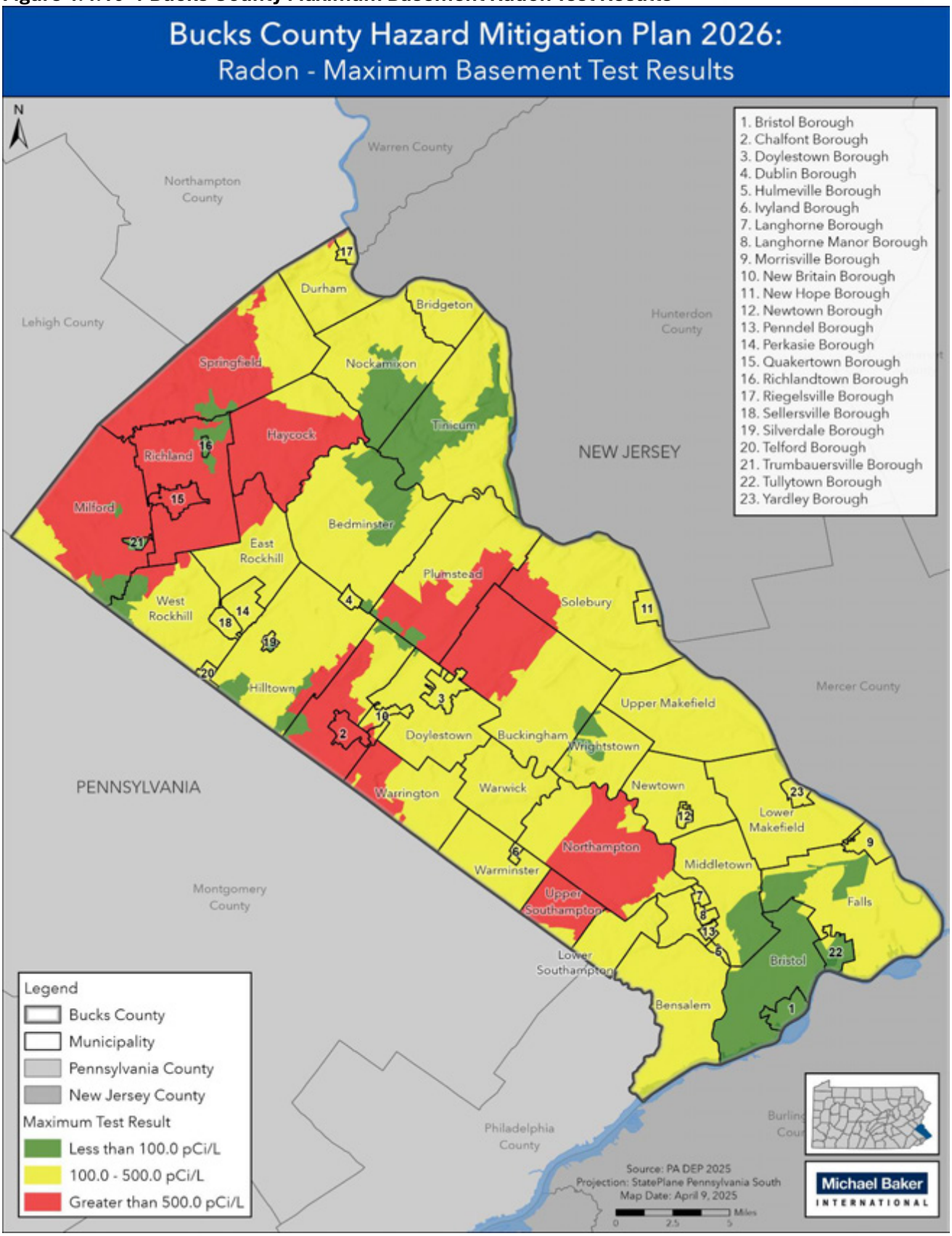


Figure 4.4.10-5 Bucks County Average First Floor Radon Test Results

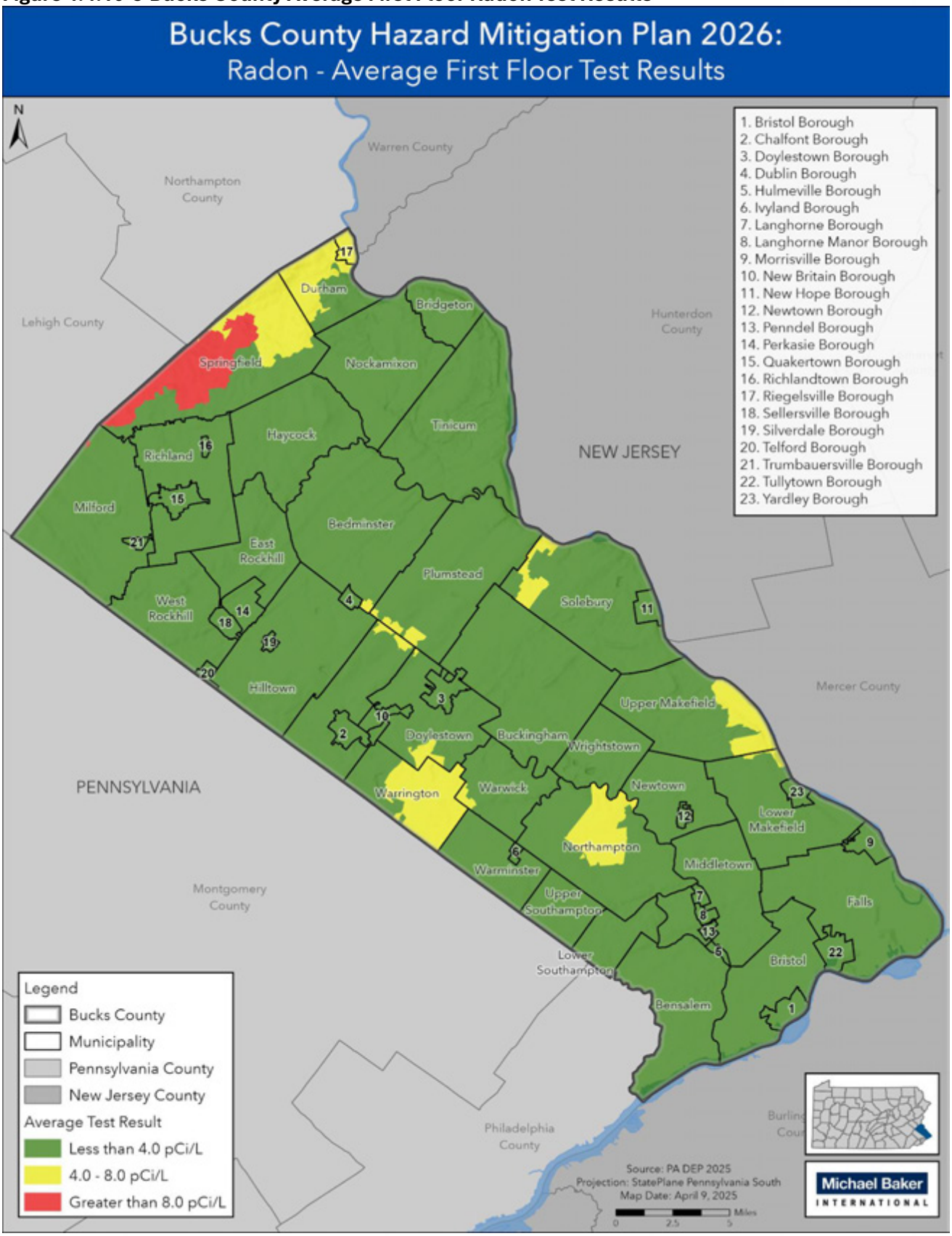
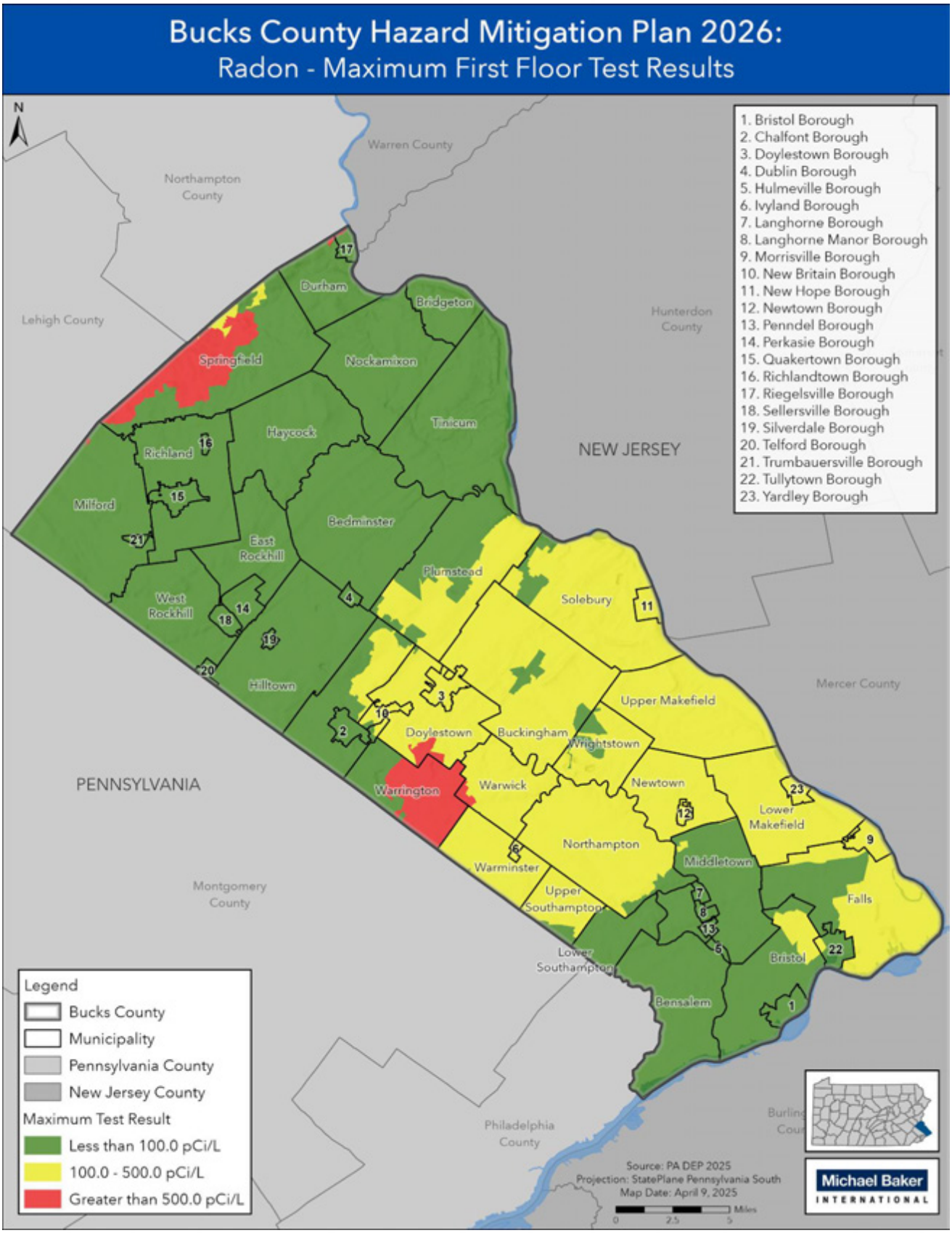


Figure 4.4.10-6 Bucks County Maximum First Floor Radon Test Results



4.4.10.2 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; approximately 2,900 of which occur among people who have never smoked. 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 adults (CDC, 2024). The main hazard is from the radon daughter products (218Po, 214Pb, 214Bi), or the byproduct released as radon decays, which may become attached to lung tissue and induce lung cancer by their radioactive decay (WHO, 2023).

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 (US EPA, 2016). Table 4.3.8-1 shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action thresholds. As is shown in the table, a smoker exposed to radon has a much higher risk of lung cancer.

Table 4.4.10-1 Radon Risk for Smokers and Non-Smokers (US EPA, 2016).

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 of the risk of dying from food poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
NON-SMOKERS			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix Structure
10	About 18 people could get lung cancer	20 times the risk of dying in a home fire	
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

Table 4.4.10-1 Radon Risk for Smokers and Non-Smokers (US EPA, 2016).

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 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 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 without the resident being aware. This worst-case scenario exposure then could lead to large numbers of people with cancer attributed to the radon exposure.

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

Table 4.4.10-2 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 amount of services and resources needed if communities develop more instances of cancer.

4.4.10.3 Previous Occurrence

Current data on abundance and distribution of radon as it affects individual houses in the state of Pennsylvania in general is considered incomplete and potentially biased. Bucks County is not an exception. 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 indoor concentration in Pennsylvania basements is about 7.1 pCi/L and 3.6 pCi/L on the first floor (PADEP, 2019).

The Pennsylvania Department of Environmental Protection Bureau of Radiation Protection provides information for homeowners on how to test for radon in their houses. If a test results in radon

concentrations over 4 pCi/L, then the Bureau works to help the homeowners make repairs to their houses to mitigate against high radon levels. The total number tests reported to the Bureau since 1990 and their results are provided by zip code on the Bureau's website. However, this information is only provided if over 30 tests total were reported in order to best approximate the average for the area. In Bucks County, all 59 ZIP codes have sufficient tests reported to the Bureau to list their findings, which are shown in Table 4.3.10-3. This table includes zip codes that are located partially in Bucks County, such as Telford and Huntingdon Valley.

Table 4.4.10-3 Radon Level Tests and Results in Bucks County Zip Codes (PADEP, 2026)

Zip Code	Basement			First Floor		
	Number Of Tests	Maximum Results (Pci/L)	Average Result (Pci/L)	Number Of Tests	Maximum Results (Pci/L)	Average Result (Pci/L)
18036	4,175	5,336.0	20.1	519	1,916.0	17.6
18041	646	138.1	4.8	126	29.9	2.7
18042	6,428	1,219.3	8.5	932	162.4	4.3
18054	635	53.6	4.7	111	19.8	2.7
18055	2,480	529.2	7.9	323	133.2	4.0
18073	1,575	125.5	4.5	202	34.3	2.2
18077	729	240.6	8.6	135	24.1	4.0
18901	16,297	427.8	5.4	3,947	155.8	3.4
18902	3,674	1,000.0	4.5	119	31.8	3.0
18913	141	502.0	14.4	50	96.0	9.3
18914	6,249	206.2	5.3	1,201	78.1	2.9
18915	251	33.1	3.1	35	6.6	2.1
18917	321	113.4	4.0	85	39.1	2.3
18920	206	42.3	7.0	46	12.8	3.3
18923	307	39.0	4.3	Insufficient Data		
18925	2,280	266.5	5.5	339	62.5	3.4
18927	168	33.5	5.1	43	8.7	2.5
18929	2820	150.0	4.1	793	69.5	2.1
18930	413	110.6	6.5	78	14.6	3.2
18932	85	39.6	5.2	Insufficient Data		
18933	117	358.1	8.5	41	62.3	5.0
18934	82	16.2	4.1	Insufficient Data		
18938	6,294	428.3	6.1	1,446	58.9	3.2
18940	12,306	243.7	4.6	4,326	186.9	2.2
18942	573	51.6	5.5	114	21.3	3.0
18944	5,164	396.6	4.6	994	69.2	2.7
18947	1,776	421.0	5.1	390	54.2	2.5
18951	5,102	549.5	4.6	1,063	22.9	2.1
18954	3,692	803.2	7.7	882	144.3	4.9
18955	202	48.1	4.1	38	12.7	2.9

Table 4.4.10-3 Radon Level Tests and Results in Bucks County Zip Codes (PADEP, 2026)

Zip Code	Basement			First Floor		
	Number Of Tests	Maximum Results (Pci/L)	Average Result (Pci/L)	Number Of Tests	Maximum Results (Pci/L)	Average Result (Pci/L)
18960	2,057	364.1	4.2	400	28.0	2.1
18964	2395	70.2	3.7	453	10.4	1.8
18966	9,414	508.0	5.0	3,023	170.8	2.9
18969	2,572	174.8	3.8	543	60.1	2.1
18972	531	183.0	6.4	147	14.0	2.5
18974	6,101	431.8	5.1	1,770	230.9	2.8
18976	4,488	294.5	4.3	884	102.6	2.6
18977	3,059	220.9	6.5	691	140.1	4.6
19002	9,241	510.2	4.3	1,954	146.1	2.6
19006	5,143	176.0	4.4	1,211	37.5	2.5
19007	1,757	30.8	2.2	428	7.4	1.3
19020	4,576	341.4	3.6	1,732	94.9	2.1
19021	681	31.2	2.9	196	8.0	1.5
19030	836	34.9	3.5	573	42.0	2.5
19040	3,463	76.6	3.4	808	19.6	1.9
19044	3,019	155.0	4.3	1,057	207.8	2.2
19047	7,080	261.6	3.7	2,219	56.2	2.0
19053	3,127	221.9	4.1	718	40.7	2.7
19054	347	305.0	3.4	406	29.5	1.5
19055	102	68.9	4.0	274	16.2	1.2
19056	403	15.0	1.9	435	26.3	1.7
19057	188	16.2	2.1	371	22.9	1.5
19067	18,665	351.5	3.9	4,896	79.3	2.1
19114	1,369	43.4	2.4	406	11.3	1.3
19116	1,816	132.0	3.4	527	29.9	1.9
19154	1,390	39.1	1.5	302	10.7	1.1
19440	3,157	395.1	3.4	802	18.2	1.6
19446	13,137	891.6	4.1	3,243	113.0	2.0
19454	6,635	114.2	3.7	1767	62.4	1.9

4.4.10.4 Potential for Future Occurrence

Radon exposure retains a significant probability given present soil, geologic, and geomorphic factors in Bucks County. Future occurrence of high radon level hazards can be considered possible by the Risk Factor Methodology probability criteria (see Table 4.6-1). 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.

4.4.10.5 Vulnerability Assessment

Structures in Bucks County, particularly in high vulnerability areas as shown in Figures 4.4.10-4 and 4.4.10-6, 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 additional risk, although this type of exposure is low and rare in Pennsylvania. Proper testing for radon levels should be completed across Luzerne County, especially in 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 EPA determines that an average radon mitigation system costs $1,200. The EPA also states that current state surveys show that 1 home in 5 has elevated radon levels. Using this methodology, radon loss estimation is factored by assuming that 20% of the buildings within the ZIP codes with elevated rest results have elevated radon values and each would require a radon mitigation system installed at the EPA estimated average of $1,200. According to the Pennsylvania State Hazard Mitigation Plan, Bucks County has 108,088 buildings in areas with high radon test results, while approximately 20%, or 21,618, of these buildings will be impacted. The estimated costs for radon mitigation total $25,941,120. 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.

4.4.10.6 Equity in Vulnerable Communities

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 may also have less disposable income to afford testing kits, home repairs, and mitigation systems.

4.4.11 Subsidence, Sinkhole

Land subsidence is a gradual settling or sudden sinking of the Earth's surface due to removal or displacement of subsurface earth materials (USGS, 2019). Sinkholes are subsidence features resulting from the downward movement of surficial material into a pre-existing subsurface void. There are two common causes of subsidence in Pennsylvania: 1) dissolution of carbonate rock such as limestone or dolomite and 2) mining activity. Collapse sometimes occurs only after a large amount of activity, or when a heavy burden is placed on the overlying material (DCNR, 2022b).

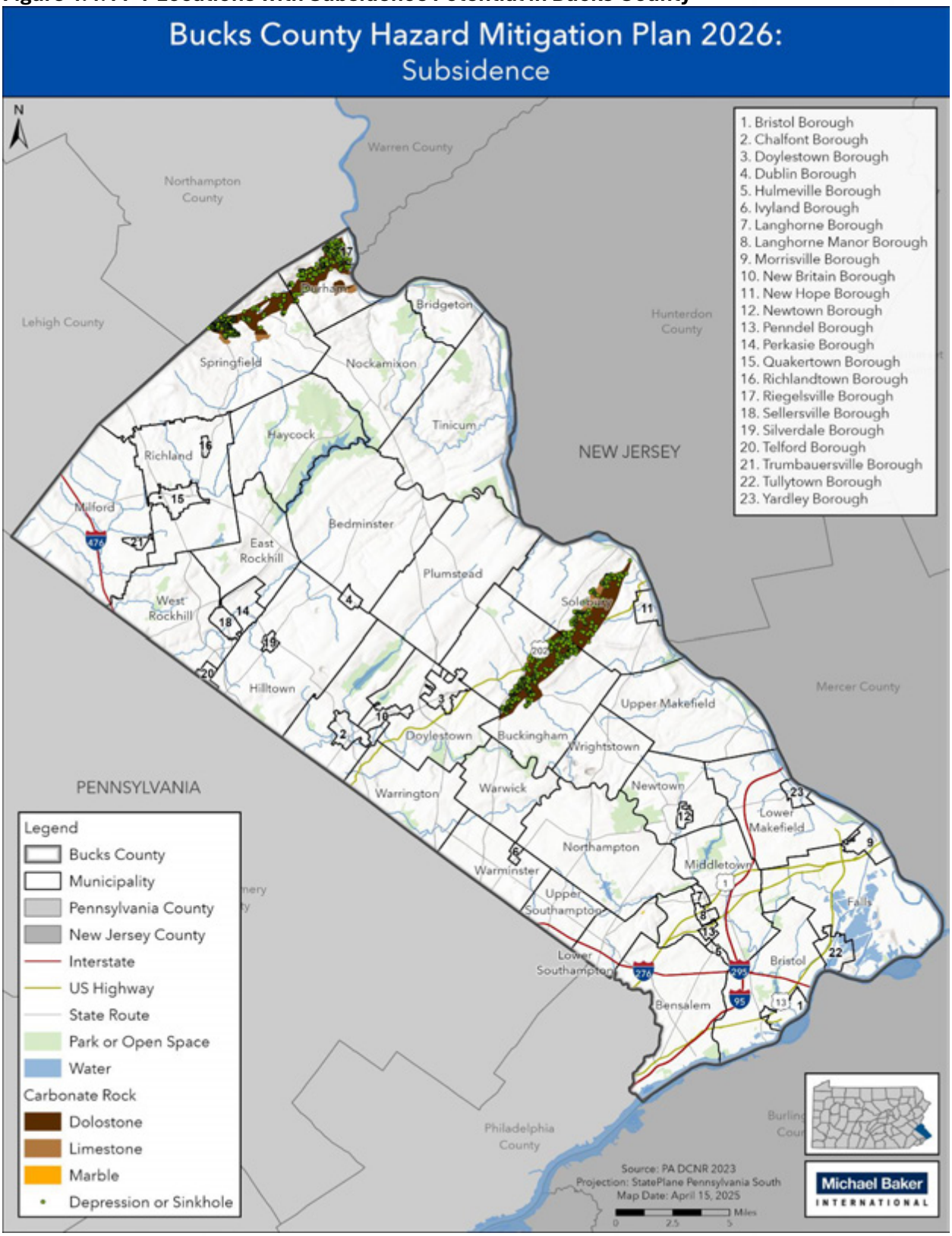
4.4.11.1 Location and Extent

There are two common causes of subsidence in Pennsylvania. Dissolution of carbonate rock such as limestone or dolomite, and mining activity. In the first case, water passing through naturally occurring fractures and bedding planes dissolves bedrock leaving voids below the surface. Eventually, overburden on top of the voids collapses, leaving surface depressions resulting in karst topography. Characteristic structures associated with karst topography include sinkholes, linear depressions, and caves. Collapse sometimes occurs only after a large amount of activity, or when a heavy burden is placed on the overlying material. This type of subsidence is fairly localized in extent.

In Pennsylvania, research has shown that subsidence may occur, but will not necessarily occur, in areas underlain by carbonate bedrock. Figure 4.3.11-1 shows that a small portion of Bucks County is underlain by carbonate bedrock (i.e., limestone). This stretch lies over parts of Buckingham and Solebury Township. Sinkholes in Pennsylvania are also often due to subsurface mining. There are two strips of underground mines: one in the northern area, and one stretching across the central part of the County on the existing carbonate bedrock. The northern area lies over parts of Durham and Springfield Townships and Riegelsville Borough.

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

Figure 4.4.11-1 Locations with Subsidence Potential in Bucks County



4.4.11.2 Range of Magnitude

No two subsidence areas or sinkholes are exactly alike. Variations in size and shape, time period under which they occur (i.e. gradually or abruptly), and their proximity to development ultimately determine the magnitude of damage incurred. Based on the geologic formations underlying parts of Bucks County, subsidence and sinkhole events may occur gradually or abruptly. Events could result in minor elevation changes or deep, gaping holes in the ground surface. Subsidence and sinkhole events can cause severe damage in urban environments, although gradual events can be addressed before significant damage occurs. Primarily, problems related to subsidence include the disruption of utility services and damages to private and public property including buildings, roads, and underground infrastructure. 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.

General recommendations have been published for site investigations prior to construction of buildings due to the potential for karst subsidence. These recommendations include thorough geotechnical investigations to identify un-collapsed karst features and potential excavation to solid rock prior to construction.

Groundwater in limestone and other similar carbonate rock formations can be easily polluted, because water moves readily from the Earth's surface down through solution cavities and fractures, thus undergoing very little filtration. Contaminants such as sewage, fertilizers, herbicides, pesticides, or industrial products are of concern.

Bucks County is located in three physiographic regions: the Gettysburg-Newark Lowland Section, the Piedmont Upland Section, and the Lowland and Intermediate Upland Section. The Gettysburg-Newark Lowland Section is characterized by rolling lowlands, shallow valleys, and isolated hills with mainly red shale, siltstone, and sandstone underlying rock types. The Piedmont Upland Section is characterized by broad, rounded to flat-topped hills and shallow valleys with mainly schist, gneiss, and quartzite underlying rock types with some saprolite rock as well. The Lowland and Intermediate Upland Section is characterized by flat upper terrace surface cut by shallow valleys located in the Delaware River floodplain with poorly consolidated sand and gravel underlain by schist, gneiss, and other metamorphic rocks as the underlying rock types. Many of these underlying rock types can contribute to karst topography.

The magnitude of land subsidence and sinkholes in Bucks County can be moderate as there have been past occurrences of land subsidence. Experience in Pennsylvania shows that subsidence may cause from a fraction of an inch to several feet of sagging of the surface of the earth and may occur within minutes or over several years. According to the PADEP, structural damages due to subsidence range from slight damage requiring cosmetic repairs to severe damage requiring foundation replacement or other high cost repairs.

A worst-case scenario for subsidence and sinkholes would be if a sinkhole occurred under a densely populated part of the County or a critical facility such as a hospital. Not only could structural damage occur to the building(s), but there could also be injuries to people as well. In addition, any damage buildings or infrastructure would have to be closed in order to repair the structural damage, and this would reduce the community's capacity to complete day to day functions.

The following impacts of subsidence and sinkholes on community lifelines are as follows:

Table 4.4.11-1 Most Likely Lifelines Impacted by Subsidence and Sinkholes

Lifelines	Notes
	Safety concerns related to sinkholes and subsidence as they have the potential to cause significant harm. Mitigation should be focused on increasing residents' knowledge of risks in their area.
	Disruption of water utility services, and potential groundwater contamination may occur.
	Direct damage to transportation infrastructure may occur depending on the location of the hazard.

4.4.11.3 Previous Occurrence

The Pennsylvania Department of Conservation and Natural Resources (DCNR) maintains an online Sinkhole Inventory Database of sinkholes throughout the Commonwealth. The database was last updated in January 2026 and includes the most recent data available at the time of drafting this plan. This inventory lists nine sinkholes due to karst geology in Bucks County – one each are listed in Solebury and Springfield Townships, and the remainder are in Buckingham Township. This has not changed from the number noted in the 2016 HMP. Additionally, the DCNR database indicates that there are 1166 surface depressions due to karst in Bucks County, which is an increase from the 2021 HMP. Figure 4.4.11-1 shows the concentration of identified surface depressions.

4.4.11.4 Potential for Future Occurrence

Based on geological conditions, subsidence events may possibly occur in the future for the areas in Bucks County underlain by carbonate rock, or by mines. Sinkholes and surface depressions are dependent on several variables, including land use and water management. Changes in these variables can affect the likelihood and frequency of future subsidence events. Overall, though, the probability of future subsidence and sinkhole events can be considered possible according to the Risk Factor Methodology (see Table 4.6-1).

4.4.11.5 Vulnerability Assessment

The secondary effects of sinkhole formation have the potential to cause significant impacts in communities underlain by surface-level limestone, including structural damage, damage to transportation systems, and damage to subsurface utility systems. Structures and critical facilities located over limestone and dolomite bedrock are considered vulnerable to sinkholes and are inventoried in Table 4.4.11-1. Solebury Township has the greatest number of structures on limestone (38), and the greatest percentage (1%). There is only one critical facility located on limestone, located in Solebury Township. Solebury Township and Buckingham Township are the only two communities within Bucks County vulnerable to limestone-related sinkholes. Springfield Township has also noted an additional vulnerability to subsidence. Currently, the Adelphia pipeline is being constructed and installed throughout the County, and will run through Springfield Township, which is a jurisdiction in Bucks County that has

karst topography. The disruption the construction of this pipeline may cause to the already karst area makes Springfield Township potentially even more vulnerable to subsidence as well as the potential impacts of liquid and gas pipelines. Table 4.4.11-2 identifies the number of structures in each municipality located in subsidence areas susceptible to subsidence by land use type. The land use type displaying the greatest vulnerability to subsidence is residential.

Table 4.4.11-2 Structures and critical facilities vulnerable to subsidence in Bucks County (Bucks County GIS, 2024) (DHS, 2025)

Municipality	Total Structures	Structures on Karst Topography	PCT Structures on Karst Topography	Total Population	Population on Karst Topography	PCT Population on Karst Topography	Total Critical Facilities	CFs on Karst Topography	PCT CFs on Karst Topography
Bedminster Township	3,278	0	0%	7,518	0	0%	13	0	0%
Bensalem Township	22,234	0	0%	62,819	0	0%	66	0	0%
Bridgeton Township	790	0	0%	1,234	0	0%	3	0	0%
Bristol Borough	4,024	0	0%	9,861	0	0%	19	0	0%
Bristol Township	20,102	0	0%	54,369	0	0%	62	0	0%
Buckingham Township	8,367	594	7%	20,847	1,710	8%	22	5	23%
Chalfont Borough	1,788	0	0%	4,253	0	0%	8	0	0%
Doylestown Borough	3,486	0	0%	8,300	0	0%	23	0	0%
Doylestown Township	6,807	0	0%	17,971	0	0%	30	0	0%
Dublin Borough	741	0	0%	2,177	0	0%	4	0	0%
Durham Township	656	218	33%	1,094	389	36%	1	1	100%
East Rockhill Township	2,652	0	0%	5,819	0	0%	9	0	0%
Falls Township	11,954	0	0%	34,672	0	0%	62	0	0%
Haycock Township	1,232	0	0%	2,201	0	0%	2	0	0%
Hilltown Township	6,428	0	0%	16,395	0	0%	13	0	0%
Hulmeville Borough	410	0	0%	982	0	0%	3	0	0%
Ivyland Borough	359	0	0%	955	0	0%	5	0	0%
Langhorne Borough	568	0	0%	1,643	0	0%	4	0	0%
Langhorne Manor Borough	349	0	0%	1,496	0	0%	4	0	0%
Lower Makefield Township	13,771	0	0%	33,224	0	0%	29	0	0%
Lower Southampton Township	8,340	0	0%	20,487	0	0%	23	0	0%
Middletown Township	17,420	0	0%	45,967	0	0%	52	0	0%
Milford Township	4,430	0	0%	10,238	0	0%	12	0	0%
Morrisville Borough	3,241	0	0%	9,809	0	0%	13	0	0%
New Britain Borough	1,151	0	0%	2,836	0	0%	9	0	0%
New Britain Township	4,937	0	0%	12,223	0	0%	15	0	0%
New Hope Borough	1,446	0	0%	2,612	0	0%	8	0	0%
Newtown Borough	1,054	0	0%	2,268	0	0%	3	0	0%
Newtown Township	8,544	0	0%	19,904	0	0%	31	0	0%
Nockamixon Township	1,827	0	0%	3,379	0	0%	8	0	0%

Municipality	Total Structures	Structures on Karst Topography	PCT Structures on Karst Topography	Total Population	Population on Karst Topography	PCT Population on Karst Topography	Total Critical Facilities	CFs on Karst Topography	PCT CFs on Karst Topography
Northampton Township	15,081	0	0%	39,915	0	0%	37	0	0%
Penndel Borough	743	0	0%	2,515	0	0%	5	0	0%
Perkasie Borough	3,546	0	0%	9,120	0	0%	8	0	0%
Plumstead Township	5,957	0	0%	14,038	0	0%	25	0	0%
Quakertown Borough	3,259	0	0%	9,359	0	0%	22	0	0%
Richland Township	6,621	0	0%	13,858	0	0%	11	0	0%
Richlandtown Borough	447	0	0%	1,353	0	0%	3	0	0%
Riegelsville Borough	465	4	1%	847	0	0%	2	0	0%
Sellersville Borough	1,914	0	0%	4,567	0	0%	6	0	0%
Silverdale Borough	337	0	0%	805	0	0%	3	0	0%
Solebury Township	4,322	447	10%	8,708	1,425	16%	11	4	36%
Springfield Township	2,719	315	12%	5,172	500	10%	8	1	13%
Telford Borough	763	0	0%	2,199	0	0%	1	0	0%
Tinicum Township	2,352	0	0%	3,818	0	0%	10	0	0%
Trumbauersville Borough	386	0	0%	883	0	0%	4	0	0%
Tullytown Borough	900	0	0%	2,268	0	0%	8	0	0%
Upper Makefield Township	3,775	0	0%	8,861	0	0%	9	0	0%
Upper Southampton Township	6,233	0	0%	15,269	0	0%	24	0	0%
Warminster Township	13,677	0	0%	33,603	0	0%	40	0	0%
Warrington Township	9,377	0	0%	25,639	0	0%	26	0	0%
Warwick Township	6,284	0	0%	14,851	0	0%	16	0	0%
West Rockhill Township	2,502	0	0%	5,446	0	0%	14	0	0%
Wrightstown Township	1,497	0	0%	3,286	0	0%	5	0	0%
Yardley Borough	1,350	0	0%	2,605	0	0%	6	0	0%
Total	**256,893**	**1,578**	**1%**	**646,538**	**4,024**	**1%**	**860**	**11**	**1%**

Table 4.4.11-3 Structures by Land Use Subsidence Vulnerability in Bucks County (Bucks County GIS, 2024)

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Bedminster Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bensalem Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bridgeton Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buckingham Township	50	109	0	5	0	0	6	377	4	4	5	0	34	594

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Chalfont Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doylestown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doylestown Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dublin Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	26	8	1	2	0	0	1	151	1	5	0	1	22	218
East Rockhill Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Falls Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haycock Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hilltown Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hulmeville Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ivyland Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Manor Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Makefield Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Southampton Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middletown Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Milford Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morrisville Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Britain Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Britain Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Hope Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newtown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newtown Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nockamixon Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northampton Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penndel Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perkasie Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plumstead Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quakertown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Richland Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Richlandtown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	4	0	0	0	0	0	0	0	0	0	0	0	0	4
Sellersville Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silverdale Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	20	26	1	4	0	0	0	380	0	6	2	1	7	447
Springfield Township	24	9	0	6	0	0	1	249	0	5	2	0	14	315
Telford Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tinicum Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trumbauersville Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Tullytown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upper Makefield Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upper Southampton Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warminster Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warrington Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warwick Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Rockhill Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wrightstown Township	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yardley Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**124**	**152**	**2**	**17**	**0**	**0**	**8**	**1,157**	**5**	**20**	**9**	**2**	**77**	**1,578**

4.4.12 Tornado, Windstorm

A tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground (NOAA NSSL, 2022b). The impact of tornadoes or windstorms is ultimately dependent on the population or amount of property (i.e., buildings, infrastructure, agricultural land, etc.) present in the area where 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.

4.4.12.1 Location and Extent

Tornadoes and potentially damaging high winds occur throughout Pennsylvania. Tornados and high winds may be experienced at any location in Bucks County. A tornado, a violently rotating funnel-like vortex, is an extraordinary feature of severe thunderstorms. A condensation funnel does not need to reach to the ground for a tornado to be present; a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the total absence of a funnel. While the extent of tornado damage is usually localized, the extreme winds of this vortex can be among the most destructive on earth when they move through populated, developed areas.

Tornadoes can occur at any time during the day or night but are most frequent during late afternoon into early evening, the warmest hours of the day. May to August is the most likely time for tornadoes to occur in Pennsylvania. Tornado movement is characterized in two ways: direction and speed of the spinning winds and forward movement of the tornado/storm track. Rotational wind speeds of the vortex can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can be zero to 45 or 50 mph. The forward motion of the tornado path can be a few hundred yards or several hundred miles in length. The width of tornadoes can vary greatly, but generally range in size from less than 100 feet to over a mile in width. Some tornadoes never touch the ground and are short-lived, while others may touch the ground several times. Straight-line winds often accompany tornadoes and are caused by the movement of air from areas of higher pressure to areas of lower pressure – the greater the difference in pressure, the stronger the winds. Windstorms are generally defined as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

4.4.12.2 Range of Magnitude

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 manufactured homes. The impact of tornado hazards is ultimately dependent on the population or amount of property present in the area in which the tornado occurs. Tornado events are often so severe that property loss or human fatality is typically inevitable if evacuation or proper construction standards are not implemented. The enhanced Fujita Tornado Scale (or the —EF-Scale) classifies U.S. tornadoes into six intensity categories, named EF0 to EF5, based upon the estimated maximum winds occurring within the funnel. The EF-Scale has subsequently become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures.

Since 2007 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. This scale is based on new information about

the relationship between wind speed given miles per hour (mph) and corresponding damages. The EF Scale categorized tornadoes from EF0 to EF5 with EF0 being the most commonly occurring type of tornado. The switch from the F-Scale to the EF Scale was made because the EF scale allows the ranges of windspeed in each category to be more accurate, and it considers more variables than the F-Scale. The strongest tornado recorded in Bucks County has been an EF3 tornado in July 2021. Table 4.4.12-1 lists 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 4.4.12-2.

Table 4.4.12-1 Enhanced Fujita Scale (EF-Scale) categories with associated wind speeds

Fujita Scale		Enhanced 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 4.4.12-2 Expected Tornado Damages

F Or EF Scale	Examples olf Possible Damage
0	Light damage. Some damage to chimneys; broken tree branches; shallow-rooted trees pushed over; damage to sign boards.
1	Moderate damage. Surface peeled off roofs; manufactured homes pushed off foundations or overturned; moving autos pushed off roads.
2	Considerable damage. Roofs torn off frame houses; manufactured 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 blown off some distance; cars thrown, and large missiles generated.
5	Catastrophic damage. Well-built houses swept completely away, leaving only the slab foundations.

Figure 4.4.6-1 in the Hurricane, Tropical Storm, and Nor'easter hazard profile 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. Bucks County falls in Zone II, which is classified as a 160-mph wind zone. This means designing wind speeds for shelters and critical facilities should be able to withstand a three second gust of up to 160 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. In Bucks County, the jurisdictions have all adopted the Pennsylvania Uniform Construction Code, which includes the International Building Code (IBC) that requires all new residential and commercial structures to be designed to a 90-mph wind speed. The potential impacts of a tornado or windstorm on community lifelines are listed in Table 4.4.12-3.

Table 4.4.12-3 Most Likely Lifelines 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.
	Tornadoes and windstorms cause significant damage to agricultural operations and structures. This can cause downstream impacts to food systems.
	Energy supplies may be directly damaged by a tornado or windstorm. This could impact response and recovery.
	Material storage facilities and operations may be damaged due to significant damage from tornadoes and windstorms.

4.4.12.3 Previous Occurrence

The most impactful tornado recorded in Bucks County was an F2 in July 1984 when 12 people were injured, and livestock were killed. Most injuries were a result of flying debris; however, three people were injured due to their automobile being picked up and thrown into a pond. Several houses and farm buildings were demolished. Four vehicles were totaled, with 40 more withstanding varying degrees of damage. Tornado magnitudes in Bucks County have never exceeded F2/EF2. F2/EF2 tornados have touched down in 1962, 1973, 2020, and 2021. The most recent tornado that moved through the County in 2020 reached wind speeds of up to 115 mph and traveled 20 miles through the County. Roofs were blown off buildings, trees were uprooted or snapped, cars were thrown around, siding was torn from homes and Doylestown Hospital and the associated Children's Village were hit (noted previously) (Seymour, 2020). Also, at least one home was moved from its foundation. Table 4.3.12-3 below summarizes previous tornado events in Bucks County. There have been three documented tornadoes since the 2021 HMP, but they caused no damage, no injuries, and no fatalities.

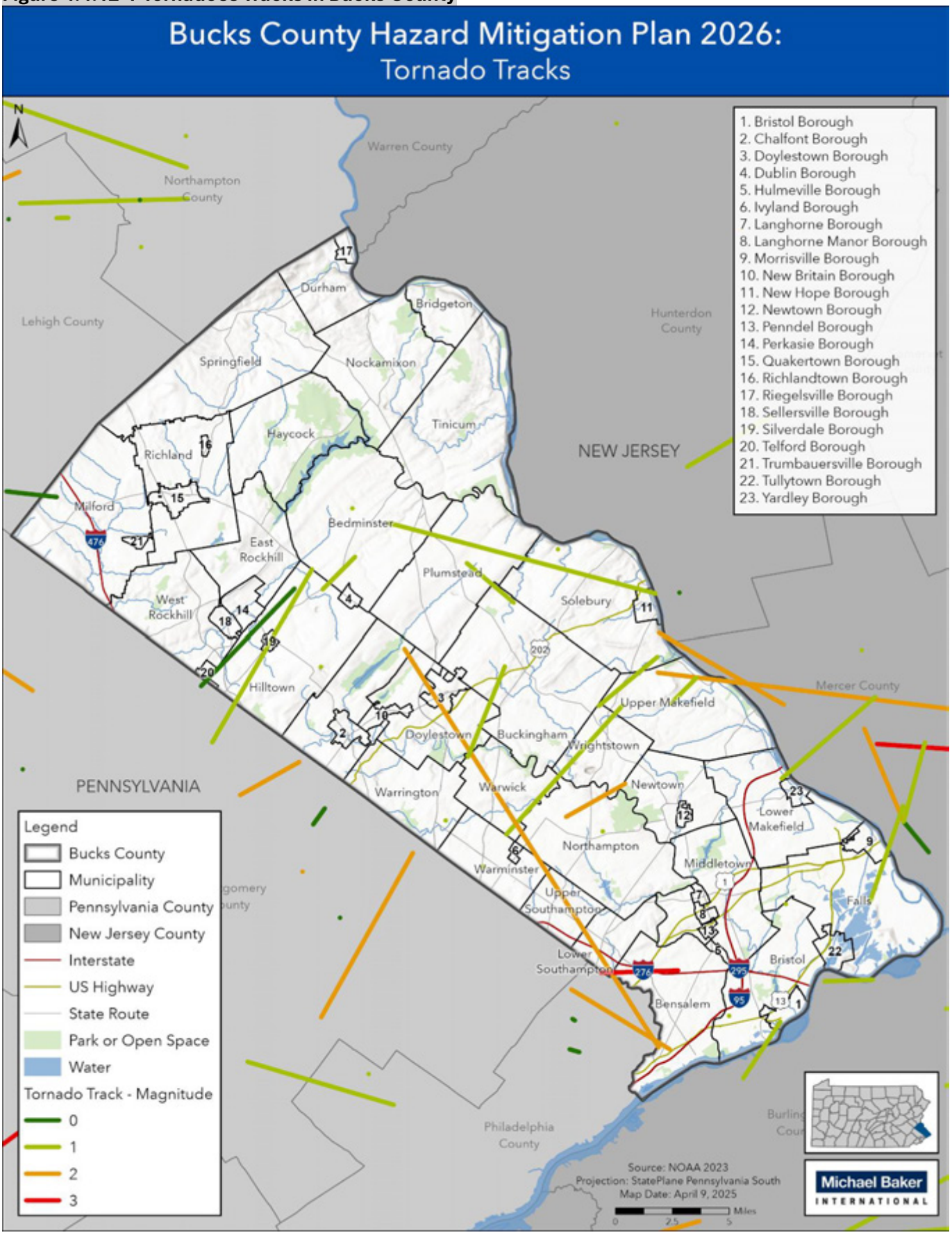
Table 4.4.12-4 Previous Tornado Events Between 1950 and 2025 in Bucks County (NOAA NCEI, 2026).

Location	Date	Magnitude	Death	Injury	Estimated Damage ($)
Countywide	8/29/1950	F1	0	0	$2,500
Countywide	9/3/1961	F1	0	0	$25,000
Countywide	5/24/1962	F2	0	0	$25,000
Countywide	6/29/1973	F2	0	0	$25,000
Countywide	7/13/1975	F1	0	0	$25,000
Countywide	6/29/1982	F1	0	0	$25,000
Countywide	3/21/1983	F1	0	0	$25,000
Countywide	8/29/1983	F1	0	0	$25,000
Countywide	4/5/1984	F1	0	0	$25,000
Countywide	11/16/1989	F0	0	0	$2,500,000
Countywide	11/16/1989	F1	0	1	$2,500,000

Location	Date	Magnitude	Death	Injury	Estimated Damage ($)
Countywide	7/5/1990	F1	0	0	$250,000
Countywide	1/14/1992	F1	0	0	$0
Countywide	7/31/1992	F1	0	0	$2,500
Neshaminy	9/27/1993	F1	0	0	$5,000,000
Hilltown	6/6/1994	F1	0	0	$50,000
Silverdale	9/11/1997	F0	0	0	$5,000
Ottsville	5/19/2019	EF1	0	0	$0
Wismer	7/29/2021	EF2	0	6	$0
New Hope	7/29/2021	EF2	0	6	$0
Belmont Hills	7/29/2021	EF1	0	0	$0
Telford	8/18/2021	EF2	0	0	$0
Edison	9/1/2021	EF3	0	0	$0
Buckmanville	9/1/2021	EF1	0	0	$0
West Bristol	9/1/2021	EF1	0	0	$0
Blooming Glen	3/31/2022	EF1	0	0	$0
Penns Park	4/1/2023	EF1	0	0	$0

In addition to tornados, high winds moving in a straight line are the movement of air from areas of higher pressure to areas of lower pressure. As the difference in pressure increases, the strength and speed of the winds increase. Many of the wind events that have occurred in Bucks County have been part of a thunderstorm event. Since 2000 there have been six days of wind above 50 knots. No damage or injuries were reported on any of these days.

Figure 4.4.12-1 Tornadoes Tracks in Bucks County



4.4.12.4 Potential for Future Occurrence

Twenty-three tornadoes were reported for Bucks County for the entire 1950–2025 period in NCEI. his means that the annual probability of being in the path of a tornado in the county is relatively small. While the chance of being hit by a tornado is small, the damage that results when the tornado arrives can be devastating. Most of Pennsylvania is susceptible to tornadoes of a magnitude of, at most an, EF-3. It can be assumed that future tornadoes will be similar in nature to those that have affected the county in the past.

The county experiences strong winds on frequent basis, and when those winds strike, it can result in significant property damage, trees down, and utility outages. More windstorms have been seen in the central Pennsylvania region, so it is possible that an increasing number of these events will be seen in the county. The probability of tornadoes and windstorms in Bucks County can be considered *likely* as defined by the Risk Methodology probability criteria (see Table 4.4-1).

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 Bucks County can be considered probable as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1).

4.4.12.5 Vulnerability Assessment

For tornadoes or high winds, aged and dilapidated structures or structures not built to applicable building codes are more susceptible to damage. Manufactured 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 manufactured homes. Past experience with tornadoes in Bucks County 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 because as building codes become more stringent, buildings are capable of enduring greater wind forces.

In Bucks County, 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. A worst-case scenario for utility interruption in Bucks County would involve a power outage during winter snow or ice storms, which have the potential to cause power outages for prolonged periods of time.

High winds often occur during hurricanes, tropical storms, and nor'easters. 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. manufactured 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 (US Census, 2019)." 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 4.4.12-6 below lists the number of manufactured housing units per municipality in Bucks County. Richland Township, Falls Township, Bensalem Township, and Buckingham Township have the most manufactured homes.

Table 4.4.12-5 Estimated Manufactured Homes Per Municipality (Bucks County GIS, 2024).

Municipality	Total Structures	Manufactured Homes	Percent of Structures that are Manufactured Homes
Bedminster Township	3,278	7	0%
Bensalem Township	22,234	499	2%
Bridgeton Township	790	23	3%
Bristol Borough	4,024	0	0%
Bristol Township	20,102	11	0%
Buckingham Township	8,367	74	1%
Chalfont Borough	1,788	0	0%
Doylestown Borough	3,486	0	0%
Doylestown Township	6,807	103	2%
Dublin Borough	741	0	0%
Durham Township	656	5	1%
East Rockhill Township	2,652	12	0%
Falls Township	11,954	928	8%
Haycock Township	1,232	12	1%
Hilltown Township	6,428	129	2%
Hulmeville Borough	410	0	0%
Ivyland Borough	359	0	0%
Langhorne Borough	568	0	0%
Langhorne Manor Borough	349	0	0%
Lower Makefield Township	13,771	0	0%
Lower Southampton Township	8,340	238	3%
Middletown Township	17,420	1	0%

Municipality	Total Structures	Manufactured Homes	Percent of Structures that are Manufactured Homes
Milford Township	4,430	70	2%
Morrisville Borough	3,241	0	0%
New Britain Borough	1,151	1	0%
New Britain Township	4,937	1	0%
New Hope Borough	1,446	0	0%
Newtown Borough	1,054	0	0%
Newtown Township	8,544	0	0%
Nockamixon Township	1,827	20	1%
Northampton Township	15,081	2	0%
Penndel Borough	743	0	0%
Perkasie Borough	3,546	0	0%
Plumstead Township	5,957	6	0%
Quakertown Borough	3,259	0	0%
Richland Township	6,621	530	8%
Richlandtown Borough	447	0	0%
Riegelsville Borough	465	0	0%
Sellersville Borough	1,914	0	0%
Silverdale Borough	337	0	0%
Solebury Township	4,322	0	0%
Springfield Township	2,719	25	1%
Telford Borough	763	0	0%
Tinicum Township	2,352	13	1%
Trumbauersville Borough	386	0	0%
Tullytown Borough	900	6	1%
Upper Makefield Township	3,775	0	0%
Upper Southampton Township	6,233	0	0%
Warminster Township	13,677	0	0%
Warrington Township	9,377	0	0%
Warwick Township	6,284	0	0%
West Rockhill Township	2,502	60	2%
Wrightstown Township	1,497	0	0%
Yardley Borough	1,350	0	0%
Total	**256,893**	**2,776**	**1%**

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 identified in Figure 4.3.6-1 in order to prevent release of hazardous materials into the environment.

Table 4.4.12-6 Expected Annual Losses to Windstorm by Census Tract (FEMA NRI, 2026)

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100102	Bensalem Township	$30,490.72	Relatively Moderate
42017100103	Bensalem Township	$24,325.40	Relatively Moderate
42017100104	Bensalem Township	$25,905.75	Relatively Moderate
42017100105	Bensalem Township	$21,395.45	Relatively Moderate
42017100201	Bensalem Township	$23,443.27	Relatively Moderate
42017100206	Bensalem Township	$12,496.12	Relatively Low
42017100207	Bensalem Township	$5,842.56	Relatively Low
42017100208	Bensalem Township	$13,736.37	Relatively Low
42017100209	Bensalem Township		
42017100210	Bensalem Township	$14,775.29	Relatively Low
42017100211	Bensalem Township	$34,857.48	Relatively Moderate
42017100212	Bensalem Township	$17,400.46	Relatively Low
42017100213	Bensalem Township	$10,833.01	Relatively Low
42017100214	Bensalem Township	$20,171.97	Relatively Moderate
42017100302	Bristol Township	$14,870.61	Relatively Low
42017100303	Bristol Township	$21,570.95	Relatively Moderate
42017100304	Bristol Township	$17,829.50	Relatively Low
42017100306	Bristol Township	$15,420.92	Relatively Low
42017100307	Bristol Township	$7,978.92	Relatively Low
42017100401	Bristol Township	$14,414.96	Relatively Low
42017100402	Bristol Township	$30,844.29	Relatively Moderate
42017100403	Bristol Township	$23,603.51	Relatively Moderate
42017100404	Bristol Township	$16,583.13	Relatively Low
42017100406	Bristol Township	$31,954.07	Relatively Moderate
42017100407	Bristol Township	$21,342.27	Relatively Moderate
42017100408	Bristol Township	$17,860.58	Relatively Low
42017100500	Bristol Borough	$25,652.07	Relatively Moderate
42017100600	Bristol Borough	$48,658.00	Relatively Moderate
42017100700	Bristol Borough	$42,226.19	Relatively Moderate
42017100803	Middletown Township	$24,051.83	Relatively Moderate
42017100804	Middletown Township	$15,104.70	Relatively Low
42017100805	Middletown Township	$39,650.21	Relatively Moderate
42017100807	Middletown Township	$47,294.54	Relatively Moderate
42017100808	Middletown Township	$29,639.47	Relatively Moderate
42017100809	Middletown Township	$12,565.33	Relatively Low
42017100811	Middletown Township	$17,653.68	Relatively Low
42017100900	Middletown Township	$22,842.52	Relatively Moderate
42017101100	Penndel Borough	$43,582.64	Relatively Moderate
42017101401	Lower Southampton Township	$10,257.67	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017101403	Lower Southampton Township	$23,737.69	Relatively Moderate
42017101404	Lower Southampton Township	$12,831.25	Relatively Low
42017101405	Lower Southampton Township	$19,896.69	Relatively Moderate
42017101503	Upper Southampton Township	$35,621.79	Relatively Moderate
42017101504	Upper Southampton Township	$15,005.85	Relatively Low
42017101505	Upper Southampton Township	$21,110.13	Relatively Moderate
42017101506	Upper Southampton Township	$8,017.70	Relatively Low
42017101603	Warminster Township	$29,277.45	Relatively Moderate
42017101605	Warminster Township	$21,421.51	Relatively Moderate
42017101607	Warminster Township	$16,164.04	Relatively Low
42017101609	Warminster Township	$4,419.25	Relatively Low
42017101610	Warminster Township	$31,681.04	Relatively Moderate
42017101611	Warminster Township	$24,384.11	Relatively Moderate
42017101802	Warrington Township	$10,146.00	Relatively Low
42017101803	Warrington Township		
42017101805	Warrington Township	$12,248.59	Relatively Low
42017101807	Warrington Township	$15,364.11	Relatively Low
42017101808	Warrington Township	$17,971.99	Relatively Low
42017101809	Warrington Township	$57,095.59	Relatively High
42017101810	Warrington Township	$14,219.02	Relatively Low
42017101900	Chalfont Borough	$30,618.90	Relatively Moderate
42017102002	New Britain Township	$33,733.95	Relatively Moderate
42017102003	New Britain Township	$19,338.14	Relatively Moderate
42017102004	New Britain Township	$16,258.41	Relatively Low
42017102102	Hilltown Township	$19,804.28	Relatively Moderate
42017102104	Hilltown Township	$23,017.01	Relatively Moderate
42017102300	East Rockhill Township	$32,141.94	Relatively Moderate
42017102401	Perkasie Borough	$27,030.20	Relatively Moderate
42017102402	Perkasie Borough	$42,150.93	Relatively Moderate
42017102500	Sellersville Borough, West Rockhill Township	$29,690.55	Relatively Moderate
42017102600	Telford Borough	$29,436.24	Relatively Moderate
42017102700	West Rockhill Township	$37,311.01	Relatively Moderate
42017102801	Milford Township	$16,468.66	Relatively Low
42017103101	Quakertown Borough	$35,193.73	Relatively Moderate
42017103102	Quakertown Borough	$9,918.92	Relatively Low
42017103103	Quakertown Borough	$30,017.88	Relatively Moderate
42017103300	Haycock Township	$28,432.24	Relatively Moderate
42017103400	Springfield Township	$19,082.72	Relatively Moderate
42017103700	Nockamixon Township	$17,629.87	Relatively Low
42017103800	Bridgeton Township	$12,835.17	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017103900	Tinicum Township	$13,659.30	Relatively Low
42017104000	Bedminster Township	$18,310.22	Relatively Low
42017104100	Dublin Borough	$32,051.98	Relatively Moderate
42017104201	Plumstead Township	$44,864.24	Relatively Moderate
42017104203	Plumstead Township	$25,978.94	Relatively Moderate
42017104204	Plumstead Township	$46,210.53	Relatively Moderate
42017104301	Solebury Township	$14,466.59	Relatively Low
42017104303	Solebury Township	$28,465.05	Relatively Moderate
42017104304	Solebury Township	$18,615.83	Relatively Moderate
42017104400	New Hope Borough	$31,055.86	Relatively Moderate
42017104502	Buckingham Township	$32,383.82	Relatively Moderate
42017104503	Buckingham Township	$27,811.77	Relatively Moderate
42017104505	Buckingham Township	$16,852.77	Relatively Low
42017104506	Buckingham Township	$25,178.53	Relatively Moderate
42017104601	Doylestown Township	$16,207.68	Relatively Low
42017104603	Doylestown Township	$21,083.74	Relatively Moderate
42017104604	Doylestown Township	$19,051.03	Relatively Moderate
42017104701	Doylestown Borough, Doylestown Township	$22,469.52	Relatively Moderate
42017104702	Doylestown Borough	$14,307.36	Relatively Low
42017104703	Doylestown Borough	$18,762.95	Relatively Moderate
42017104800	New Britain Borough	$33,705.52	Relatively Moderate
42017104901	Warwick Township	$22,687.83	Relatively Moderate
42017104902	Warwick Township	$32,706.88	Relatively Moderate
42017105003	Northampton Township	$28,030.72	Relatively Moderate
42017105004	Northampton Township	$18,195.23	Relatively Low
42017105006	Northampton Township	$23,530.56	Relatively Moderate
42017105008	Northampton Township	$32,568.92	Relatively Moderate
42017105009	Northampton Township	$28,559.05	Relatively Moderate
42017105010	Northampton Township	$36,897.42	Relatively Moderate
42017105011	Northampton Township	$12,045.57	Relatively Low
42017105012	Northampton Township	$27,760.10	Relatively Moderate
42017105013	Northampton Township	$14,279.01	Relatively Low
42017105100	Wrightstown Township	$14,273.99	Relatively Low
42017105202	Newtown Township	$35,348.09	Relatively Moderate
42017105203	Newtown Township	$29,720.06	Relatively Moderate
42017105206	Newtown Township	$21,180.70	Relatively Moderate
42017105207	Newtown Township	$25,526.73	Relatively Moderate
42017105208	Newtown Township	$21,882.04	Relatively Moderate
42017105300	Newtown Borough	$41,592.76	Relatively Moderate
42017105401	Upper Makefield Township	$14,678.44	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017105402	Upper Makefield Township	$22,763.31	Relatively Moderate
42017105505	Lower Makefield Township	$29,310.18	Relatively Moderate
42017105506	Lower Makefield Township	$19,820.38	Relatively Moderate
42017105507	Lower Makefield Township	$26,605.20	Relatively Moderate
42017105508	Lower Makefield Township	$33,416.30	Relatively Moderate
42017105509	Lower Makefield Township	$20,798.65	Relatively Moderate
42017105510	Lower Makefield Township	$23,436.73	Relatively Moderate
42017105511	Lower Makefield Township	$14,566.94	Relatively Low
42017105600	Yardley Borough	$18,074.62	Relatively Low
42017105702	Morrisville Borough	$16,040.55	Relatively Low
42017105704	Morrisville Borough, Falls Township	$31,909.77	Relatively Moderate
42017105801	Falls Township	$33,753.00	Relatively Moderate
42017105805	Falls Township	$27,103.91	Relatively Moderate
42017105807	Falls Township	$30,626.18	Relatively Moderate
42017105808	Falls Township	$26,946.47	Relatively Moderate
42017105809	Falls Township	$13,063.84	Relatively Low
42017105810	Falls Township	$21,609.95	Relatively Moderate
42017105811	Falls Township	$13,743.74	Relatively Low
42017105812	Falls Township	$39,515.75	Relatively Moderate
42017105900	Tullytown Borough	$17,494.13	Relatively Low
42017106000	Middletown Township, Hulmeville Borough	$34,917.95	Relatively Moderate
42017106100	Langhorne Manor Borough, Langhorne Borough	$8,686.42	Relatively Low
42017106201	Warminster Township	$21,583.97	Relatively Moderate
42017106202	Warminster Township, Ivyland Borough	$24,127.32	Relatively Moderate
42017106300	Hilltown Township, Silverdale Borough	$23,054.37	Relatively Moderate
42017106401	Richland Township	$11,375.41	Relatively Low
42017106402	Milford Township, Trumbauersville Borough	$38,365.55	Relatively Moderate
42017106500	Richland Township, Richlandtown Borough	$20,543.56	Relatively Moderate
42017106600	Durham Township, Riegelsville Borough	$12,844.26	Relatively Low
42017980000	Falls Township	$13,377.59	Relatively Low
TOTAL		$3,462,284.25	

Table 4.4.12-8 below shows the Expected Annual Losses to Tornado for each census tract in the county according to FEMA's National Risk Index (NRI).

Table 4.4.12-7 Expected Annual Losses to Tornado by Census Tract (FEMA NRI, 2026)

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100102	Bensalem Township	$87,645.22	Relatively Moderate
42017100103	Bensalem Township	$69,439.13	Relatively Low
42017100104	Bensalem Township	$73,164.05	Relatively Moderate
42017100105	Bensalem Township	$57,478.66	Relatively Low
42017100201	Bensalem Township	$78,558.16	Relatively Moderate
42017100206	Bensalem Township	$36,454.94	Relatively Low
42017100207	Bensalem Township	$15,602.67	Very Low
42017100208	Bensalem Township	$45,378.87	Relatively Low
42017100209	Bensalem Township		
42017100210	Bensalem Township	$41,240.16	Relatively Low
42017100211	Bensalem Township	$104,423.80	Relatively Moderate
42017100212	Bensalem Township	$48,730.56	Relatively Low
42017100213	Bensalem Township	$32,523.69	Relatively Low
42017100214	Bensalem Township	$55,628.43	Relatively Low
42017100302	Bristol Township	$44,202.17	Relatively Low
42017100303	Bristol Township	$64,520.74	Relatively Low
42017100304	Bristol Township	$50,395.71	Relatively Low
42017100306	Bristol Township	$42,457.41	Relatively Low
42017100307	Bristol Township	$24,393.32	Relatively Low
42017100401	Bristol Township	$42,866.86	Relatively Low
42017100402	Bristol Township	$102,626.60	Relatively Moderate
42017100403	Bristol Township	$70,967.95	Relatively Moderate
42017100404	Bristol Township	$51,375.44	Relatively Low
42017100406	Bristol Township	$102,128.21	Relatively Moderate
42017100407	Bristol Township	$61,483.18	Relatively Low
42017100408	Bristol Township	$58,271.93	Relatively Low
42017100500	Bristol Borough	$78,431.44	Relatively Moderate
42017100600	Bristol Borough	$142,360.41	Relatively Moderate
42017100700	Bristol Borough	$123,716.14	Relatively Moderate
42017100803	Middletown Township	$77,466.44	Relatively Moderate
42017100804	Middletown Township	$47,706.25	Relatively Low
42017100805	Middletown Township	$113,005.42	Relatively Moderate
42017100807	Middletown Township	$140,131.37	Relatively Moderate
42017100808	Middletown Township	$89,846.41	Relatively Moderate
42017100809	Middletown Township	$33,704.46	Relatively Low
42017100811	Middletown Township	$47,673.19	Relatively Low
42017100900	Middletown Township	$62,566.62	Relatively Low
42017101100	Penndel Borough	$128,397.26	Relatively Moderate

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017101401	Lower Southampton Township	$28,483.26	Relatively Low
42017101403	Lower Southampton Township	$65,393.69	Relatively Low
42017101404	Lower Southampton Township	$37,734.53	Relatively Low
42017101405	Lower Southampton Township	$60,640.36	Relatively Low
42017101503	Upper Southampton Township	$107,690.12	Relatively Moderate
42017101504	Upper Southampton Township	$49,325.07	Relatively Low
42017101505	Upper Southampton Township	$56,423.96	Relatively Low
42017101506	Upper Southampton Township	$31,315.22	Relatively Low
42017101603	Warminster Township	$84,152.15	Relatively Moderate
42017101605	Warminster Township	$66,625.09	Relatively Low
42017101607	Warminster Township	$47,523.27	Relatively Low
42017101609	Warminster Township	$12,089.24	Very Low
42017101610	Warminster Township	$98,151.53	Relatively Moderate
42017101611	Warminster Township	$66,152.03	Relatively Low
42017101802	Warrington Township	$32,623.06	Relatively Low
42017101803	Warrington Township		
42017101805	Warrington Township	$36,228.78	Relatively Low
42017101807	Warrington Township	$44,118.04	Relatively Low
42017101808	Warrington Township	$56,077.39	Relatively Low
42017101809	Warrington Township	$175,926.64	Relatively Moderate
42017101810	Warrington Township	$41,018.29	Relatively Low
42017101900	Chalfont Borough	$94,482.28	Relatively Moderate
42017102002	New Britain Township	$101,159.12	Relatively Moderate
42017102003	New Britain Township	$55,198.66	Relatively Low
42017102004	New Britain Township	$46,861.47	Relatively Low
42017102102	Hilltown Township	$63,055.72	Relatively Low
42017102104	Hilltown Township	$63,533.79	Relatively Low
42017102300	East Rockhill Township	$98,786.95	Relatively Moderate
42017102401	Perkasie Borough	$87,026.69	Relatively Moderate
42017102402	Perkasie Borough	$128,544.63	Relatively Moderate
42017102500	Sellersville Borough, West Rockhill Township	$91,158.49	Relatively Moderate
42017102600	Telford Borough	$78,760.50	Relatively Moderate
42017102700	West Rockhill Township	$111,991.69	Relatively Moderate
42017102801	Milford Township	$45,552.85	Relatively Low
42017103101	Quakertown Borough	$107,509.03	Relatively Moderate
42017103102	Quakertown Borough	$28,063.23	Relatively Low
42017103103	Quakertown Borough	$99,280.98	Relatively Moderate
42017103300	Haycock Township	$88,812.06	Relatively Moderate
42017103400	Springfield Township	$55,676.79	Relatively Low
42017103700	Nockamixon Township	$55,009.56	Relatively Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017103800	Bridgeton Township	$38,183.69	Relatively Low
42017103900	Tinicum Township	$44,416.98	Relatively Low
42017104000	Bedminster Township	$56,207.29	Relatively Low
42017104100	Dublin Borough	$98,730.25	Relatively Moderate
42017104201	Plumstead Township	$137,460.79	Relatively Moderate
42017104203	Plumstead Township	$89,173.12	Relatively Moderate
42017104204	Plumstead Township	$146,883.83	Relatively Moderate
42017104301	Solebury Township	$46,399.31	Relatively Low
42017104303	Solebury Township	$89,621.41	Relatively Moderate
42017104304	Solebury Township	$60,937.35	Relatively Low
42017104400	New Hope Borough	$101,491.40	Relatively Moderate
42017104502	Buckingham Township	$105,415.04	Relatively Moderate
42017104503	Buckingham Township	$93,659.73	Relatively Moderate
42017104505	Buckingham Township	$52,743.83	Relatively Low
42017104506	Buckingham Township	$78,638.31	Relatively Moderate
42017104601	Doylestown Township	$51,070.64	Relatively Low
42017104603	Doylestown Township	$66,873.79	Relatively Low
42017104604	Doylestown Township	$62,146.05	Relatively Low
42017104701	Doylestown Borough, Doylestown Township	$71,371.00	Relatively Moderate
42017104702	Doylestown Borough	$46,020.81	Relatively Low
42017104703	Doylestown Borough	$60,008.32	Relatively Low
42017104800	New Britain Borough	$110,551.11	Relatively Moderate
42017104901	Warwick Township	$69,922.00	Relatively Low
42017104902	Warwick Township	$97,227.23	Relatively Moderate
42017105003	Northampton Township	$94,551.70	Relatively Moderate
42017105004	Northampton Township	$59,358.35	Relatively Low
42017105006	Northampton Township	$74,126.41	Relatively Moderate
42017105008	Northampton Township	$99,857.29	Relatively Moderate
42017105009	Northampton Township	$78,994.59	Relatively Moderate
42017105010	Northampton Township	$113,098.62	Relatively Moderate
42017105011	Northampton Township	$35,205.85	Relatively Low
42017105012	Northampton Township	$81,490.43	Relatively Moderate
42017105013	Northampton Township	$42,949.31	Relatively Low
42017105100	Wrightstown Township	$43,527.72	Relatively Low
42017105202	Newtown Township	$105,804.23	Relatively Moderate
42017105203	Newtown Township	$84,771.76	Relatively Moderate
42017105206	Newtown Township	$51,079.71	Relatively Low
42017105207	Newtown Township	$63,838.79	Relatively Low
42017105208	Newtown Township	$67,074.09	Relatively Low
42017105300	Newtown Borough	$101,705.54	Relatively Moderate

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017105401	Upper Makefield Township	$48,058.00	Relatively Low
42017105402	Upper Makefield Township	$57,807.61	Relatively Low
42017105505	Lower Makefield Township	$73,409.74	Relatively Moderate
42017105506	Lower Makefield Township	$61,034.76	Relatively Low
42017105507	Lower Makefield Township	$64,564.07	Relatively Low
42017105508	Lower Makefield Township	$107,290.70	Relatively Moderate
42017105509	Lower Makefield Township	$49,971.19	Relatively Low
42017105510	Lower Makefield Township	$68,765.98	Relatively Low
42017105511	Lower Makefield Township	$35,573.32	Relatively Low
42017105600	Yardley Borough	$54,286.88	Relatively Low
42017105702	Morrisville Borough	$37,396.90	Relatively Low
42017105704	Morrisville Borough, Falls Township	$72,201.15	Relatively Moderate
42017105801	Falls Township	$85,876.24	Relatively Moderate
42017105805	Falls Township	$81,382.67	Relatively Moderate
42017105807	Falls Township	$92,516.87	Relatively Moderate
42017105808	Falls Township	$78,789.13	Relatively Moderate
42017105809	Falls Township	$35,169.01	Relatively Low
42017105810	Falls Township	$63,796.24	Relatively Low
42017105811	Falls Township	$37,922.30	Relatively Low
42017105812	Falls Township	$121,347.87	Relatively Moderate
42017105900	Tullytown Borough	$49,583.19	Relatively Low
42017106000	Middletown Township, Hulmeville Borough	$104,652.90	Relatively Moderate
42017106100	Langhorne Manor Borough, Langhorne Borough	$23,664.97	Relatively Low
42017106201	Warminster Township	$62,602.11	Relatively Low
42017106202	Warminster Township, Ivyland Borough	$67,310.71	Relatively Low
42017106300	Hilltown Township, Silverdale Borough	$64,965.10	Relatively Low
42017106401	Richland Township	$32,687.92	Relatively Low
42017106402	Milford Township, Trumbauersville Borough	$120,831.23	Relatively Moderate
42017106500	Richland Township, Richlandtown Borough	$64,345.34	Relatively Low
42017106600	Durham Township, Riegelsville Borough	$37,547.91	Relatively Low
42017980000	Falls Township	$40,394.45	Relatively Low
Total		$10,313,453.53	

4.4.12.6 Equity in Vulnerable Communities

Manufactured home communities, primarily mobile homes, are extremely at risk in the face of tornadoes and high-speed winds. Additionally, households without vehicles, smartphones, or people with disabilities are also at higher risk if evacuation becomes necessary as all these factors present significant barriers to active response times.

4.4.13 Wildfire

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.

4.4.13.1 Location and Extent

Wildfires can occur at any time of the year but are most likely to occur in the County during a drought. Wildland fires in Pennsylvania 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. The greatest potential for wildfires is in the spring months of March, April, and May, and, to a lesser extent, the autumn months of October and November. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. In the fall, dried leaves are also fuel for fires.

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. In 2017, debris burning accounted for the largest number of wildfires, while incendiary causes accounted for the largest number of acres burned in Pennsylvania (DCNR, 2017). However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion.

Bucks County is generally urban in nature, consisting of large tracts of residential areas with commercial and industrial sprinkled throughout the County. However, a wildfire could develop in any portion of the County. The most high-risk areas of the County are at the forest-urban interface, where the potential for wildfire to spread to structures is greatest.

4.4.13.2 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. A wildfire has the potential to kill people, livestock, fish, and wildlife. They often destroy property, valuable timber, and forage, recreational, and scenic values.

Vegetation loss is often an environmental concern with wildfires, but it typically is not a serious impact in that they burn dead trees, leaves, and grasses to allow more open space 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 its heat can open pinecones and other seed pods. The most significant negative impact the potential for severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event.

In addition to the risk wildfires pose to the general public and property owners, the safety of firefighters is also a concern. Although loss of life among firefighters does not occur often in Pennsylvania, 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 accidents and can place them in remote acres away from the communities that they are chartered to protect.
The potential impacts of wildfire on community lifelines are as follows:

Table 4.4.13-1 Most Likely Lifelines Impacted by Wildfire

Lifelines	Notes
	Fire departments will need to respond and possibly recover where community safety is threatened.
	Wildlife directly threatens homes and potentially agricultural operations.
	Potential serious injuries and fatalities may occur, which can stress health and medical systems in large numbers.

4.4.13.3 Previous Occurrence

Sixty-one wildfire events were reported to the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry between 2002 and 2013 in Bucks County. This number does not include wildfires that were not reported to DCNR, that had no known location, or that were controlled solely by the volunteer fire departments in the County. However, it is the most comprehensive list of wildfire occurrences available for this time period in Bucks County. Table 4.3.13-2 lists the number of wildfire events and acres burned by municipality from 2002-2013.

Table 4.4.13-2 Number of wildfire events and acres burned in Bucks County from 2002-2013 (DCNR, 2014).

Municipality	Number of Fires	Acres Burned
Bedminster Township	1	1.2
Bridgeton Township	1	1.2
Bristol Township	2	16.1
Buckingham Township	1	1
Durham Township	1	0.3
East Rockhill Township	5	0.81
Haycock Township	6	6.1
Hilltown Township	1	0.75
Milford Township	4	10.66
Nockamixon Township	4	11.75
Plumstead Township	3	40
Quakertown Borough	1	0.01
Richland Township	8	5.8
Solebury Township	1	1.3
Springfield Township	21	20.86
West Rockhill Township	1	0.35
Total	**61**	**118.19**

Of all of Bucks County's jurisdictions, wildfires have been concentrated in fifteen of the jurisdictions: Bedminster Township, Bridgeton Township, Bristol Township, Buckingham Township, Durham Township, East Rockhill Township, Haycock Township, Hilltown Township, Milford Township, Nockamixon Township, Plumstead Township, Quakertown Borough, Richland Township, Solebury Township, Springfield Township, and West Rockhill Township. Note the clustering of wildfire events in the far northern portions of the County where brush, grassland, forested land, and park land abound. The wildfires have ranged significantly in size; the largest fires burned more than 20 acres while the smallest only consumed 0.01 acres.

Major parks and state gamelands within Bucks County could be a significant factor for wildfires. Notable among these is Nockamixon State Park, which is over 5,000 acres in area. In addition, several of these parks include large bodies of water which have multiple uses within the community. Therefore, fires within the forest can have severe impacts on the well-being of residents and the local economy.

The DCNR Bureau of Forestry (BOF) no longer publicly reports wildfire incidents at the county or municipal level. Open data is available for State Forest Districts; Bucks County lies in State Forest District 17 (William Penn). District 17 consists of nine counties: Berks, Bucks, Chester, Delaware, Lancaster, Lehigh, Montgomery, Northampton, and Philadelphia. From 2014-2020, there were 526 wildfire events in District 17. This number does not include wildfires that were not reported to DCNR or that were controlled solely by the volunteer fire departments in the County, but it is the most current and comprehensive list of wildfire occurrences available for the region surrounding Bucks County. Table 4.4.13-3 lists number of wildfire events and total area burned as reported to DCNR.

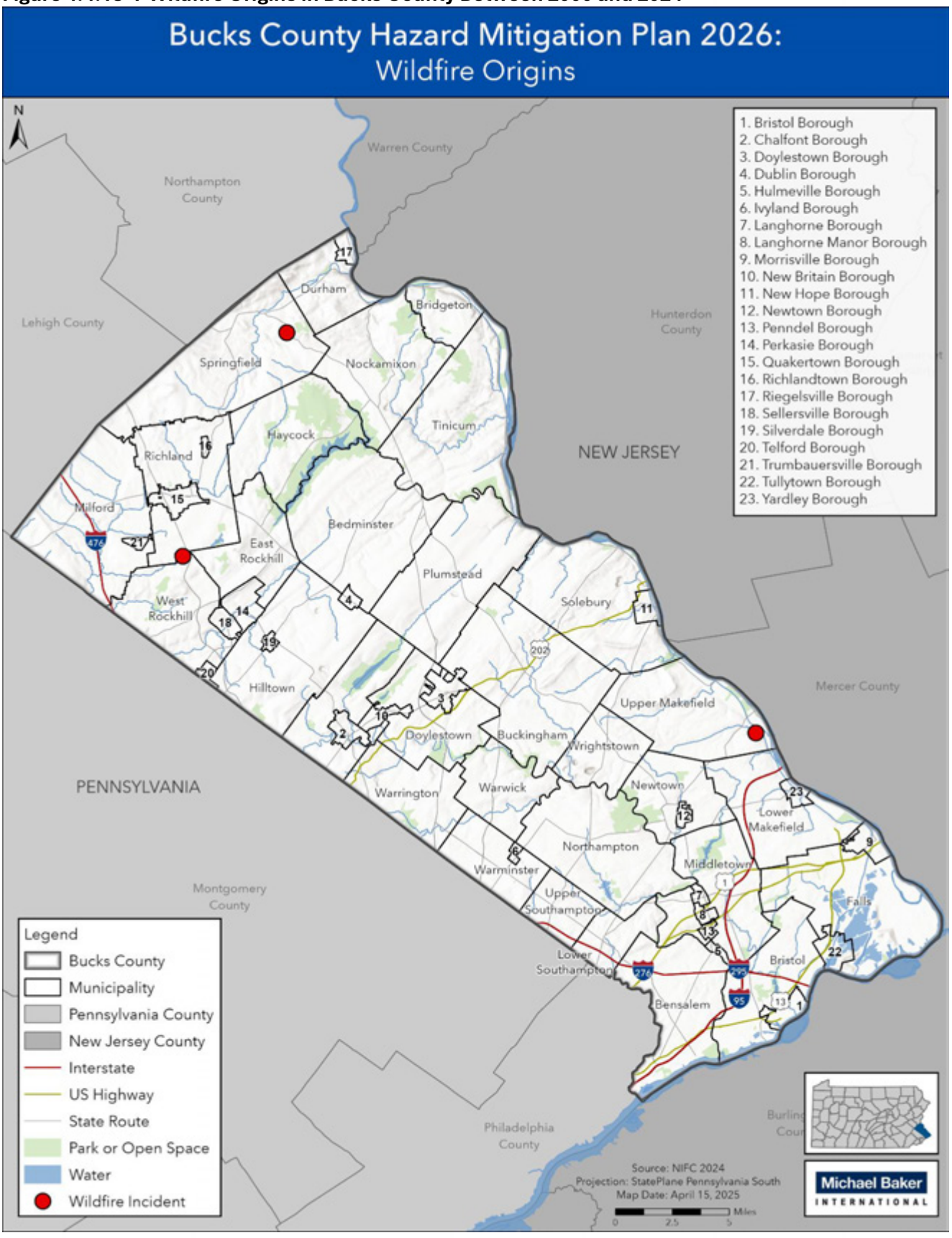
Table 4.4.13-3 List of Wildfire Events Reported in PA State Forest District 17 from 2014 to 2020 (DCNR-BOF, 2020).

Year	Total # of Fires	Total Area (Acres)	% Total Fires	% Total Area (Acres)
2014	71	123.5	8.2%	2.7%
2015	75	153.1	9.2%	3.7%
2016	49	133.3	5.7%	1.1%
2017	101	78.0	18.9%	4.7%
2018	66	45.1	9.6%	2.4%
2019	59	43.3	11.0%	6.2%
2020	105	89.4	7.0%	2.9%

Notes: % Total Fires and % Total area represent percentages of the entire state of Pennsylvania.

Figure 4.4.13 illustrates three fires originating within Bucks County between 2000 and 2024. The fires occurred on 4/23/2018, 2/25/202, and 4/30/2022 in Washington Crossing, Riegelsville, and Quakertown, respectively. Additionally, a scan of news stories indicated that Bucks County experienced isolated brush fires in 2024. All of the events were easily contained with minimal damage and no casualties.

Figure 4.4.13-1 Wildfire Origins in Bucks County Between 2000 and 2024



4.4.13.4 Potential for Future Occurrence

There have been over 500 wildfire events reported to the DCNR over the past six years. Previous events indicate that wildfires will continue to occur yearly in Bucks County. Therefore, the probability of a wildfire is estimated to be more than ninety percent in any given year and can be considered likely as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1). The likelihood of a fire attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

Previous events indicate that wildfires will continue to occur yearly in Bucks County. The likelihood of a fire attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Therefore, the probability of a wildfire is estimated to be between 50 and 90 percent in any given year and can be considered likely as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1).

The CMRA Tool provides a county-level assessment report for wildfire, shown in Figure 4.4.13-2 below. The future climate indicators for wildfire are precipitation and temperatures thresholds. According to CMRA, the days per year with no precipitation are projected to increase slightly while the days with maximum temperatures above 90 degrees Fahrenheit are expected to increase significantly. These projections show that the conditions in the future may make wildfires more likely. Beyond changes in temperature and precipitation, future land use patterns can alter future wildfire risk. If land in the wildland-urban interface is developed without adequate fire-resistant features and designs, the number of wildfires may increase.

Figure 4.4.13-2 Bucks County Wildfire Hazard Assessment Report (CRMA, 2025).

Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		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:							
Days per year with no precipitation (dry days)	**184 days** 179 - 189	**184 days** 174 - 193	**185 days** 175 - 199	**185 days** 172 - 198	**186 days** 172 - 204	**185 days** 174 - 198	**188 days** 171 - 214
Maximum number of consecutive dry days	**11 days** 11 - 13	**12 days** 10 - 14	**12 days** 11 - 15	**12 days** 11 - 15	**12 days** 11 - 15	**12 days** 11 - 15	**13 days** 11 - 16
Days per year with precipitation (wet days)	**181 days** 176 - 186	**181 days** 172 - 191	**181 days** 166 - 190	**180 days** 167 - 193	**179 days** 161 - 193	**180 days** 167 - 191	**177 days** 151 - 195
Temperature thresholds:							
Annual days with maximum temperature > 90°F	**13 days** 13 - 19	**33 days** 19 - 44	**35 days** 20 - 49	**43 days** 21 - 61	**52 days** 26 - 68	**52 days** 28 - 77	**83 days** 37 - 105
Annual days with maximum temperature > 100°F	**0 days** 0 - 0	**2 days** 0 - 6	**2 days** 1 - 6	**3 days** 1 - 10	**6 days** 1 - 14	**6 days** 1 - 10	**20 days** 2 - 46

4.4.13.5 Vulnerability Assessment

Wildfire hazard is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography and local weather. The FEMA NRI estimates wildfire may cause approximately $77,000 of damage in Bucks County. All census tracts across the county have been given a relatively low, very low, or no expected annual losses rating. This is notably less vulnerable than the 2021 HMP indicated, which is likely related to improvement in vulnerability modeling related to wildfire risk. The county has areas of potential risk, but likely has the capability to contain incidents as they occur.

Table 4.4.13-4 Expected Annual Losses to Wildfire by Census Tract (FEMA NRI, 2026)

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100102	Bensalem Township	$2,027.30	Relatively Low
42017100103	Bensalem Township	$8.33	Very Low
42017100104	Bensalem Township	$73.31	Very Low
42017100105	Bensalem Township	$62.61	Very Low
42017100201	Bensalem Township	$3,892.09	Relatively Low
42017100206	Bensalem Township	$155.12	Very Low
42017100207	Bensalem Township	$3.90	Very Low
42017100208	Bensalem Township	$181.01	Very Low
42017100209	Bensalem Township		
42017100210	Bensalem Township	$30.95	Very Low
42017100211	Bensalem Township	$614.20	Very Low
42017100212	Bensalem Township	$202.68	Very Low
42017100213	Bensalem Township	$362.83	Very Low
42017100214	Bensalem Township	$3,830.17	Relatively Low
42017100302	Bristol Township	$2,042.96	Relatively Low
42017100303	Bristol Township	$247.10	Very Low
42017100304	Bristol Township	$29.41	Very Low
42017100306	Bristol Township	$435.18	Very Low
42017100307	Bristol Township	$54.24	Very Low
42017100401	Bristol Township	$118.83	Very Low
42017100402	Bristol Township	$250.63	Very Low
42017100403	Bristol Township	$2,712.27	Relatively Low
42017100404	Bristol Township	$0.00	No Expected Annual Losses
42017100406	Bristol Township	$783.01	Very Low
42017100407	Bristol Township	$3,354.85	Relatively Low
42017100408	Bristol Township	$0.00	No Expected Annual Losses
42017100500	Bristol Borough	$55.10	Very Low
42017100600	Bristol Borough	$930.05	Very Low
42017100700	Bristol Borough	$1,100.76	Very Low
42017100803	Middletown Township	$1,165.58	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017100804	Middletown Township	$306.79	Very Low
42017100805	Middletown Township	$425.18	Very Low
42017100807	Middletown Township	$936.47	Very Low
42017100808	Middletown Township	$230.57	Very Low
42017100809	Middletown Township	$190.47	Very Low
42017100811	Middletown Township	$39.03	Very Low
42017100900	Middletown Township	$21.54	Very Low
42017101100	Penndel Borough	$296.54	Very Low
42017101401	Lower Southampton Township	$90.52	Very Low
42017101403	Lower Southampton Township	$473.72	Very Low
42017101404	Lower Southampton Township	$156.34	Very Low
42017101405	Lower Southampton Township	$853.98	Very Low
42017101503	Upper Southampton Township	$792.06	Very Low
42017101504	Upper Southampton Township	$264.81	Very Low
42017101505	Upper Southampton Township	$99.87	Very Low
42017101506	Upper Southampton Township	$2,507.84	Relatively Low
42017101603	Warminster Township	$1,141.50	Very Low
42017101605	Warminster Township	$738.72	Very Low
42017101607	Warminster Township	$0.00	No Expected Annual Losses
42017101609	Warminster Township	$0.00	No Expected Annual Losses
42017101610	Warminster Township	$903.98	Very Low
42017101611	Warminster Township	$414.67	Very Low
42017101802	Warrington Township	$598.38	Very Low
42017101803	Warrington Township		
42017101805	Warrington Township	$390.95	Very Low
42017101807	Warrington Township	$0.88	Very Low
42017101808	Warrington Township	$24.53	Very Low
42017101809	Warrington Township	$1,725.28	Relatively Low
42017101810	Warrington Township	$0.39	Very Low
42017101900	Chalfont Borough	$1,291.63	Relatively Low
42017102002	New Britain Township	$774.23	Very Low
42017102003	New Britain Township	$83.15	Very Low
42017102004	New Britain Township	$155.84	Very Low
42017102102	Hilltown Township	$131.60	Very Low
42017102104	Hilltown Township	$822.78	Very Low
42017102300	East Rockhill Township	$293.60	Very Low
42017102401	Perkasie Borough	$508.53	Very Low
42017102402	Perkasie Borough	$598.35	Very Low
42017102500	Sellersville Borough, West Rockhill Township	$1,059.60	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017102600	Telford Borough	$136.84	Very Low
42017102700	West Rockhill Township	$129.50	Very Low
42017102801	Milford Township	$0.00	Very Low
42017103101	Quakertown Borough	$206.47	Very Low
42017103102	Quakertown Borough	$0.23	Very Low
42017103103	Quakertown Borough	$10.19	Very Low
42017103300	Haycock Township	$102.26	Very Low
42017103400	Springfield Township	$24.47	Very Low
42017103700	Nockamixon Township	$43.01	Very Low
42017103800	Bridgeton Township	$43.67	Very Low
42017103900	Tinicum Township	$101.39	Very Low
42017104000	Bedminster Township	$9.50	Very Low
42017104100	Dublin Borough	$662.12	Very Low
42017104201	Plumstead Township	$333.37	Very Low
42017104203	Plumstead Township	$73.43	Very Low
42017104204	Plumstead Township	$1,332.40	Relatively Low
42017104301	Solebury Township	$13.95	Very Low
42017104303	Solebury Township	$538.29	Very Low
42017104304	Solebury Township	$228.16	Very Low
42017104400	New Hope Borough	$508.31	Very Low
42017104502	Buckingham Township	$1,710.93	Relatively Low
42017104503	Buckingham Township	$1,078.14	Very Low
42017104505	Buckingham Township	$146.09	Very Low
42017104506	Buckingham Township	$11.38	Very Low
42017104601	Doylestown Township	$93.18	Very Low
42017104603	Doylestown Township	$4.17	Very Low
42017104604	Doylestown Township	$21.11	Very Low
42017104701	Doylestown Borough, Doylestown Township	$1.58	Very Low
42017104702	Doylestown Borough	$215.85	Very Low
42017104703	Doylestown Borough	$56.40	Very Low
42017104800	New Britain Borough	$621.41	Very Low
42017104901	Warwick Township	$2,337.19	Relatively Low
42017104902	Warwick Township	$62.35	Very Low
42017105003	Northampton Township	$67.80	Very Low
42017105004	Northampton Township	$799.44	Very Low
42017105006	Northampton Township	$2.82	Very Low
42017105008	Northampton Township	$23.50	Very Low
42017105009	Northampton Township	$624.72	Very Low
42017105010	Northampton Township	$693.67	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017105011	Northampton Township	$34.21	Very Low
42017105012	Northampton Township	$821.99	Very Low
42017105013	Northampton Township	$909.45	Very Low
42017105100	Wrightstown Township	$0.00	No Expected Annual Losses
42017105202	Newtown Township	$5,861.99	Relatively Low
42017105203	Newtown Township	$780.20	Very Low
42017105206	Newtown Township	$2,404.84	Relatively Low
42017105207	Newtown Township	$324.65	Very Low
42017105208	Newtown Township	$126.67	Very Low
42017105300	Newtown Borough	$1,336.20	Relatively Low
42017105401	Upper Makefield Township	$102.71	Very Low
42017105402	Upper Makefield Township	$947.74	Very Low
42017105505	Lower Makefield Township	$1,016.52	Very Low
42017105506	Lower Makefield Township	$206.00	Very Low
42017105507	Lower Makefield Township	$0.00	No Expected Annual Losses
42017105508	Lower Makefield Township	$271.83	Very Low
42017105509	Lower Makefield Township	$125.55	Very Low
42017105510	Lower Makefield Township	$148.60	Very Low
42017105511	Lower Makefield Township	$25.19	Very Low
42017105600	Yardley Borough	$222.43	Very Low
42017105702	Morrisville Borough	$0.00	No Expected Annual Losses
42017105704	Morrisville Borough, Falls Township	$84.83	Very Low
42017105801	Falls Township	$3.53	Very Low
42017105805	Falls Township	$900.62	Very Low
42017105807	Falls Township	$592.82	Very Low
42017105808	Falls Township	$167.51	Very Low
42017105809	Falls Township	$872.61	Very Low
42017105810	Falls Township	$492.87	Very Low
42017105811	Falls Township	$99.13	Very Low
42017105812	Falls Township	$385.36	Very Low
42017105900	Tullytown Borough	$0.00	Very Low
42017106000	Middletown Township, Hulmeville Borough	$296.59	Very Low
42017106100	Langhorne Manor Borough, Langhorne Borough	$40.71	Very Low
42017106201	Warminster Township	$92.74	Very Low
42017106202	Warminster Township, Ivyland Borough	$147.58	Very Low
42017106300	Hilltown Township, Silverdale Borough	$36.80	Very Low
42017106401	Richland Township	$40.99	Very Low
42017106402	Milford Township, Trumbauersville Borough	$449.26	Very Low

Census Tract	Municipalities	Estimated Annual Losses	Estimated Annual Loss Rating
42017106500	Richland Township, Richlandtown Borough	$284.40	Very Low
42017106600	Durham Township, Riegelsville Borough	$52.73	Very Low
42017980000	Falls Township	$1.05	Very Low
TOTAL		**$77,847.00**	

Table 4.4.13-5 Structures and Critical Facilities Vulnerable to Wildfires in Bucks County (Bucks County GIS,2024) (USFS, 2024)

Municipality	Total Structures	Structures In Wooded Area	Pct Structures In Wooded Area	Total Population	Population In Wooded Area	Pct Population In Wooded Area	Total Critical Facilities	Cfs In Wooded Area	Pct Cfs In Wooded Area
Bedminster Township	3,278	118	4%	7,518	1,836	24%	13	1	8%
Bensalem Township	22,234	273	1%	62,819	6,654	11%	66	0	0%
Bridgeton Township	790	77	10%	1,234	869	70%	3	0	0%
Bristol Borough	4,024	5	0%	9,861	37	0%	19	0	0%
Bristol Township	20,102	293	1%	54,369	4,459	8%	62	2	3%
Buckingham Township	8,367	165	2%	20,847	4,634	22%	22	0	0%
Chalfont Borough	1,788	11	1%	4,253	73	2%	8	0	0%
Doylestown Borough	3,486	13	0%	8,300	24	0%	23	0	0%
Doylestown Township	6,807	98	1%	17,971	2,258	13%	30	0	0%
Dublin Borough	741	0	0%	2,177	88	4%	4	0	0%
Durham Township	656	79	12%	1,094	393	36%	1	0	0%
East Rockhill Township	2,652	343	13%	5,819	1,483	25%	9	0	0%
Falls Township	11,954	140	1%	34,672	2,087	6%	62	2	3%
Haycock Township	1,232	217	18%	2,201	1,915	87%	2	0	0%
Hilltown Township	6,428	128	2%	16,395	2,732	17%	13	0	0%
Hulmeville Borough	410	6	1%	982	17	2%	3	0	0%
Ivyland Borough	359	6	2%	955	132	14%	5	0	0%
Langhorne Borough	568	5	1%	1,643	240	15%	4	0	0%
Langhorne Manor Borough	349	10	3%	1,496	94	6%	4	0	0%
Lower Makefield Township	13,771	306	2%	33,224	4,946	15%	29	0	0%
Lower Southampton Township	8,340	38	0%	20,487	1,348	7%	23	0	0%

Municipality	Total Structures	Structures In Wooded Area	Pct Structures In Wooded Area	Total Population	Population In Wooded Area	Pct Population In Wooded Area	Total Critical Facilities	Cfs In Wooded Area	Pct Cfs In Wooded Area
Middletown Township	17,420	243	1%	45,967	5,113	11%	52	0	0%
Milford Township	4,430	202	5%	10,238	3,672	36%	12	1	8%
Morrisville Borough	3,241	18	1%	9,809	273	3%	13	0	0%
New Britain Borough	1,151	9	1%	2,836	59	2%	9	0	0%
New Britain Township	4,937	84	2%	12,223	3,083	25%	15	0	0%
New Hope Borough	1,446	34	2%	2,612	696	27%	8	0	0%
Newtown Borough	1,054	4	0%	2,268	83	4%	3	0	0%
Newtown Township	8,544	68	1%	19,904	3,348	17%	31	0	0%
Nockamixon Township	1,827	237	13%	3,379	1,901	56%	8	0	0%
Northampton Township	15,081	97	1%	39,915	5,956	15%	37	1	3%
Penndel Borough	743	8	1%	2,515	0	0%	5	0	0%
Perkasie Borough	3,546	33	1%	9,120	804	9%	8	0	0%
Plumstead Township	5,957	199	3%	14,038	3,077	22%	25	1	4%
Quakertown Borough	3,259	19	1%	9,359	910	10%	22	0	0%
Richland Township	6,621	500	8%	13,858	3,178	23%	11	1	9%
Richlandtown Borough	447	0	0%	1,353	74	5%	3	0	0%
Riegelsville Borough	465	9	2%	847	29	3%	2	0	0%
Sellersville Borough	1,914	81	4%	4,567	222	5%	6	0	0%
Silverdale Borough	337	0	0%	805	198	25%	3	0	0%
Solebury Township	4,322	225	5%	8,708	2,389	27%	11	0	0%
Springfield Township	2,719	284	10%	5,172	2,029	39%	8	0	0%
Telford Borough	763	2	0%	2,199	70	3%	1	0	0%
Tinicum Township	2,352	368	16%	3,818	1,790	47%	10	0	0%
Trumbauersville Borough	386	2	1%	883	102	12%	4	0	0%
Tullytown Borough	900	14	2%	2,268	56	2%	8	0	0%
Upper Makefield Township	3,775	185	5%	8,861	2,002	23%	9	0	0%

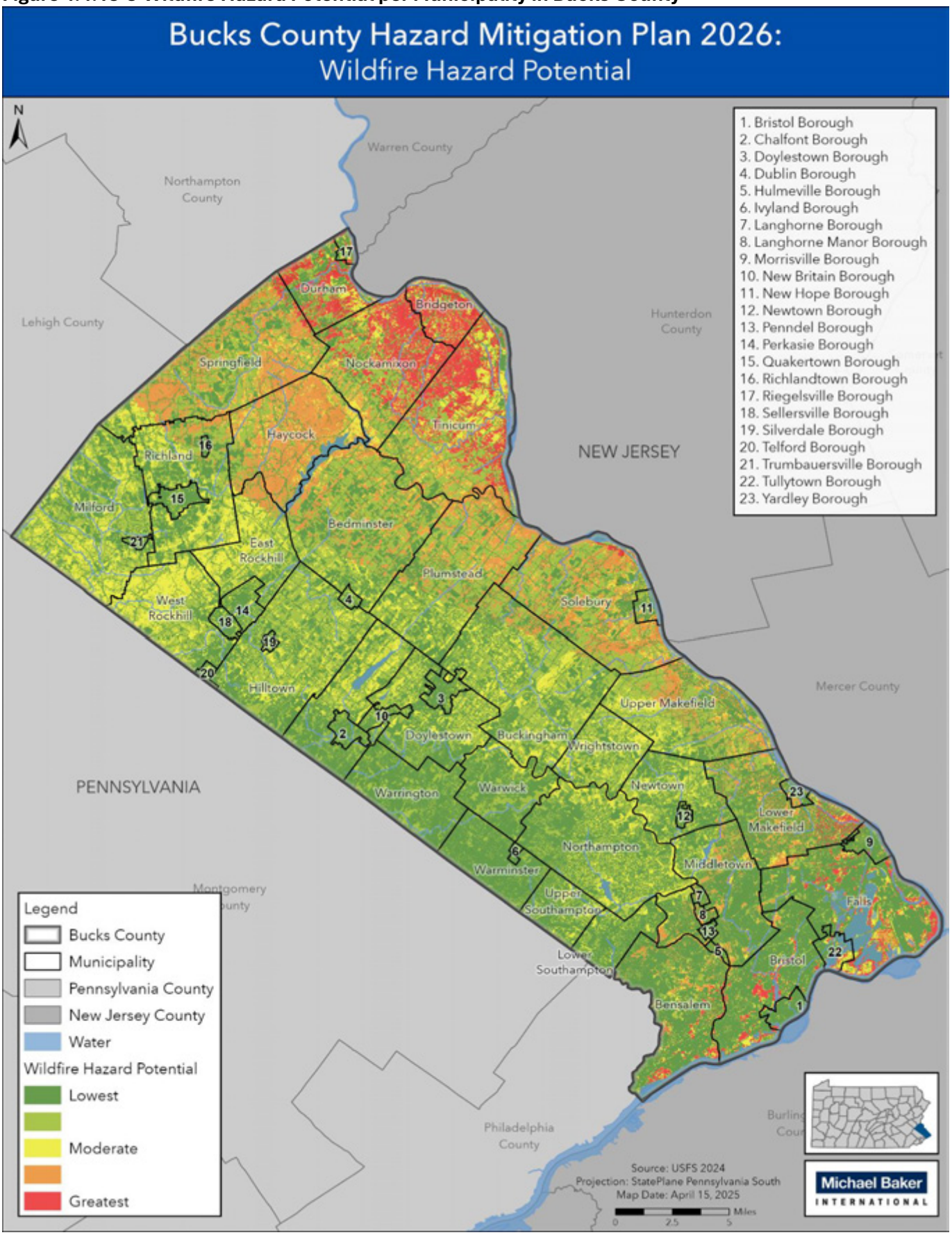
Municipality	Total Structures	Structures In Wooded Area	Pct Structures In Wooded Area	Total Population	Population In Wooded Area	Pct Population In Wooded Area	Total Critical Facilities	Cfs In Wooded Area	Pct Cfs In Wooded Area
Upper Southampton Township	6,233	56	1%	15,269	1,403	9%	24	0	0%
Warminster Township	13,677	34	0%	33,603	629	2%	40	0	0%
Warrington Township	9,377	108	1%	25,639	4,616	18%	26	1	4%
Warwick Township	6,284	155	2%	14,851	2,393	16%	16	0	0%
West Rockhill Township	2,502	232	9%	5,446	2,409	44%	14	0	0%
Wrightstown Township	1,497	122	8%	3,286	763	23%	5	0	0%
Yardley Borough	1,350	67	5%	2,605	225	9%	6	0	0%
Grand Total	256,893	6,030	2%	646,538	89,871	14%	860	10	1%

Table 4.4.13-6 Structures Vulnerable to Wildfires by Generalized Land Use Type (Bucks County GIS, 2024)

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Bedminster Township	0	0	0	0	0	0	0	0	0	0	0	0	118	118
Bensalem Township	0	0	0	0	0	0	0	0	0	0	0	0	273	273
Bridgeton Township	0	0	0	0	0	0	0	0	0	0	0	0	77	77
Bristol Borough	0	0	0	0	0	0	0	0	0	0	0	0	5	5
Bristol Township	0	0	0	0	0	0	0	0	0	0	0	0	293	293
Buckingham Township	0	0	0	0	0	0	0	0	0	0	0	0	165	165
Chalfont Borough	0	0	0	0	0	0	0	0	0	0	0	0	11	11
Doylestown Borough	0	0	0	0	0	0	0	0	0	0	0	0	13	13
Doylestown Township	0	0	0	0	0	0	0	0	0	0	0	0	98	98
Dublin Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	0	0	0	0	0	0	0	0	0	0	0	0	79	79
East Rockhill Township	0	0	0	0	0	0	0	0	0	0	0	0	343	343
Falls Township	0	0	0	0	0	0	0	0	0	0	0	0	140	140
Haycock Township	0	0	0	0	0	0	0	0	0	0	0	0	217	217
Hilltown Township	0	0	0	0	0	0	0	0	0	0	0	0	128	128
Hulmeville Borough	0	0	0	0	0	0	0	0	0	0	0	0	6	6
Ivyland Borough	0	0	0	0	0	0	0	0	0	0	0	0	6	6
Langhorne Borough	0	0	0	0	0	0	0	0	0	0	0	0	5	5
Langhorne Manor Borough	0	0	0	0	0	0	0	0	0	0	0	0	10	10
Lower Makefield Township	0	0	0	0	0	0	0	0	0	0	0	0	306	306
Lower Southampton Township	0	0	0	0	0	0	0	0	0	0	0	0	38	38
Middletown Township	0	0	0	0	0	0	0	0	0	0	0	0	243	243
Milford Township	0	0	0	0	0	0	0	0	0	0	0	0	202	202

Municipality	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Grand Total
Morrisville Borough	0	0	0	0	0	0	0	0	0	0	0	0	18	18
New Britain Borough	0	0	0	0	0	0	0	0	0	0	0	0	9	9
New Britain Township	0	0	0	0	0	0	0	0	0	0	0	0	84	84
New Hope Borough	0	0	0	0	0	0	0	0	0	0	0	0	34	34
Newtown Borough	0	0	0	0	0	0	0	0	0	0	0	0	4	4
Newtown Township	0	0	0	0	0	0	0	0	0	0	0	0	68	68
Nockamixon Township	0	0	0	0	0	0	0	0	0	0	0	0	237	237
Northampton Township	0	0	0	0	0	0	0	0	0	0	0	0	97	97
Penndel Borough	0	0	0	0	0	0	0	0	0	0	0	0	8	8
Perkasie Borough	0	0	0	0	0	0	0	0	0	0	0	0	33	33
Plumstead Township	0	0	0	0	0	0	0	0	0	0	0	0	199	199
Quakertown Borough	0	0	0	0	0	0	0	0	0	0	0	0	19	19
Richland Township	0	0	0	0	0	0	0	0	0	0	0	0	500	500
Richlandtown Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	0	0	0	0	0	0	0	0	0	0	0	0	9	9
Sellersville Borough	0	0	0	0	0	0	0	0	0	0	0	0	81	81
Silverdale Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	0	0	0	0	0	0	0	0	0	0	0	0	225	225
Springfield Township	0	0	0	0	0	0	0	0	0	0	0	0	284	284
Telford Borough	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Tinicum Township	0	0	0	0	0	0	0	0	0	0	0	0	368	368
Trumbauersville Borough	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Tullytown Borough	0	0	0	0	0	0	0	0	0	0	0	0	14	14
Upper Makefield Township	0	0	0	0	0	0	0	0	0	0	0	0	185	185
Upper Southampton Township	0	0	0	0	0	0	0	0	0	0	0	0	56	56
Warminster Township	0	0	0	0	0	0	0	0	0	0	0	0	34	34
Warrington Township	0	0	0	0	0	0	0	0	0	0	0	0	108	108
Warwick Township	0	0	0	0	0	0	0	0	0	0	0	0	155	155
West Rockhill Township	0	0	0	0	0	0	0	0	0	0	0	0	232	232
Wrightstown Township	0	0	0	0	0	0	0	0	0	0	0	0	122	122
Yardley Borough	0	0	0	0	0	0	0	0	0	0	0	0	67	67
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	6,030	6,030

Figure 4.4.13-3 Wildfire Hazard Potential per Municipality in Bucks County



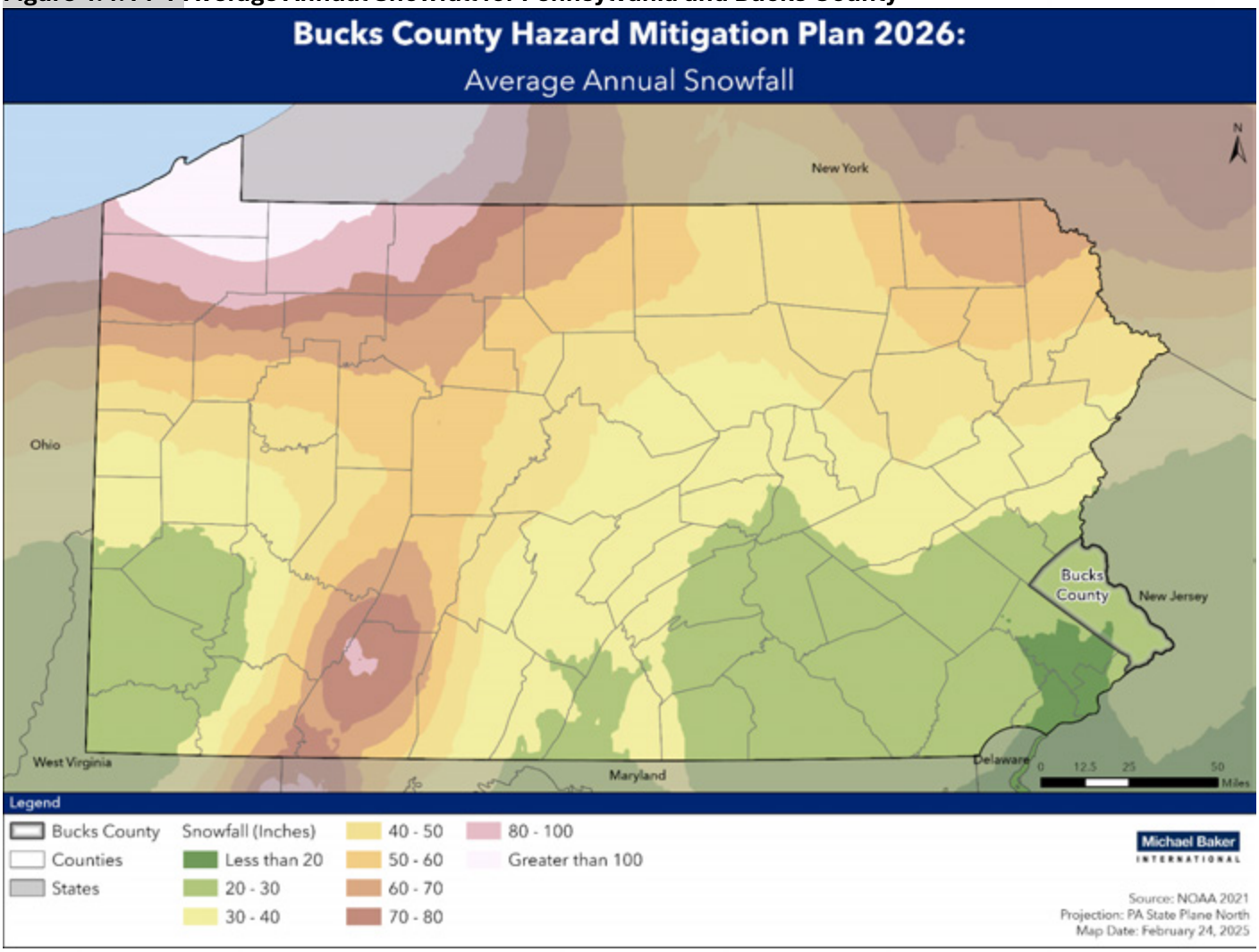
4.4.14 Winter Storm

Winter storms are regional events and most often impact a large portion or all of Pennsylvania. Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. They begin as low-pressure systems that move through Pennsylvania usually following the jet stream (NOAA NSSL, 2022c). A winter storm can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite and freezing conditions. They can result in the closing of secondary roads, particularly in rural locations, loss of utility services and depletion of oil heating supplies (FEMA, 2022d).

4.4.14.1 Location and Extent

Heavy snow or ice occurs throughout the Commonwealth of Pennsylvania. Every municipality in Bucks County is affected by these storms. Bucks County experiences all levels of winter storms from ice storms and freezing rain to heavy snow and blizzards. Generally, the average annual snowfall is mostly consistent throughout the County, with the area receiving between 20 and 30 inches of snow annually (see Figure 4.4.13-1 below). This was the most current data available at the time of this HMP Update.

Figure 4.4.14-1 Average Annual Snowfall for Pennsylvania and Bucks County



4.4.14.2 Range of Magnitude

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. Because winter storms are a regular occurrence in Bucks County, they are considered hazards only when they result in damage to specific structures and/or overwhelm local capabilities to handle disruptions to traffic, communications, and electric power. The cost of removing snow, repairing damages, especially from ice storms, and the loss to businesses can have a negative economic impact for communities. Winter storms can generate other hazards such as infrastructure disruption (blocked roads, severely damaged roads and power outages), human-caused hazards (traffic accidents and trapped vehicles), and technological problems (communication system outages and overload). Winter storms can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite, or freezing.

Winter storms may include one or more of the following weather events:

- **Heavy Snowstorm:** Accumulations of four inches or more in a six-hour period, or six inches or more in a 12-hour period.
- **Sleet Storm:** Sleet is formed when snow falling to the earth partially melts as it passes through a layer of warm air. The precipitation then passes through a cold layer of air and refreezes into solid pellets. Sleet causes surfaces to become slippery, posing hazards to pedestrians and motorists.
- **Ice Storm:** An ice storm occurs when rain freezes upon impact with the ground or other objects such as trees and power lines. Heavy accumulations of ice can bring down trees and topple utility poles, disrupting power and communication for days while crews make the necessary repairs. The icy conditions are also dangerous for pedestrians and vehicular traffic.
- **Blizzard:** According to the National Weather Service, a blizzard is a severe snowstorm that occurs when winds reach 35 mph or more. The blowing snow reduces visibility to less the one-quarter of a mile for at least three hours. Storms that meet these criteria are not frequent in Bucks County; however, storms that produce blizzard-like conditions are a common occurrence.
- **Severe Blizzard:** Wind velocity of 45 mph, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

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

Table 4.4.14-1 Most Likely Lifelines Impacted by Winter Storm

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.
	Potential direct damage to infrastructure and then potential increased fuel use for those who lost access to electrical heating may occur.
	Transportation lifeline will be involved in response and recovery. There may be direct damage to infrastructure and dangerous road conditions.

4.4.14.3 Previous Occurrence

The Commonwealth of Pennsylvania has a long history of winter storms. Bucks County experienced major winter storms in 1958, 1966, 1972, 1977, 1978, 1981, 1983, 1993, 1994, 1996, 2003, 2007, 2010, and 2014. Winter storms generally occur more than once each year in the County. The NCEI data on past occurrences for winter storm lists events since 1996, causing no estimated property or crop damages and also not causing any injuries or deaths as a result of the events. Table 4.4.14-2 lists the number of winter storm events each year between 2006 and 2025.

A notable recent winter storm event occurred in January 2016 when a blizzard hit Bucks County. While the Philadelphia International Airport reported 22.4 inches of snow, suburbs around the city, including Bucks County, reported upwards of 30 inches of snow. Strong winds accompanied the heavy snowfall, closing businesses, shopping malls, and SEPTA Regional Rail for the weekend in late January (NOAA NCEI, 2021). The last significant winter storm event occurred in 2021 when Winter Storm Oriena hit. Upper Bucks saw a range of 18-31 inches of snow from this event. Springtown Township saw the most snow accumulation with 31.2 inches reported. A winter warning was issued during this event and wind speeds as high as 40 miles per hour were reported (Bucks Local News, 2021). There have been no disasters or notable events since the last plan update.

Table 4.4.14-2 Number of winter weather events in Bucks County from 2006 to 2025 (NOAA NCEI, 2026).

Year	Number of Events
2006	4
2007	10
2008	11
2009	9
2010	7
2011	8
2012	3
2013	20
2014	20
2015	15
2016	4
2017	5
2018	7
2019	10
2020	2
2021	9
2022	11
2023	1
2024	6
2025	6
TOTAL	168

4.4.14.4 Potential for Future Occurrence

Data from NCDC shows that winter storms are a regular occurrence in Bucks County. So, the probability of the occurrence of a winter storm or winter weather event in Bucks County in any given year is 100 percent. The future occurrence of winter storms hazard can be considered highly likely as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1).

4.4.14.5 Vulnerability Assessment

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. Some shed roofs that protect road maintenance or firefighting equipment have large span roofs that may collapse under the weight of especially heavy snow or ice although none have collapsed due to recent heavy snow or ice storms.

In Bucks County, accumulations of snow and/or ice during winter months are expected and normal. The most common detrimental effects of snow and/or ice are not collapsed structures but traffic accidents and interruptions in power supply and communications services.

All structures and infrastructure in Bucks County are exposed to heavy snow and ice. For this analysis, structures built prior to 1940 are identified as being potentially at risk of being somewhat weakened and more susceptible to damage due to heavy snow or ice. Table 4.3.14-3 lists the number of housing units in Bucks County built prior to 1940 according to the US Census Bureau's estimates. Bristol Borough has the most structures of any municipality in the county built prior to 1940 (over 2,000), as well as the largest proportion of housing units built prior to 1940 (57.7%). While the U.S. Census provides estimates for residential structures, the age of non-residential structures is not available. All structures and infrastructure in Bucks County will be exposed to heavy snow and ice. Because all of Bucks County has adopted the Pennsylvania Uniform Construction Code, new construction will be able to withstand the weight of heavy snow or ice.

Table 4.4.14-3 Housing Built in Bucks County Prior to 1940 (US Census, 2019)

Municipality	Number of Housing Units Built Prior To 1940	Percent of Total Housing Units	Municipality	Number of Housing Units Built Prior To 1940	Percent of Total Housing Units
Bedminster Township	369	13.0%	Newtown Borough	509	51.0%
Bensalem Township	1,059	4.2%	Newtown Township	132	1.6%
Bridgeton Township	256	42.2%	Nockamixon Township	378	23.4%
Bristol Borough	2,416	57.7%	Northampton Township	336	2.3%
Bristol Township	1,556	7.4%	Penndel Borough	106	9.0%
Buckingham Township	687	9.0%	Perkasie Borough	1,172	34.5%
Chalfont Borough	175	9.9%	Plumstead Township	576	10.8%
Doylestown Borough	1,179	28.7%	Quakertown Borough	1,374	38.3%
Doylestown Township	289	4.6%	Richland Township	479	9.0%
Dublin Borough	182	19.5%	Richlandtown Borough	214	43.7%
Durham Township	128	26.6%	Riegelsville Borough	239	58.4%
East Rockhill Township	327	15.9%	Sellersville Borough	598	33.9%
Falls Township	429	3.2%	Silverdale Borough	51	20.5%
Haycock Township	120	13.4%	Solebury Township	763	19.3%
Hilltown Township	724	12.7%	Springfield Township	671	31.4%
Hulmeville Borough	151	41.6%	Telford Borough	133	12.8%
Ivyland Borough	80	24.9%	Tinicum Township	764	35.3%
Langhorne Borough	311	46.3%	Trumbauersville Borough	214	51.9%
Langhorne Manor Borough	133	42.5%	Tullytown Borough	83	9.0%
Lower Makefield Township	539	4.3%	Upper Makefield Township	443	13.7%
Lower Southampton Township	362	5.0%	Upper Southampton Township	296	4.7%
Middletown Township	612	3.5%	Warminster Township	600	4.4%
Milford Township	646	17.0%	Warrington Township	316	3.5%
Morrisville Borough	1,407	35.7%	Warwick Township	317	5.7%
New Britain Borough	118	11.7%	West Rockhill Township	344	14.9%
New Britain Township	288	6.6%	Wrightstown Township	341	29.1%
New Hope Borough	434	29.0%	Yardley Borough	357	28.8%

4.4.14.6 Equity in Vulnerable Communities

Winter storms may have a disproportionate impact on populations that live in older homes, have less disposable income or are older. Older homes may lack sufficient heating, insulation, and weatherproofing, making them more vulnerable to damage. Many low-income households may struggle to afford heating during winter months. Energy shutoffs due to unpaid bills can expose individuals to cold weather. Icy conditions, snow buildup, and impassable roads or sidewalks may limit individuals with lower mobility from leaving their homes.

4.5 MAN-MADE HAZARDS

4.5.1 Structure Collapse (Infrastructure)

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

4.5.1.1 Location and Extent

Adherence to modern building codes can lower a building's risk to collapse. Building codes – developed by the International Code Council in partnership with FEMA and other federal, state, local, and private authorities – specify the minimum legal design and construction requirements for structural integrity, construction materials, and fire protection (FEMA, 2014). Most buildings constructed after 1961 in Bucks County were built under modern building codes as adopted in the Pennsylvania Uniform Construction Code.

Structure collapse incidents in Bucks County are always linked to other hazards including flooding, urban fire and explosion, winter storms, subsidence and sinkhole. While these hazards are profiled in this plan, they do not sufficiently addressed the impacts of structure collapse. The main concern for Bucks County is focused on bridge infrastructure collapse.

Bridges serve to connect both large and small roadways and communities throughout the County. Whether they span another roadway or a body of water, bridges are a crucial part of every transportation system. However, many of Pennsylvania's bridge structures are aging and in great need of repair (PennDOT, 2026). Inspection and maintenance are necessary to observe and mitigate the extent of the disrepair, especially on older structures.

4.5.1.2 Range of Magnitude

Disrepair can critically affect the integrity of a bridges structure. The level of disrepair depends on how much of the structure is damaged and how critical that portion of the structure is to the safety of drivers. When in disrepair, some bridges may only need deck replacement or a new superstructure, while others have substructure problems and should be entirely replaced.

Bridges are ranked by sufficiency rating and condition in order to classify the level of deterioration. Sufficiency ratings determine the overall capability of a bridge, help to determine funding for repair, and range from 0 to 100, worst to best. Condition ratings are determined for each of the following bridge components: bridge superstructure, bridge deck, and the bridge substructure or foundation. These ratings range from 0 to 9, worst to best. For a bridge to be structurally deficient, it must have one or more component with a condition rating equal to or less than 4 (PennDOT, 2018).

As of September 2025, 80 of the 666 bridges on state roads and 38 of the 202 bridges on locally-owned roads were classified as poor in Bucks County. A poor rating means that the bridge is "structurally deficient." This rating does not indicate that a bridge is unsafe, only that there is deterioration to one or more of the major components. Should

a bridge be determined to be unsafe, it would be closed. Four bridges on locally-owned roads are closed due to structural integrity (PennDOT, 2026). The worst-case scenario for a bridge structure collapse is for a high traffic bridge to collapse during rush hour causing injuries and deaths.

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

Table 4.5.1-1 Most Likely Lifelines Impacted by Structure Collapse

Lifeline	Notes
Transportation	If a bridge were to collapse, access to communities in order to respond may be limited, and evacuation opportunities may be limited.

4.5.1.3 Previous Occurrence

Structures can collapse due to deterioration of critical load bearing members, but external occurrences can also impact bridges. Most often, weather events such as flooding, high winds, and winter storms lead to structure and bridge collapse. The NOAA NCEI Storm Events Database includes incidents of structure collapse in event narrative sections. Six incidents have led to structure or bridge collapse in Bucks County (NOAA NCEI, 2026).

In June 1996, heavy rain and flash flooding caused the roof of a gym to collapse in Middletown Township. Luckily, the building was evacuated just prior to the incident saving 90 people from possible injury. Seven bridges were washed out in Bristol, Langhorne, Morrisville, Penndel, and Yardley due to this incident.

- In September 1999, Hurricane Floyd damaged dozens of bridges in Bucks County. Specifically, bridges were damaged or washed out in Buckingham, Durham, Solebury, Upper Makefield, and Wrightstown Townships. Three bridges were destroyed and not expected to be reopened until 2001. These include River Road over the Jericho Creek in Upper Makefield Township, New Hope Road over Mill Creek in Buckingham Township, and Swamp Road over Mill Creek in Wrightstown Township.

- In July 2000, flash flooding damaged and closed several bridges over Mill Creek. SR 532 between Old Bristol Road and Chinquapin Road in Lower Southampton Township and Northampton Township was closed when flood waters washed away the bridge supports. The approaches to bridges in Upper Southampton Township and Northampton Township were washed out leading to road closures.

- In June 2001, Tropical Storm Allison led to flash flooding in Buck County. Several bridges were damages or washed out, including a couple on SEPTA Regional Rail lines. Damage to roads and bridges in the region cost around $5 million.

- In August 2003, thunderstorms and heavy downpours led to rapid floodwaters. Heavy waters in the Perkiomen Creek beat against the walls of a small bridge on County Line Road in West Rockhill Township. This caused the bridge to collapse.

- In February 2017, heavy wind and thunderstorms blew across eastern Pennsylvania. Wind speeds were measured at 47 mph in Northeast Philadelphia. A townhouse in Bucks County collapsed because of this incident.

- In July 2021 a tornado impacted multiple communities in Bucks County, and caused structure damage at Maximuck's Farm Market on Long Ln in Wismer, where greenhouses sustained roof damage and some uplift of their frames. Some convergence was also noted in crop fields on the property. Just southeast of the greenhouses, a barn on the property was heavily damaged with a partial collapse of its walls. Four car dealerships on state road were also impacted in Belmont Hills.

- In August 2024 flash flooding caused a structure to collapse in West Bristol. A roof collapse of a commercial building was reported due to the water load on the roof.

A notable event was when the Delaware River Turnpike Bridge was closed in January 2017 after a crack was found in the steel support of the bridge. While the bridge did not collapse, the inspectors determined the bridge to be unsafe for travel to prevent a collapse from occurring. The 65-year old bridge supported approximately 42,000 vehicles a day. After two months of $12 million dollar repairs were completed on the bridge, the roadway reopened to traffic (PEMA, 2023).

Infrastructure can also be impacted by human caused hazards such as transportation accidents. A notable past occurrence was when the Geigel Hill Road Bridge in Tinicum Township was hit by a vehicle in 2002. The accident damaged one vertical member and broke another on the bridge. In 2008, the bridge was demolished and replaced in 2011 (Jordan, 2011).

4.5.1.4 Potential for Future Occurrence

Structures can collapse due to deterioration of bridge critical load bearing members, but as demonstrated in the Geigel Hill Road Bridge accident, external occurrences can also impact bridges. Pennsylvania has the third-largest number of bridges in the nation, and the average age of bridges in the state are over 50 years old (PennDOT, 2026). Due to the continually aging infrastructure, the entire state will see an increased focus on prevention of structure collapse. With almost 14 percent of its bridges marked as being in poor condition, Bucks County will continue to face deteriorating structures in the future if these are not addressed.

The future occurrence of structure collapse can be considered possible as defined by the Risk Factor methodology probability criteria (see Table 4.6-1). Additionally, other hazard events such as fires, winter storms, and tropical storms could create conditions that would cause structures to collapse. Information on the future occurrences of such events can be found in their respective hazard profiles.

4.5.1.5 Vulnerability Assessment

The most vulnerable areas of the County are those with the highest concentration of deteriorating structures. In Bucks County, the majority of bridges, about 85%, are owned and maintained by the state, the rest are owned and maintained by the County or local municipalities. PennDOT defines the following bridge terminology for the operational status of bridges (PennDOT, 2026):

- Open – bridge is open to traveling public.

- Closed – bridge is closed to vehicular traffic (barriers and signs put in place); pedestrian traffic may or may not be allowed.
- Posted – bridge is open but signs have been placed stating a weight limit that can travel across the bridge.
- Temp – bridge has temporary supports and/or restrictions in place.
- U/CON – bridge is closed due to construction.

Additionally, PennDOT defines a poor rating as an indication of the bridge's overall status in terms of structural soundness and ability to service traveling public. If a bridge is marked as poor or structurally deficient, that indicates that the bridge has deterioration to one or more of its major components (PennDOT, 2026).

Table 4.5.1-2 shows the operational status of bridges by ownership. Four bridges were closed to vehicular traffic due to their structural deficiencies (PennDOT, 2026).

Table 4.5.1-2 Summary of Bridge Operational Status in Bucks County (PennDOT, 2026)

Owner	Closed	Open	Posted	Temp	U/Con	Total
State Owned	0	643	20	1	1	665
County and Locally Owned	4	151	48	0	0	203
Total	4	794	68	1	1	868

4.5.1.6 Equity in Vulnerable Communities

Bridges are often relied on as critical infrastructure in the case of a hazard event, and therefore, the highest risk from structure collapse is if another hazard event occurs where a bridge is not accessible. Often times they are needed to access communities in order to respond to a hazard event, and they are also often relied on for evacuation routes. Communities that have bridges that are in poor condition, or that are closed will be the most impacted if a hazard event were to occur. Currently, there are bridges that are closed in Tinicum, Bristol, Warwick and Milford, which makes these communities most at risk to the cascading impacts of other hazard events in terms of response and evacuation.

4.5.2 Cyberterrorism

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).

4.5.2.1 Location and Extent

Cyber Terrorism acts can range from taking control of a host website, to using networked resources to directly cause destruction and harm. Table 4.5.4-1 includes the types and methods of cyberattacks as defined by the Pennsylvania Department of Homeland Security (PA DHS, 2017).

Table 4.5.4-1 Methods of Cyberattacks (PA DHS, 2017)

Threat	Description
Botnet (also zombies)	A collection of computers subject to be controlled by an outside party, usually without the knowledge of the owners, using secretly installed software robots. 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.
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 steal data.
Spoofing	Making a message or transaction appears 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
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 cyber terrorism 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 Centre County, 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.

4.5.4.2 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. In addition, attacks on institutions or organizations outside of the county or even the state can impact residents, businesses, and government services.

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

Table 4.5.4-2 Lifelines Most Likely to be Impacted by Cyberterrorism

Lifelines	Notes
	Community safety may be threatened, and government services targeted by cyberterrorism activities.
	Energy infrastructure may be a target for cyberterrorism activities.
	Hazardous materials facilities and operations may be targets for cyber terrorists.

4.5.4.3 Past Occurrence

Penn State University guards against and repels cyber threats every day. In 2015, the University discovered cyberattacks to both the Colleges of Engineering and Liberal Arts (Penn State News, 2015). FireEye, a cybersecurity forensic unit with Mandiant, was hired for remediation. Remediation refers to post cyberattack assessments made to determine what parts of the network are infected and need fixing. It was determined that these were sophisticated cyberattacks conducted with advanced malware. The attacks exposed thousands of passwords and other Personal Identification Information (PII). It was also determined that the earliest dates of intrusion were in 2012. The networks were taken offline for several days to find and remove malware. All students and faculty were asked to reset their passwords. There have been no significant attacks on the University in recent years.

Between 2012 and 2023, 24 cyberterrorism related incidents have been reported to PEMA-KC. Of these, 13 have occurred since 2021 (PEMA-KC, 2023). In 2017 there was an international cyber-attack, in 2018 there was a statewide cyber incident, and in 2021 a third-party vendor working with the PA Health Department on contact tracing compromised information on 72,000 people (Associated Press, 2021). Some of these events are described in more detail below. A large-scale attack was the Equifax data breach in 2017, which was estimated to potentially impact over 5.5 million residents of Pennsylvania and over 145.5 million nationally. The information accessed included names, Social Security numbers, birthdates, addresses, and driver's license numbers (PA Office of the Attorney General, 2017). 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.

In January 2024, Bucks County, Pennsylvania was hit by a ransomware attack attributed to the Akira cybercriminal group that disabled the county's computer-aided dispatch (CAD) system, forcing 911 dispatchers to temporarily rely

on manual processes; while 911 phone and radio services continued to operate, the outage disrupted automated call handling, responder tracking, and access to key law-enforcement databases, prompting county officials to work with state and federal partners to investigate and restore systems without paying a ransom (Mitman, 2024).

4.5.4.4 Future Occurrence

Cyber terrorism is an emerging hazard that has the potential to impact the County'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 as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1).

4.5.4.5 Vulnerability Assessment

Generally, cyber terrorism has no direct effect on the environment; however, the environment may be affected if a hazardous materials release occurred because of critical infrastructure failure as a result of cyber terrorism. Similarly, an act of cyber terrorism on a nuclear facility could have devastating environmental consequences if the plant suffered an intentional catastrophic failure. Please see Section 4.5.4 for more information on Hazardous Materials Release. 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 Commonwealth 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 Bucks County 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 Bucks County 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. Additionally, areas with higher concentrations of people, businesses, and critical infrastructure may be at higher risk.

4.5.4.6 Equity in Vulnerable Communities

Households with those 65 or older may be more susceptible to cyber-attacks as older adults have lower levels of digital literacy compared to younger generations. This makes them more susceptible to scams, phishing, and other forms of cybercrime. Municipalities in Bucks County with a large senior population are clustered in Upper Bucks and Central Bucks, especially river-adjacent and large-lot townships. This includes Solebury Township and New Hope Township. Additionally, 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. Lower Bucks County along the I-95 Corridor contains many of the lower income households within the County.

4.5.5 Dam Failure

Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides. The consequences of dam failures can include property and environmental damage and loss of life (Association of State Dam Safety Officers (ASDSO), 2018).

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

4.5.6 Environmental Hazards (Gas and Liquid Pipelines)

Pipeline failures are low-probability, potentially high-consequence events. Although gas and liquid pipeline failures are infrequent, the hazardous and inflammable materials released by these events can pose a significant threat to public safety and the built and natural environment. Explosions associated with pipeline failures, for example, can cause severe injury to nearby residents and destroy homes and other property.

4.5.6.1 Location and Extent

Pipelines are a vital component of the nation's infrastructure that transport two of the materials most essential to daily life – water and energy products. This profile addresses the risks posed by the gas and liquid pipeline systems that move energy products in Pennsylvania and across Bucks County. These pipeline systems cross moderately to densely populated areas as shown in Figure 4.3.18-1. Pipeline systems are defined by federal regulations as all parts of a pipeline facility through which a hazardous liquid or gas moves, including piping, valves, pumps or compressors, metering and delivery stations, and storage and breakout tanks. Although pipelines are typically located underground, they may also be located aboveground when dictated by operational considerations (such as connections to pump and compressor stations) or environmental conditions (such as geological characteristics) (FEMA, 2015).

Natural gas pipelines are the most common type of pipeline in the United States and serve to transport natural gas from the point of production to the point of use. Three major types of pipelines move natural gas: gathering lines, transmission lines, and distribution lines. Gathering lines are the pipelines that move natural gas from the production well to a processing facility. Gas transmission lines are the large pipelines (6 to 48 inches in diameter) that move natural gas from the processing facility to local distribution networks. Gas transmission lines are designed to transport natural gas long distances at high pressures (often 200 – 1,500 psi). There are approximately 300,000 miles of gas transmission pipelines in the United States. Gas distribution lines are the smaller gas mains and service lines (1/2 to 2 inches in diameter) that move natural gas from the transmission network directly to homes and businesses. Gas distribution pipelines are designed to transport natural gas shorter distances at relatively low pressures (PHMSA, n.d.; Pipeline Safety Trust, 2015). There are approximately 2.35 million miles of gas distribution lines in the United States (PHMSA, 2023).

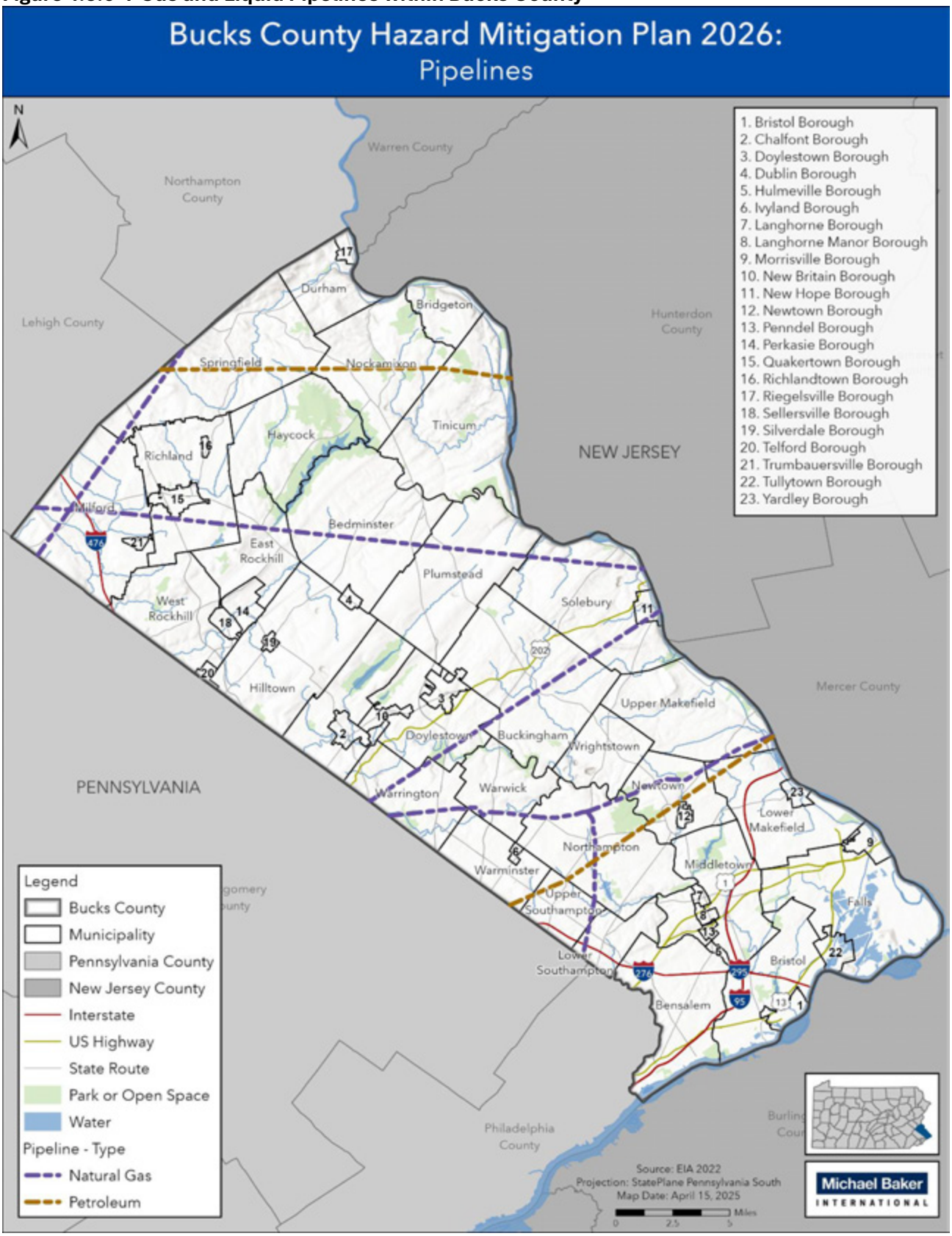
Liquid petroleum pipelines are the second most common type of pipeline in the United States, and serve to transport crude oil, refined product, and highly volatile liquids (HVLs) to local distribution networks. The system for doing so has the same three categories of pipelines. Gathering lines are typically 2 to 8 inches in diameter, transmission lines are larger, cross-country pipelines (8 to 48 inches in diameter), and refined product lines are similar but typically smaller than transmission ones at 8 to 42 inches in diameter. There are approximately 85,000 miles of crude oil transmission pipelines and 64,000 miles of refined product lines in the United States (PHMSA, 2022). Tanker trucks take the refined petroleum products the last few miles from the storage terminals to gas stations and homes.

Highly volatile liquids (HVLs) are products that are liquid when stored at a certain temperature or pressure, but quickly vaporize when released into the atmosphere. HVLs include natural gas liquids (NGLs), ethylene, propylene, and anhydrous ammonia. There are approximately 69,000 miles of HVL pipelines in the United States. These pipelines are becoming increasingly common as NGL production grows. NGLs are liquids produced at both natural

gas processing plants and oil refineries that have many uses spanning nearly all sectors of the economy. As the use of hydraulic fracturing to extract natural gas from shale gas formations expands, the production of NGLs is growing.

Figure 4.3.18-1 shows the gas and liquid pipeline that are located within Bucks County. Gas pipelines are located throughout the county while liquid pipelines can be found in the northern area of Bucks as well as the southern portion of the County. There are 243.3 miles of natural gas transmission pipeline and 47.5 miles of liquid petroleum pipeline within Bucks County, combining for a total of 290.8 miles of pipeline (PEMA, 2019).

Figure 4.5.6-1 Gas and Liquid Pipelines within Bucks County



4.5.6.2 Range of Magnitude

Many factors determine the magnitude of the hazard posed by pipeline failures, including the chemicals released, the failure mode of the pipeline, the operating conditions of the pipeline at the time of the incident, and the characteristics of the surrounding area. Impacts to life and property can result from inhalation or ingestion of toxins, exposure to a fire or explosion, or exposure to contaminated soils or drinking water (FEMA, 2015). These impacts may include:

- Serious injuries or fatalities;
- Damage to buildings and infrastructure;
- Disruptions and closures to critical infrastructure and services, including transportation routes and emergency medical services;
- Residential, commercial, and industrial energy supply losses;
- Disruption of local businesses and regional economies; and
- Displacement of residential communities or businesses.

Understanding pipeline threats and hazards begins with understanding the physical and chemical properties of the products in the pipeline. Natural gas is a clean-burning fuel that consists mostly of methane (94 percent) and ethane (2 percent). Some relevant characteristics of natural gas are summarized below:

- Although natural gas is nontoxic, it can cause asphyxiation if released in an enclosed area.
- Natural gas is combustible and natural gas fires produce large amounts of radiant heat.
- If an ignition source exists, natural gas releases can result in a sudden fire or explosion
- near the point of release. Once the release ends, however, the hazard declines very quickly as the gas disperses.
- If natural gas migrates into a building and accumulates inside, the hazard can persist for longer.

Liquid petroleum pipelines can carry many different crude oil and refined petroleum products with widely varying physical and chemical properties. Many of these products can spread over land and water, flowing into valleys, ravines, and waterways. Relevant characteristics of some liquid petroleum products are summarized below:

- Most crude oils are heavier and less toxic than refined petroleum products, and do not penetrate porous surfaces such as soil and sand. Because these products do not evaporate and tend to adhere to surfaces, however, they remain in the environment longer than refined products. Oil spills may take weeks, months, or even years to clean up.
- Most refined petroleum products are highly fluid, spready quickly over land or water surfaces, and penetrate porous surfaces. These products are usually flammable, and their volatile components can burn the eyes and skin and irritate the nose, eyes, and mouth. Because these products have a high evaporation rate and generally do not adhere to surfaces, they are easier to clean up. Refined petroleum products also produce vapors that are heavier than air. These vapors will collect in low areas.
- Highly volatile liquids are lighter than air and will form a vapor cloud when released to the atmosphere.
- Anhydrous ammonia is a highly volatile liquid that is particularly toxic and corrosive. It is typically transported under pressure as liquefied gas, and rapidly expands when released.

In some cases, natural hazard events can cause pipeline failures and/or complicate emergency response activities. When a pipeline failure occurs during a natural disaster, access to the pipeline may be restricted, waterlines for fire suppression may be compromised, and response personnel and resources may be limited. In addition, the potential threat of a pipeline failure can be amplified by natural hazard events that are accompanied by winds, thunderstorms,

or floods. These conditions can spread contamination more quickly and exacerbate the threat to local water supplies, air quality, soil, and agriculture. Other natural hazard events that can lead to pipeline failure include earthquakes, land subsidence, avalanches, lightning, fires, and severe winter storms (FEMA, 1997).

Several exacerbating or mitigating circumstances can affect the severity of a pipeline failure. Mitigating circumstances include precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. After a release, primary and secondary containment or shielding by sheltering-in-place can help protect people and property. Exacerbating circumstances can include weather conditions, the micro-meteorological effects of buildings and terrain, and lack of code compliance or maintenance. 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 pipelines and surrounding buildings. The potential impacts of pipeline failure on community lifelines are detailed in Table 4.5.6-1.

Table 4.5.6-1 Lifelines Most Likely to be Impacted by Gas and Liquid Pipelines

Lifelines	Notes
	Fire departments may be called into response and recovery if leaks or other issues result in explosions and fires.
	Environmental contamination from pipelines can impact agricultural operations and water supplies. Supply chains may also be impacted if there are disruptions to transportation infrastructure.
	Environmental impacts from pipelines could adversely impact communities, leading to more strain on the local healthcare system.
	Pipelines play an important role in energy production and distribution. Issues with pipelines may lead to additional challenges with energy production and availability.

4.5.6.3 Previous Occurrence

Pennsylvania has a long history of oil and gas well drilling and transportation and, though relatively infrequent, many accidents and incidents have occurred related to the extraction and transportation of these natural resources. No comprehensive list of oil and gas related incidents exist at the county level. The hazards associated with each incident vary widely and encompass damages including serious injury, explosion, fire, and water contamination.

Other prior year incident information for Pennsylvania can be found on the Pennsylvania Emergency Management Association website. The Pennsylvania Hazardous Material Emergency Planning and Response Act 1990-165 2018 Annual Report states there were 5 “Natural Gas Release” incidents and no pipeline breaks in 2018 in Bucks County. However, within the Commonwealth, there have been 654 Natural Gas Releases and 18 pipeline breaks in 2018 (PEMA, 2018). However, the definition of “Natural Gas Release” is not clearly defined, and pipeline break data was

only reported starting in the 2018 report. Natural gas release information was also only specified from "hazardous materials" incidents in the reports in 2018.

In December 2025, an apparent gas explosion collapsed part of a nursing home in Bucks County, Pennsylvania, leaving three women dead and 20 hospitalized. As of the time of this writing, the exact cause of the explosion has not been disclosed.

4.5.6.4 Potential for Future Occurrence

While many pipeline break incidents have occurred in Pennsylvania in the past, they are generally considered difficult to predict, especially within the boundaries of a county. An occurrence is largely dependent upon the accidental or intentional actions of a person or group. It is difficult to predict when and where environmental hazards related to gas pipelines will arise as they are often related to equipment failure and human error. Adequate monitoring through the DEP will reduce the likelihood of potential impacts to the community and to the environment. Overall, the probability of future environmental hazards events is likely as defined by the Risk Factor Methodology (See Section 4.6-1).

Pipeline failures are low-probability, potentially high-consequence events. Although gas and liquid pipeline failures are infrequent, the hazardous and inflammable materials released by these events can pose a significant threat to public safety and the built and natural environment. Explosions associated with pipeline failures, for example, can cause severe injury to nearby residents and destroy homes and other property. Corrosion is a major cause of pipeline failure, and is often associated with pipeline age (FEMA, 2015). Besides corrosion, pipeline failures can be caused by external impacts from farm or construction machinery, structural failures, mechanical defects, and natural hazards. Land development tends to increase the likelihood of external impacts and pipeline failure. Gas and liquid pipeline data and information is often difficult to share given the sensitivity and information sharing protections. This limits analysis that can be conducted for proposed and existing developments, community vulnerabilities and impact points. Land development without appropriate planning can also impede access to pipelines for operation and maintenance or emergency response.

4.5.6.5 Vulnerability Assessment

Table 4.5.6-2 lists the total structures and critical facilities vulnerable to a liquid or gas pipeline incident. The jurisdictions with the most structures located within 0.25 miles of a liquid or gas are Northampton Township (3,185 structures), Warrington Township (2,247 structures), and Richland Township (1,532 structures). The communities with the highest percent of total structures within 0.25 miles of a liquid or gas pipeline are New Hope Borough (34% of total structures), Milford Borough (26% of total structures), and Warrington Township (49% of total structures). The jurisdictions that have the most critical facilities within 0.25 miles of a liquid or gas pipeline are Northampton Township (13 critical facilities), and Doylestown Borough with 8 facilities within 0.25 miles of a liquid or gas pipeline.

Table 4.5.6-3 lists the vulnerability of each municipality to liquid and gas pipelines generalized by land use. There are in total 17,055 total structures located within 0.25 miles of a liquid or gas pipeline; the most vulnerable structure to the hazard is residential with 14,905 structures located near a pipeline. In addition, 42,001 people live within 0.25 miles of a liquid or gas pipeline (6% of the total population of the county). Not considered in the spatial analysis conducted are the Adelphia pipeline and compressor station that are in the process of being installed. The installation of this infrastructure will significantly impact the county, specifically Richland Township and West

Rockhill Township. As spatial data becomes available , this new pipeline will be incorporated more thoroughly into the vulnerability analysis.

Table 4.5.6-2 Structures and Critical Facilities Vulnerable Liquid and Gas Pipelines (Bucks County GIS, 2025) (DHS, 2025)

Municipality	Total Structures	Structures Within .25 Miles of a Liquid or Gas Pipeline	Percent Structures Within .25 Miles of a Liquid or Gas Pipeline	Total Population	Population Within 0.25 Mile of Pipeline	Pct Population Within 0.25 Mile of Pipeline	Total Critical Facilities	Critical Facilities Within .25 Miles of a Liquid or Gas Pipeline	Percent Critical Facilities Within .25 Miles of a Liquid or Gas
Bedminster Township	3,278	180	5%	7,518	330	4%	13	0	0%
Bensalem Township	22,234	0	0%	62,819		0%	66	0	0%
Bridgeton Township	790	0	0%	1,234		0%	3	0	0%
Bristol Borough	4,024	0	0%	9,861		0%	19	0	0%
Bristol Township	20,102	0	0%	54,369		0%	62	0	0%
Buckingham Township	8,367	842	10%	20,847	2,652	13%	22	1	5%
Chalfont Borough	1,788	0	0%	4,253		0%	8	0	0%
Doylestown Borough	3,486	0	0%	8,300		0%	23	0	0%
Doylestown Township	6,807	431	6%	17,971	2,325	13%	30	8	27%
Dublin Borough	741	0	0%	2,177		0%	4	0	0%
Durham Township	656	0	0%	1,094		0%	1	0	0%
East Rockhill Township	2,652	134	5%	5,819	232	4%	9	0	0%
Falls Township	11,954	0	0%	34,672		0%	62	0	0%
Haycock Township	1,232	0	0%	2,201		0%	2	0	0%
Hilltown Township	6,428	0	0%	16,395		0%	13	0	0%
Hulmeville Borough	410	0	0%	982		0%	3	0	0%
Ivyland Borough	359	0	0%	955		0%	5	0	0%
Langhorne Borough	568	0	0%	1,643		0%	4	0	0%
Langhorne Manor Borough	349	0	0%	1,496		0%	4	0	0%
Lower Makefield Township	13,771	403	3%	33,224	1,094	3%	29	0	0%
Lower Southampton Township	8,340	587	7%	20,487	1,013	5%	23	0	0%
Middletown Township	17,420	0	0%	45,967		0%	52	0	0%
Milford Township	4,430	1,170	26%	10,238	3,184	31%	12	5	42%
Morrisville Borough	3,241	0	0%	9,809		0%	13	0	0%
New Britain Borough	1,151	0	0%	2,836		0%	9	0	0%
New Britain Township	4,937	0	0%	12,223		0%	15	0	0%
New Hope Borough	1,446	489	34%	2,612	1,117	43%	8	1	13%
Newtown Borough	1,054	53	5%	2,268	120	5%	3	0	0%
Newtown Township	8,544	1,051	12%	19,904	2,631	13%	31	6	19%
Nockamixon Township	1,827	250	14%	3,379	340	10%	8	3	38%
Northampton Township	15,081	3,185	21%	39,915	8,236	21%	37	13	35%
Penndel Borough	743	0	0%	2,515		0%	5	0	0%
Perkasie Borough	3,546	0	0%	9,120		0%	8	0	0%

Municipality	Total Structures	Structures Within .25 Miles of a Liquid or Gas Pipeline	Percent Structures Within .25 Miles of a Liquid or Gas Pipeline	Total Population	Population Within 0.25 Mile of Pipeline	Pct Population Within 0.25 Mile of Pipeline	Total Critical Facilities	Critical Facilities Within .25 Miles of a Liquid or Gas Pipeline	Percent Critical Facilities Within .25 Miles of a Liquid or Gas
Plumstead Township	5,957	207	3%	14,038	396	3%	25	1	4%
Quakertown Borough	3,259	180	6%	9,359	728	8%	22	1	5%
Richland Township	6,621	1,532	23%	13,858	2,335	17%	11	1	9%
Richlandtown Borough	447	0	0%	1,353		0%	3	0	0%
Riegelsville Borough	465	0	0%	847		0%	2	0	0%
Sellersville Borough	1,914	0	0%	4,567		0%	6	0	0%
Silverdale Borough	337	0	0%	805		0%	3	0	0%
Solebury Township	4,322	447	10%	8,708	970	11%	11	1	9%
Springfield Township	2,719	507	19%	5,172	886	17%	8	6	75%
Telford Borough	763	0	0%	2,199		0%	1	0	0%
Tinicum Township	2,352	52	2%	3,818	74	2%	10	1	10%
Trumbauersville Borough	386	0	0%	883		0%	4	0	0%
Tullytown Borough	900	0	0%	2,268		0%	8	0	0%
Upper Makefield Township	3,775	416	11%	8,861	899	10%	9	0	0%
Upper Southampton Township	6,233	1,346	22%	15,269	3,342	22%	24	3	13%
Warminster Township	13,677	524	4%	33,603	1,518	5%	40	0	0%
Warrington Township	9,377	2,247	24%	25,639	5,871	23%	26	11	42%
Warwick Township	6,284	822	13%	14,851	1,708	12%	16	2	13%
West Rockhill Township	2,502	0	0%	5,446		0%	14	0	0%
Wrightstown Township	1,497	0	0%	3,286	0	0%	5	0	0%
Yardley Borough	1,350	0	0%	2,605		0%	6	0	0%
TOTAL	**256,893**	**17,055**	**7%**	**646,538**	**42,001**	**6%**	**860**	**64**	**7%**

Table 4.5.6-3 Structures Vulnerable to Liquid and Gas Pipelines by Generalized Land Use Type (Bucks County GIS, 2025)

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Road Crash Zones
Bedminster Township	3,278	44	7	0	3	1	119	1	0	0	0	5	180
Bensalem Township	22,234	0	0	0	0	0	0	0	0	0	0	0	0
Bridgeton Township	790	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Borough	4,024	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Township	20,102	0	0	0	0	0	0	0	0	0	0	0	0
Buckingham Township	8,367	6	18	1	0	3	774	3	3	3	0	31	842
Chalfont Borough	1,788	0	0	0	0	0	0	0	0	0	0	0	0

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Road Crash Zones
Doylestown Borough	3,486	0	0	0	0	0	0	0	0	0	0	0	0
Doylestown Township	6,807	2	29	0	20	0	364	0	1	0	0	15	431
Dublin Borough	741	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	656	0	0	0	0	0	0	0	0	0	0	0	0
East Rockhill Township	2,652	2	1	0	0	0	100	0	0	0	6	25	134
Falls Township	11,954	0	0	0	0	0	0	0	0	0	0	0	0
Haycock Township	1,232	0	0	0	0	0	0	0	0	0	0	0	0
Hilltown Township	6,428	0	0	0	0	0	0	0	0	0	0	0	0
Hulmeville Borough	410	0	0	0	0	0	0	0	0	0	0	0	0
Ivyland Borough	359	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Borough	568	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Manor Borough	349	0	0	0	0	0	0	0	0	0	0	0	0
Lower Makefield Township	13,771	5	1	0	1	1	376	0	6	2	1	10	403
Lower Southampton Township	8,340	0	67	35	1	2	475	0	2	0	0	5	587
Middletown Township	17,420	0	0	0	0	0	0	0	0	0	0	0	0
Milford Township	4,430	68	24	9	15	9	989	2	14	2	1	37	1,170
Morrisville Borough	3,241	0	0	0	0	0	0	0	0	0	0	0	0
New Britain Borough	1,151	0	0	0	0	0	0	0	0	0	0	0	0
New Britain Township	4,937	0	0	0	0	0	0	0	0	0	0	0	0
New Hope Borough	1,446	0	59	0	6	4	403	1	1	1	1	13	489
Newtown Borough	1,054	0	0	0	0	0	53	0	0	0	0	0	53
Newtown Township	8,544	8	141	0	10	6	841	1	12	5	2	25	1,051
Nockamixon Township	1,827	21	3	0	4	3	196	0	1	2	0	20	250
Northampton Township	15,081	10	83	9	15	1	3,004	2	25	10	1	25	3,185
Penndel Borough	743	0	0	0	0	0	0	0	0	0	0	0	0
Perkasie Borough	3,546	0	0	0	0	0	0	0	0	0	0	0	0
Plumstead Township	5,957	28	1	0	3	0	166	0	1	2	1	5	207
Quakertown Borough	3,259	0	16	0	3	3	149	0	5	0	0	4	180
Richland Township	6,621	0	20	3	3	3	1,170	1	63	5	0	264	1,532
Richlandtown Borough	447	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	465	0	0	0	0	0	0	0	0	0	0	0	0
Sellersville Borough	1,914	0	0	0	0	0	0	0	0	0	0	0	0
Silverdale Borough	337	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	4,322	27	0	0	2	0	378	1	5	1	0	33	447
Springfield Township	2,719	40	22	2	9	1	350	3	7	8	0	63	507
Telford Borough	763	0	0	0	0	0	0	0	0	0	0	0	0
Tinicum Township	2,352	5	0	0	1	4	17	1	0	0	0	24	52
Trumbauersville Borough	386	0	0	0	0	0	0	0	0	0	0	0	0
Tullytown Borough	900	0	0	0	0	0	0	0	0	0	0	0	0
Upper Makefield Township	3,775	11	0	0	3	0	354	0	0	0	2	46	416
Upper Southampton Township	6,233	1	65	0	5	5	1,251	0	5	2	0	12	1,346

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Road Crash Zones
Warminster Township	13,677	0	31	0	1	0	486	0	1	0	0	5	524
Warrington Township	9,377	11	35	0	18	12	2,125	1	20	6	2	17	2,247
Warwick Township	6,284	5	2	14	6	4	765	1	4	1	3	17	822
West Rockhill Township	2,502	0	0	0	0	0	0	0	0	0	0	0	0
Wrightstown Township	1,497	0	0	0	0	0	0	0	0	0	0	0	0
Yardley Borough	1,350	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	256,893	294	625	73	129	62	14,905	18	176	50	20	701	17,055

4.5.6.6 Equity in Vulnerable Communities

Seniors, low-income households, and renters may be more susceptible to gas and liquid pipeline incidents because they are less likely to be aware of pipeline locations, emergency procedures, or warning signs of a pipeline failure. These populations may also lack the financial resources needed for temporary relocation or property repair following a pipeline incident. In Bucks County, pipeline infrastructure crosses both suburban and developed areas, including sections of Lower Bucks and Central Bucks, where vulnerable populations are present in older residential neighborhoods near utility corridors. Communities with limited housing options and higher renter occupancy face greater challenges in responding to and recovering from pipeline-related emergencies.

4.5.7 Environmental Hazards: Hazardous Materials Release

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.

4.5.7.1 Location and Extent

Facilities that use, manufacture, or store hazardous materials in Pennsylvania 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), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities. EPCRA was designed to ensure that state and local communities are prepared to respond to potential chemical accidents through Local Emergency Planning Committees (LEPCs). LEPCs are charged with developing emergency response plans for SARA Title III facilities; these plans cover the location and extent of hazardous materials, establish evacuation plans, response procedures, methods to reduce the magnitude of a materials release, and establish methods and schedules for training and exercises. There are 381 SARA Title III – Tier II reporting facilities in Bucks County as of 2018 (PEMA, 2018). SARA Title III facilities are protected data, and this is the most recent information at this time.

Because SARA Title III facilities are covered under their own unique planning process and are continually evaluated through the LEPC, this Hazard Mitigation Plan will focus on the Environmental Protection Agency (EPA)-identified hazardous materials sites. This dataset, publicly available at http://www.epa.gov/enviro/geo_data.html, includes a number of materials facilities including:

- Superfund National Priorities List (NPL) sites,
- RCRAInfo (EPA and state treatment, storage, disposal) facilities,
- Toxic Release Inventory System (TRI) sites,
- Integrated Compliance Information System (ICIS) and Permit Compliance System (PCS) - National Pollutant Discharge Elimination System (NPDES) Majors,
- RCRAInfo - Large Quantity Generators (LQG),
- Air Facility System (AFS) - Major discharges of air pollutants,
- RCRAInfo - Corrective Actions,
- Risk Management Plan,
- Section Seven Tracking System Sites (Pesticides), and
- ACRES - Brownfields Properties.

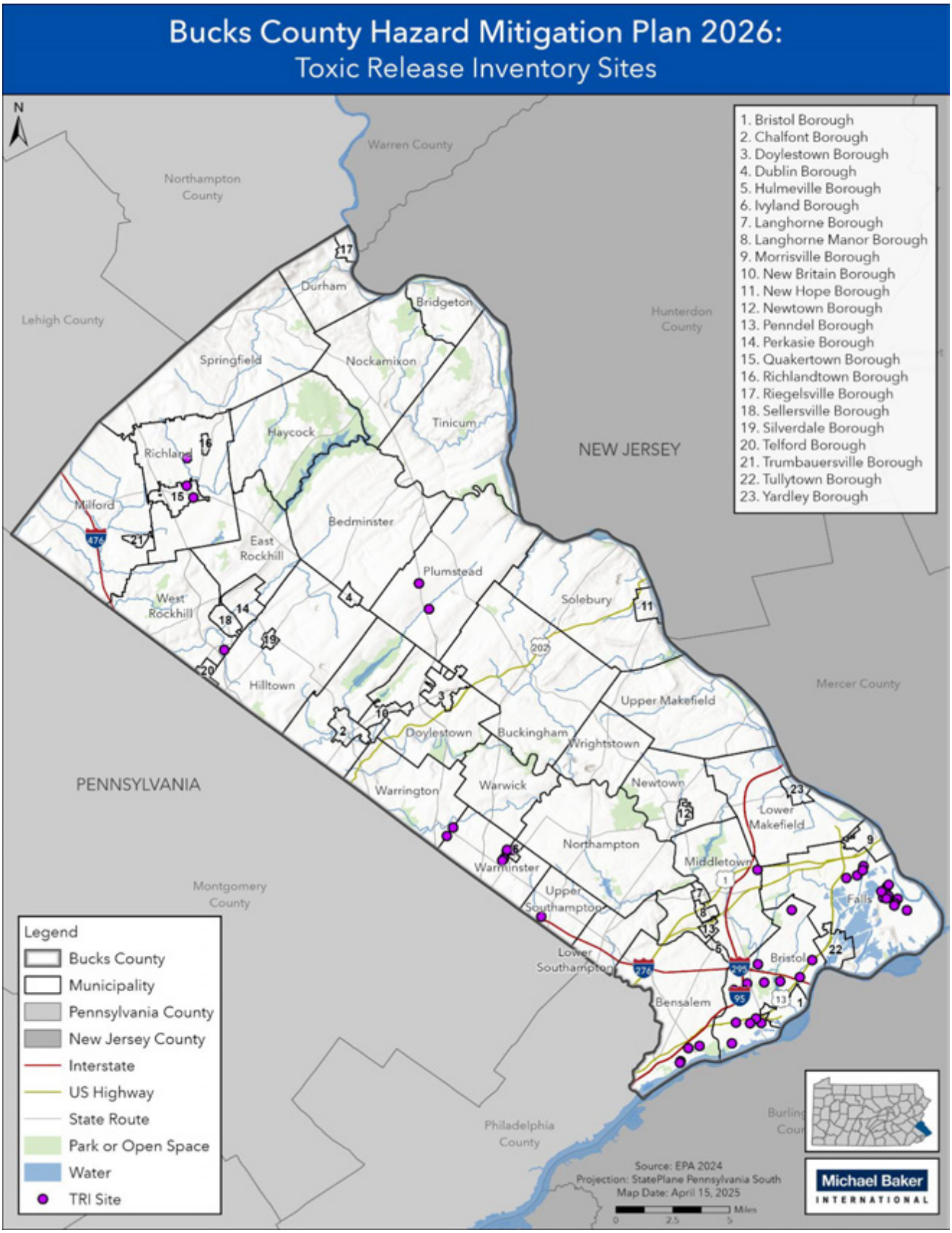
Using this dataset will help to provide a more complete picture of the risk of hazardous materials releases in the County. Bucks County has 49 EPA-identified hazardous materials sites throughout the County, shown in Figure 4.5.6-1. Bristol and Falls Townships have the most hazardous materials facilities within the County. Other municipalities

and places hosting TRI sites include Bensalem Township, Ivyland Borough, Middletown Township, Plumstead Township, Quakertown Borough, Richland Township, Upper Southampton Township, Warminster Township, Warrington Township, and West Rockhill Township.

Transportation of hazardous materials on highways involves tanker trucks or trailers. Unsurprisingly, large trucks are responsible for the greatest number of hazard material release incidents. Hazardous material releases from rail transport are also of concern due to collisions and derailments that result in large spills.

The development pattern in Bucks County is focused along the major transportation routes, including, for example, Interstates 476, 276, and 95. Interstate 276 is a six-lane highway in a portion of the County before it tapers down to a four-lane highway and, as it is the major east-west limited access facility through the County; it typically has large trucks transporting a variety of materials, including hazardous waste on it. Interstate 95 is the major north-south limited access facility through the County and also carries a significant amount of truck traffic. These major transportation routes are also shown on Figure 4.5.6-1.

Figure 4.5.7-1 Bucks County Toxic Release Inventory Facilities.



4.5.4.2 Range of Magnitude

Hazardous material releases can 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 waste. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

With hazardous material release, 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, or characteristics that can enhance or magnify the effects of 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.

Whether or not a hazardous materials site is contained in the SFHA is also a concern, as there could be larger-scale water contamination during a flood event should the flood compromise the production or storage of hazardous chemicals. Such a situation could be considered a worst-case scenario for hazardous materials release because it could swiftly move toxic chemicals throughout a water supply and across great distances.

The severity of a given incident is dependent not only on the circumstances described above, but also on 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 (e.g. centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

The potential impacts of hazardous materials release on community lifelines are as follows:

Table 4.5.7-1 Most Likely Lifelines Impacted by Hazardous Materials Release

Lifeline	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.

Lifeline	Notes
	Releases can have adverse impacts on communities, leading to more strain on the local healthcare system.
	Transportation lifeline as release itself or resulting explosions and fires.

4.5.7.2 Previous Occurrence

The EPA TRI records indicate that there has been a total of 430,667 pounds of chemicals released from fixed sites in Bucks County in 2024 (US EPA, 2026). As a majority of hazardous material release incidents occur in transit, the Pipeline and Hazardous Materials Safety Administration (PHMSA) of the U.S. Department of Transportation tracks hazardous materials releases as a result of transportation accidents. Table 4.5.7-2 lists the reported incidents from PHMSA in Bucks County from June 2, 2015 to present as of January 2026, with a total of 291 incidents occurring since the previous plan update. For incidents occurring prior to 2015, please consult the 2021 update to the Bucks County HMP.

Table 4.5.7-2 Previous Hazardous Materials Incidents in Transportation in Bucks County Between 2015 - 2024 (PHMSA, 2026).

Material Released	Date of Incident	Mode of Transportation
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler, And Liquid Lacquer Base	6/22/2015	Highway
Caustic Alkali Liquids, N.O.S.	6/24/2015	Highway
Styrene Monomer, Stabilized	7/23/2015	Highway
Petroleum Distillates, N.O.S. Or Petroleum Products, N.O.S.	7/27/2015	Highway
Petroleum Gases, Liquefied Or Liquefied Petroleum Gas	9/3/2015	Rail
Fuel Oil (No. 1, 2, 4, 5, Or 6)	9/18/2015	Highway
Printing Ink, Flammable Or Printing Ink Related Material (Including Printing Ink Thinning Or Reducing Compound), Flammable	10/5/2015	Highway
Compounds, Cleaning Liquid	10/8/2015	Highway
Styrene Monomer, Stabilized	10/26/2015	Highway
Corrosive Liquid, Acidic, Organic, N.O.S.	10/27/2015	Highway
Extracts, Flavoring, Liquid	10/27/2015	Highway
Sodium Hydroxide, Solid	10/28/2015	Highway
Corrosive Liquid, Acidic, Organic, N.O.S.	11/22/2015	Highway
Corrosive Liquid, Basic, Inorganic, N.O.S.	12/28/2015	Highway
Carbon Disulfide	12/29/2015	Highway
Sodium Hydroxide, Solid	2/8/2016	Highway
Methanol	3/10/2016	Highway
Hydrochloric Acid	4/7/2016	Highway
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	4/25/2016	Highway
Isopropenylbenzene	4/25/2016	Rail
Extracts, Flavoring, Liquid	4/27/2016	Highway

Material Released	Date of Incident	Mode of Transportation
Nitrocellulose, Solution, Flammable With Not More Than 12.6 Percent Nitrogen, By Mass, And Not More Than 55 Percent Nitrocellulose	6/23/2016	Highway
Corrosive Liquid, Basic, Organic, N.O.S.	6/29/2016	Highway
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	8/10/2016	Highway
Sodium Hydroxide, Solid	8/10/2016	Highway
Corrosive Liquids, Oxidizing, N.O.S.	8/26/2016	Highway
Petroleum Gases, Liquefied Or Liquefied Petroleum Gas	9/3/2016	Rail
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	9/17/2016	Highway
Elevated Temperature Liquid, Flammable, N.O.S., With Flash Point Above 37.8 C, At Or Above Its Flash Point	9/19/2016	Highway
Phenol, Molten	9/21/2016	Rail
Petroleum Distillates, N.O.S. Or Petroleum Products, N.O.S.	10/9/2016	Highway
Paint Related Material Including Paint Thinning, Drying, Removing, Or Reducing Compound	11/3/2016	Highway
Dioxane	12/1/2016	Highway
Sodium Hydroxide, Solid	1/17/2017	Highway
Pine Oil	1/25/2017	Highway
Compounds, Tree Killing, Liquid Or Compounds, Weed Killing, Liquid	2/6/2017	Highway
Sodium Hydroxide, Solid	2/22/2017	Highway
Butyl Acrylates, Stabilized	2/24/2017	Highway
Fuel Oil (No. 1, 2, 4, 5, Or 6)	3/10/2017	Highway
Resin Solution, Flammable	3/28/2017	Highway
Styrene Monomer, Stabilized	4/6/2017	Rail
Fuel Oil (No. 1, 2, 4, 5, Or 6)	4/19/2017	Rail
Ethanol And Gasoline Mixture Or Ethanol And Motor Spirit Mixture Or Ethanol And Petrol Mixture, With More Than 10% Ethanol	5/5/2017	Highway
Corrosive Liquid, Basic, Inorganic, N.O.S.	6/15/2017	Highway
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	7/7/2017	Highway
Corrosive Liquid, Basic, Inorganic, N.O.S.	7/14/2017	Highway
Adhesives, Containing A Flammable Liquid	7/14/2017	Highway
Sodium Hydroxide, Solution	7/17/2017	Highway
Corrosive Liquid, Basic, Inorganic, N.O.S.	8/7/2017	Highway
Aerosols, Flammable, (Each Not Exceeding 1 L Capacity)	8/14/2017	Highway
Flammable Liquids, Toxic, N.O.S.	8/17/2017	Highway
Printing Ink, Flammable Or Printing Ink Related Material (Including Printing Ink Thinning Or Reducing Compound), Flammable	8/18/2017	Highway
Potassium Chlorate	8/25/2017	Highway
Batteries, Wet, Filled With Acid, Electric Storage	9/18/2017	Highway
Fuel Oil (No. 1, 2, 4, 5, Or 6)	9/25/2017	Highway
Naphtha	10/6/2017	Highway
Aerosols, Flammable, (Each Not Exceeding 1 L Capacity)	10/9/2017	Highway
Sodium Hydroxide, Solution	11/28/2017	Highway
Diacetone Alcohol	1/12/2018	Highway
Petroleum Distillates, N.O.S. Or Petroleum Products, N.O.S.	1/19/2018	Highway
Self-Heating, Solid, Organic, N.O.S.	3/28/2018	Highway
Isopropanol Or Isopropyl Alcohol	4/27/2018	Highway

Material Released	Date of Incident	Mode of Transportation
Isopropanol Or Isopropyl Alcohol	4/30/2018	Highway
Toxic Solids, Organic, N.O.S.	5/3/2018	Highway
Batteries, Wet, Filled With Acid, Electric Storage	5/3/2018	Highway
Hydrofluorosilicic Acid	5/15/2018	Highway
Corrosive Liquids, N.O.S.	6/5/2018	Highway
Sodium Borohydride And Sodium Hydroxide Solution, With Not More Than 12 Percent Sodium Borohydride And Not More Than 40 Percent Sodium Hydroxide By Mass	6/7/2018	Highway
Hydrochloric Acid	6/13/2018	Rail
Sodium Hydroxide, Solution	7/17/2018	Highway
Ethyl Mercaptan	10/26/2018	Highway
Paraformaldehyde	11/1/2018	Highway
Isopropenylbenzene	11/21/2018	Rail
Petroleum Distillates, N.O.S. Or Petroleum Products, N.O.S.	12/4/2018	Highway
Corrosive Liquid, Basic, Organic, N.O.S.	12/6/2018	Highway
Ethanol Or Ethyl Alcohol Or Ethanol Solutions Or Ethyl Alcohol Solutions	12/15/2018	Highway
Isopropenylbenzene	12/19/2018	Rail
Resin Solution, Flammable	1/9/2019	Highway
Adhesives, Containing A Flammable Liquid	1/14/2019	Highway
Potassium Hydroxide, Solid	2/7/2019	Highway
Batteries, Wet, Filled With Acid, Electric Storage	2/15/2019	Highway
Toxic Solids, Organic, N.O.S.	3/5/2019	Highway
Toxic Solids, Organic, N.O.S.	3/8/2019	Highway
Extracts, Flavoring, Liquid	3/28/2019	Highway
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	5/6/2019	Highway
Methyl Isobutyl Ketone	5/6/2019	Highway
Resin Solution, Flammable	5/30/2019	Highway
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	10/11/2019	Highway
Cyclohexane	10/11/2019	Highway
Isopropanol Or Isopropyl Alcohol	10/21/2019	Highway
Vinyl Acetate, Stabilized	10/28/2019	Highway
Methanol	11/6/2019	Highway
Hydrochloric Acid	11/22/2019	Highway
Flammable Liquids, N.O.S.	2/7/2020	Highway
Flammable Liquids, Toxic, N.O.S.	4/17/2020	Highway
Flammable Liquids, N.O.S.	5/27/2020	Highway
Batteries, Wet, Filled With Acid, Electric Storage	5/27/2020	Highway
Combustible Liquid, N.O.S.	6/19/2020	Highway
Sodium Hydroxide, Solution	8/13/2020	Highway
Sodium Hydroxide, Solution	8/13/2020	Highway
Sodium Persulfate	9/28/2020	Highway
Corrosive Liquids, N.O.S.	10/8/2020	Highway
Sodium Nitrite	10/9/2020	Highway
Ethanol Or Ethyl Alcohol Or Ethanol Solutions Or Ethyl Alcohol Solutions	10/15/2020	Highway

Material Released	Date of Incident	Mode of Transportation
Compressed Gas, N.O.S	11/2/2020	Highway
Styrene Monomer, Stabilized	1/5/2021	Rail
Corrosive Liquids, N.O.S.	4/29/2021	Highway
Alcohols, N.O.S.	4/27/2021	Highway
Hydrochloric Acid	6/10/2021	Rail
Petroleum Distillates, N.O.S. Or Petroleum Products, N.O.S.	9/8/2021	Highway
Combustible Liquid, N.O.S.	9/13/2021	Highway
Chlorite Solution	10/1/2021	Highway
Environmentally Hazardous Substances, Solid, N.O.S.	11/19/2021	Highway
Dichloromethane	2/9/2022	Highway
Toxic Liquids, Flammable, Organic, N.O.S.	3/4/2022	Highway
Toxic Liquids, Flammable, Organic, N.O.S.	3/4/2022	Highway
Ethanol Or Ethyl Alcohol Or Ethanol Solutions Or Ethyl Alcohol Solutions	2/22/2022	Highway
Ethanol Or Ethyl Alcohol Or Ethanol Solutions Or Ethyl Alcohol Solutions	2/22/2022	Highway
Ethanol Or Ethyl Alcohol Or Ethanol Solutions Or Ethyl Alcohol Solutions	2/22/2022	Highway
Corrosive Solids, N.O.S.	5/25/2022	Highway
Sulfuric Acid With Not More Than 51% Acid	5/9/2022	Highway
Methyl Acetate	7/6/2022	Highway
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	10/3/2022	Highway
Batteries, Wet, Filled With Acid, Electric Storage	10/10/2022	Highway
Batteries, Wet, Filled With Acid, Electric Storage	10/10/2022	Highway
Corrosive Solid, Acidic, Inorganic, N.O.S.	10/10/2022	Highway
Bisulfites, Aqueous Solutions, N.O.S.	12/28/2022	Highway
Amines, Liquid, Corrosive, N.O.S. Or Polyamines, Liquid, Corrosive, N.O.S.	12/29/2022	Highway
Amines, Liquid, Corrosive, N.O.S. Or Polyamines, Liquid, Corrosive, N.O.S.	3/1/2023	Highway
Sodium Hydroxide, Solution	2/22/2023	Highway
Adhesives, Containing A Flammable Liquid	10/13/2023	Highway
Methanol	2/8/2024	Highway
Methanol	2/12/2024	Highway
Resin Solution, Flammable	3/25/2024	Highway
Paint Including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler And Liquid Lacquer Base	5/24/2024	Highway

4.5.7.3 Potential for Future Occurrence

While many incidents involving hazardous materials releases have occurred in Bucks County in the past, they are generally difficult to predict. Any occurrence is largely dependent upon the accidental or intentional actions of a person or group. At the same time, though, the County cites increases in truck-based shipping as a potential source for expanding numbers of hazardous materials releases in Bucks County. The future occurrence of environmental hazards can be considered highly likely as defined by the Risk Factor methodology probability criteria (see Table 4.6-1).

4.5.7.4 Vulnerability Assessment

Jurisdictions that are home to one or more hazardous materials facilities should be considered vulnerable to hazardous materials releases from fixed facilities. Table 4.5.7-3 illustrates the structures vulnerable to hazardous material facilities – specifically structures within 1.5 miles of a hazardous material facility – as well as critical facilities located within 1.5 miles of a hazardous material facility. The jurisdictions without TRI facilities have much lower relative vulnerability to fixed hazardous materials incidents.

Populations in and around the communities that are home to TRI sites are more vulnerable to facility releases, particularly those within 1.5 miles of the facility. Bristol Township has the highest number of addressable structures within 1.5 miles with 20,102 and the highest number of critical facilities vulnerable to fixed hazardous materials incidents with 62 Warminster follows with 13,011 structures and 40 critical facilities. Third is Falls Township with 11,954 Structures and 59 critical facilities. Other municipalities that are home to a high number of critical facilities with 20 or more vulnerable to fixed hazardous materials incidents include Bensalem, Richland, and Middletown Townships.

Table 4.5.7-3 Exposure of Structures to Hazardous Material Sites (Bucks County GIS, 2024) (DHS, 2025)

Municipality	Total structures	Structures vulnerable to hazardous material facilities (within 1.5 miles)	Percent Structures Vulnerable to Hazardous Material Facilities (within 1.5 miles)	Total critical facilities	Critical Facilities Vulnerable to hazardous material facilities (within 1.5 miles)	Percent Critical Facilities Vulnerable to Hazardous Material Facilities (within 1.5 miles)
Bedminster Township	3,278	80	2%	13	0	0%
Bensalem Township	22,234	9,916	45%	66	25	38%
Bridgeton Township	790	0	0%	3	0	0%
Bristol Borough	4,024	4,009	100%	19	17	89%
Bristol Township	20,102	20,102	100%	62	62	100%
Buckingham Township	8,367	0	0%	22	0	0%
Chalfont Borough	1,788	0	0%	8	0	0%
Doylestown Borough	3,486	0	0%	23	0	0%
Doylestown Township	6,807	0	0%	30	0	0%
Dublin Borough	741	0	0%	4	0	0%
Durham Township	656	0	0%	1	0	0%
East Rockhill Township	2,652	0	0%	9	0	0%
Falls Township	11,954	9,778	82%	62	59	95%
Haycock Township	1,232	0	0%	2	0	0%
Hilltown Township	6,428	1,572	24%	13	0	0%
Hulmeville Borough	410	53	13%	3	0	0%
Ivyland Borough	359	359	100%	5	5	100%
Langhorne Borough	568	0	0%	4	0	0%
Langhorne Manor Borough	349	0	0%	4	0	0%
Lower Makefield Township	13,771	2,799	20%	29	3	10%
Lower Southampton Township	8,340	0	0%	23	0	0%

Municipality	Total structures	Structures vulnerable to hazardous material facilities (within 1.5 miles)	Percent Structures Vulnerable to Hazardous Material Facilities (within 1.5 miles)	Total critical facilities	Critical Facilities Vulnerable to hazardous material facilities (within 1.5 miles)	Percent Critical Facilities Vulnerable to Hazardous Material Facilities (within 1.5 miles)
Middletown Township	17,420	5,693	33%	52	12	23%
Milford Township	4,430	0	0%	12	0	0%
Morrisville Borough	3,241	2,665	82%	13	12	92%
New Britain Borough	1,151	0	0%	9	0	0%
New Britain Township	4,937	0	0%	15	0	0%
New Hope Borough	1,446	0	0%	8	0	0%
Newtown Borough	1,054	0	0%	3	0	0%
Newtown Township	8,544	0	0%	31	0	0%
Nockamixon Township	1,827	0	0%	8	0	0%
Northampton Township	15,081	716	5%	37	0	0%
Penndel Borough	743	0	0%	5	0	0%
Perkasie Borough	3,546	121	3%	8	0	0%
Plumstead Township	5,957	2,933	49%	25	19	76%
Quakertown Borough	3,259	3,119	96%	22	22	100%
Richland Township	6,621	4,212	64%	11	9	82%
Richlandtown Borough	447	447	100%	3	3	100%
Riegelsville Borough	465	0	0%	2	0	0%
Sellersville Borough	1,914	1,371	72%	6	4	67%
Silverdale Borough	337	0	0%	3	0	0%
Solebury Township	4,322	0	0%	11	0	0%
Springfield Township	2,719	0	0%	8	0	0%
Telford Borough	763	708	93%	1	1	100%
Tinicum Township	2,352	0	0%	10	0	0%
Trumbauersville Borough	386	0	0%	4	0	0%
Tullytown Borough	900	742	82%	8	6	75%
Upper Makefield Township	3,775	0	0%	9	0	0%
Upper Southampton Township	6,233	3,834	62%	24	18	75%
Warminster Township	13,677	13,011	95%	40	40	100%
Warrington Township	9,377	3,162	34%	26	14	54%
Warwick Township	6,284	1,543	25%	16	1	6%
West Rockhill Township	2,502	815	33%	14	5	36%
Wrightstown Township	1,497	0	0%	5	0	0%
Yardley Borough	1,350	0	0%	6	0	0%
TOTAL	256,893	93,760	36%	860	337	39%

Table 4.5.7-4 Exposure of Populations to Hazardous Material Sites (Bucks County GIS, 2024) (DHS, 2025)

Municipality	Total Population	Population within 1.5 mile of TRI Site	Population within 1.5 mile of TRI Site
Bedminster Township	7,518	93	1%
Bensalem Township	62,819	22,824	36%
Bridgeton Township	1,234	0	0%
Bristol Borough	9,861	9,753	99%
Bristol Township	54,369	54,369	100%
Buckingham Township	20,847	0	0%
Chalfont Borough	4,253	0	0%
Doylestown Borough	8,300	0	0%
Doylestown Township	17,971	0	0%
Dublin Borough	2,177	0	0%
Durham Township	1,094	0	0%
East Rockhill Township	5,819	0	0%
Falls Township	34,672	26,657	77%
Haycock Township	2,201	0	0%
Hilltown Township	16,395	4,322	26%
Hulmeville Borough	982	214	22%
Ivyland Borough	955	955	100%
Langhorne Borough	1,643	0	0%
Langhorne Manor Borough	1,496	0	0%
Lower Makefield Township	33,224	5,596	17%
Lower Southampton Township	20,487	0	0%
Middletown Township	45,967	15,978	35%
Milford Township	10,238	0	0%
Morrisville Borough	9,809	8,417	86%
New Britain Borough	2,836	0	0%
New Britain Township	12,223	0	0%
New Hope Borough	2,612	0	0%
Newtown Borough	2,268	0	0%
Newtown Township	19,904	0	0%
Nockamixon Township	3,379	0	0%
Northampton Township	39,915	1,073	3%
Penndel Borough	2,515	0	0%
Perkasie Borough	9,120	520	6%
Plumstead Township	14,038	7,248	52%
Quakertown Borough	9,359	8,857	95%
Richland Township	13,858	8,062	58%
Richlandtown Borough	1,353	1,353	100%
Riegelsville Borough	847	0	0%
Sellersville Borough	4,567	3,320	73%
Silverdale Borough	805	0	0%

Municipality	Total Population	Population within 1.5 mile of TRI Site	Population within 1.5 mile of TRI Site
Solebury Township	8,708	0	0%
Springfield Township	5,172	0	0%
Telford Borough	2,199	2,037	93%
Tinicum Township	3,818	0	0%
Trumbauersville Borough	883	0	0%
Tullytown Borough	2,268	1,531	68%
Upper Makefield Township	8,861	0	0%
Upper Southampton Township	15,269	8,529	56%
Warminster Township	33,603	31,031	92%
Warrington Township	25,639	8,465	33%
Warwick Township	14,851	3,090	21%
West Rockhill Township	5,446	2,286	42%
Wrightstown Township	3,286	0	0%
Yardley Borough	2,605	0	0%
TOTAL	**646,538**	**236,580**	**37%**

4.5.7.5 Equity In Vulnerable Communities

Low-income households, non-English speaking populations, and individuals without access to personal transportation are more vulnerable to hazardous materials incidents due to potential barriers to risk communication, evacuation, and emergency response. These populations may also have limited access to resources needed for long-term health monitoring or recovery following exposure. In Bucks County, communities with elevated vulnerability often overlap with industrial land uses, major highways, and rail corridors, particularly in Lower Bucks County along the I 95, Route 13, and rail corridors. Municipalities such as Bristol Township, Tullytown Borough, Morrisville Borough, and Falls Township contain both higher concentrations of vulnerable populations and greater exposure to hazardous materials transportation routes.

4.5.8 Substance Use Disorder

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

4.5.8.1 Location and Extent

Substance use disorder occurs when an individual becomes physically dependent on an opioid, a class of drugs that reduce pain. Opioid is used as a broad term and includes opiates, which are drugs naturally extracted from certain types of poppy plants and narcotics. Opioids can also be synthetically made to emulate opium. According to the Drug Enforcement Administration (DEA) opioids come in various forms: tablets, capsules, skin patches, powder, chunks in various colors from white to shades of brown and black, liquid form for oral use and injection, syrups, suppositories, and lollipops. The Centers for Disease Control and Prevention (CDC) defines the following as the three most common types of opioids:

- Prescription Opioids: Opioid medication prescribed by doctors for pain treatment. Prescription opioids can be synthetic-oxycodone (OxyContin) or hydrocodone (Vicodin), or natural, like morphine.

- Fentanyl: A powerful synthetic opioid that is 50 to 100 times more powerful than morphine and is used for treating severe pain. Illegally made and distributed fentanyl is becoming more prevalent.

- Heroin: An illegal natural opioid processed from morphine and is also becoming more commonly used in the United States. Opioids are highly addictive. They block the body's ability to feel pain and can create a sense of euphoria.

Additionally, individuals often build a tolerance to opioids, which can lead to misuse and overdose. Fentanyl and fentanyl-related substances are hazardous materials and should be treated as such. Contact with fentanyl can impact first responders and family and friends of opioid users. Depending on the potency of the drug, it can take as a little as the equivalent of a few grams of table salt to cause health complications (DEA, 2020). Substance use disorder impacts the entire Commonwealth. Nationally, Pennsylvania is among four of the hardest hit states from opioid-related deaths, along with West Virginia, Ohio, and New Hampshire.

People under the age of 35 have been particularly vulnerable to opioid abuse. According to a joint intelligence report prepared by the DEA Philadelphia Division and the University of Pittsburgh, between 2015 and 2016 in Pennsylvania, fentanyl use increased 380 percent among 15- to 24-year-olds while heroin use increased 970 percent in the 25- to 34-year age range. The report also documented a higher percentage of drug-related deaths attributed to opioid use in Pennsylvania's rural communities at 42 percent, compared to 34 percent in urban communities (DEA Philadelphia Division, 2017).

According to a recent study, environmental scientists at the Cary Institute of New York found traces of opioid 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. However, the ecological and environmental impacts are unknown. The EPA suggests that while the risks of pharmaceuticals found in wastewater, ambient water, and drinking water is low, further

research is needed (US EPA, 2014a). A study published in 2022 which tested 52 drinking water sources in the US found hydrocodone and codeine in 40% of sampled sources. Fentanyl was not found in any of the sampled locations (Skaggs and Logue, 2022).

4.5.8.2 Range of Magnitude

Substance use disorder can lead to overdose, which can be fatal. The most dangerous side effect of an opioid overdose is depressed breathing. The lack of oxygen to the brain causes permanent brain damage, leading to organ failure, and eventually, death. Signs and symptoms include respiratory depression, drowsiness, disorientation, pinpoint pupils, and clammy skin. Substance use disorder can also be passed from mother to child in the womb. This condition, known as neonatal abstinence syndrome (NAS), has increased five-fold from 2000 to 2012, according to the National Institute of Drug Abuse (NIDA), resulting in an estimated 22,000 babies in the United States born with this condition (NIDA, 2019). Between 2010 and 2017, the number of babies diagnosed with NAS increased by 82% (Hirai et al, 2021). Data from 2020 suggests that 59 children are diagnosed with NAS in the United States every day (CDC 2024). First responders – paramedics, police officers, and fire fighters, are also affected by Pennsylvania's substance use disorder crisis. In addition to the crisis consuming time and resources, first responders also face exposure risk, particularly to synthetic fentanyl. According to the DEA, it takes two to three milligrams of fentanyl to induce respiratory depression, arrest, and possibly death. 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 (Rushton, 2019).

In 2018, Centre County experienced three opioid-related deaths in six days. Local Law enforcement and the Centre County District Attorney's Office warned citizens about a possible rise in the sale of lethal illegal narcotics in the area (Rushton, 2019). In 2022, Centre County saw twenty-two deaths resulting from overdoses (Pallotto, 2023). The potential impacts of substance abuse on community lifelines are as follows:

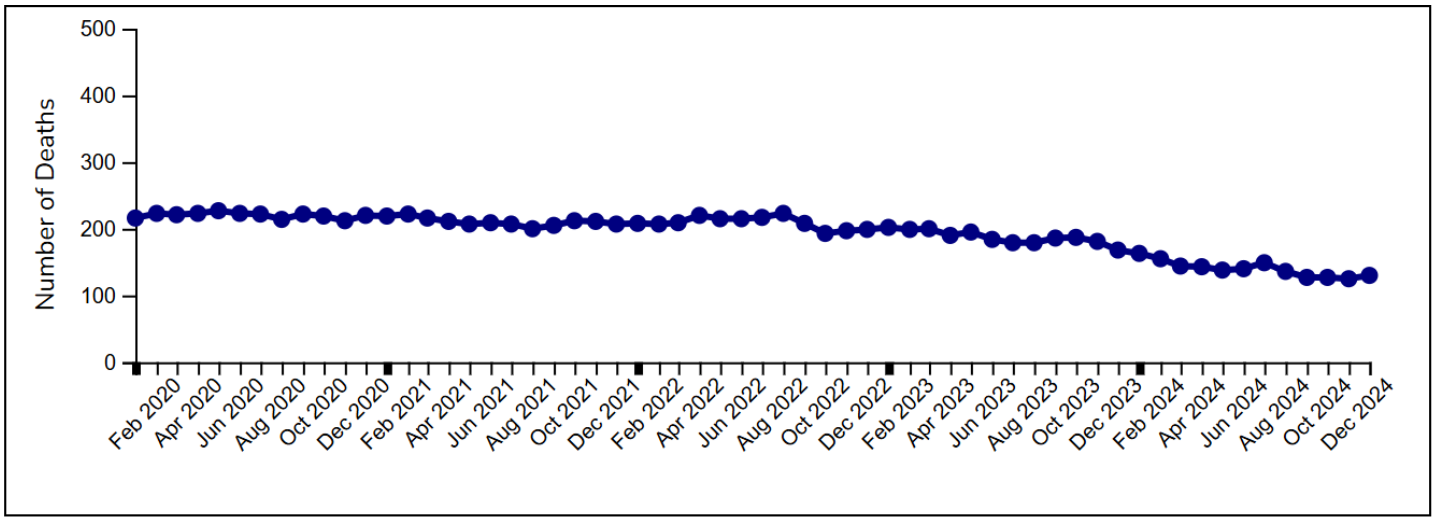
Table 4.5.8-1 Most Likely Lifelines Impacted by Substance Abuse

Lifelines	Notes
	Government services are needed to aid individuals with substance use disorder and police officers and other first responders may be at risk of exposure to certain substances.
	Medical services may be needed as substance use has negative impacts on public health and may require medical treatment and mental health services.

4.5.8.3 Previous Occurrence

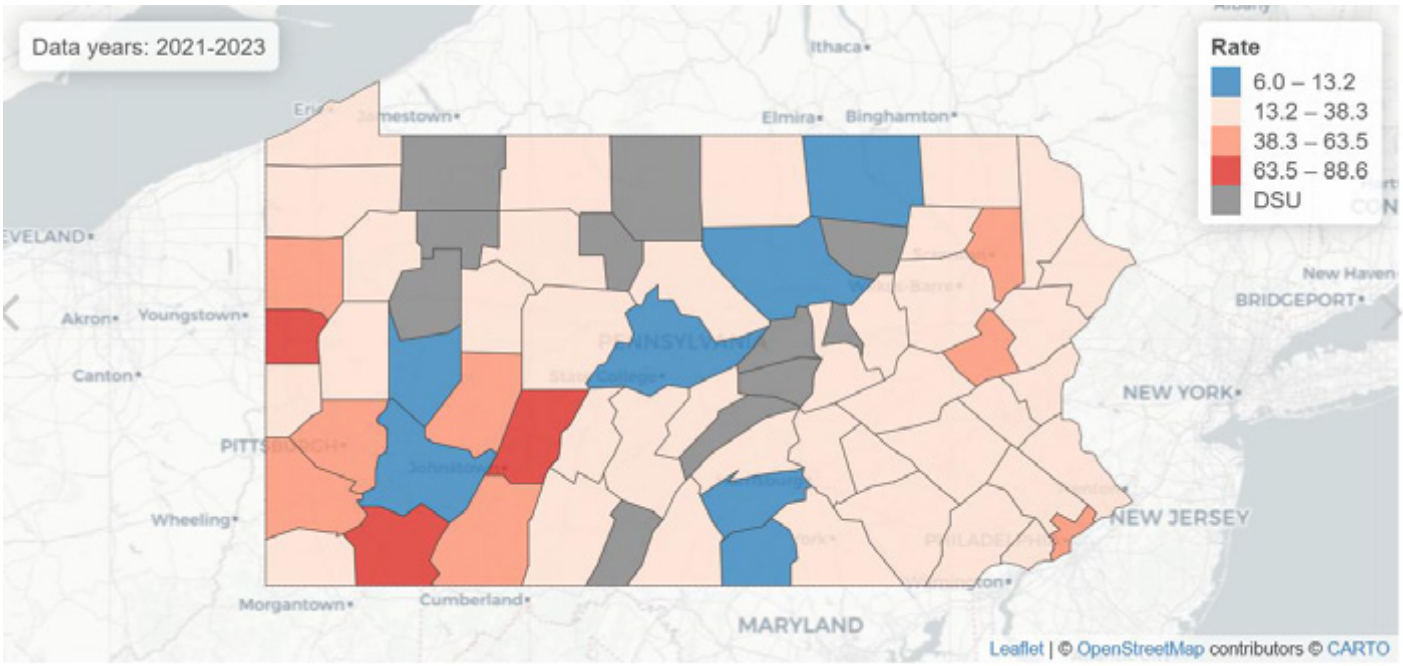
The rate of fatalities across a 12-month span has remained relatively stable between 130 and 210 deaths. The overall trend over the past five years has been largely a moderate decline in fatalities. Figure 4.5.8-2 shows the rate of fatalities per 100,000 people between 2021 and 2023 across counties in the state. Bucks is among the second lowest quartile, but is still higher than the state's target of less than 13.2 fatalities per 100,000.

Figure 4.5.8-1 12 Month-ending Provisional Counts of Drug Overdose Deaths for Bucks County, PA (CDC, 2025)



Provisional death counts presented in this data visualization are for "12 month-ending periods," defined as the number of deaths occurring in the 12-month period ending in the month indicated. For example, the 12 month-ending period in June 2020 would include deaths occurring from July 1, 2019 through June 30, 2020. The 12 month-ending period counts includes all seasons of the year and are insensitive to reporting variations by seasonality. These provisional counts of drug overdose deaths and related data quality metrics are provided for public health surveillance and monitoring of emerging trends. Provisional drug overdose death data are often incomplete, and the degree of completeness varies by jurisdiction and 12 month-ending period. Consequently, the numbers of drug overdose deaths are underestimated based on provisional data relative to final data and are subject to random variation. (CDC, 2026)

Figure 4.5.8-2 Rate Substance Abuse per 100,000 across Pensylvania (PADOH, 2025)



4.5.8.4 Potential for Future Occurrence

Bucks County continues to work with local, state, federal, and nongovernmental partners to minimize future fatalities from substance use disorder. However, there will likely be reoccurrence of this hazard in the future. As with other health-related hazards, the target continues to be to see the downward trend illustrated in figure XXX continue into the future.

4.5.8.5 Vulnerability Assessment

Jurisdictional losses in the substance use crisis stem from lost wages, productivity, and resources rather than losses to buildings or land. Locally, many Pennsylvania counties have seen an increase of time and resources devoted to the situation as overdose and response increases however there is no comprehensive tracking mechanism to record total local losses associated with the substance use crisis. 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 ($1,799), of specifically the opioid crisis for Pennsylvania. AEI's estimates were calculated by utilizing national estimates based on variations in local wages, health care costs, and criminal justice costs along with variation in opioid-related death and addiction rates, and average age-adjusted value of statistical lives lost and divided by each state's population in the 2012-2016 American Community Survey (AEI, 2018).

The 2023 PA State HMP cited an estimate that opioid adduction had cost Bucks County $1,130,385,459 based on per capita estimates. This was the fourth highest total estimate across the state. Philadelphia Allegheny, and Montgomery were estimated at a higher cost.

4.5.8.6 Equity in Vulnerable Communities

Communities of concern when it comes to equity and substance use include marginalized communities. Oftentimes these communities frequently encounter obstacles to accessing substance use treatment and prevention services.

4.5.9 Terrorism

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 (FEMA, 2009). Cyber-attacks have become an increasingly pressing concern and are discussed in their own profile in Section 4.5.2.

4.5.9.1 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).

The Federal Bureau of Investigation (FBI) characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. However, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences.

Terrorism refers to the use of weapons of mass destruction (WMD), including, biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and "cyber-terrorism." Within these general categories, however, there are many variations, including:

- Agriterrorism,
- Arson/incendiary attack,
- Armed attack (including active shooter attacks),
- Biological agent,
- Chemical agent,
- Cyberterrorism,
- Conventional bomb,
- Intentional hazardous materials or radiological releases, or
- Nuclear bombs.

The HMPT identified active shooter attacks as being relevant to Bucks County. As discussed in the beginning of the Risk Assessment, cyberterrorism was identified as a potential threat, but it was ultimately decided to not include a full profile regarding cyberterrorism. The probability of terrorism 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. This type of attack could take place at any facility or public or private location in the County. Thus, planning and mitigation strategies should be training specific to ensure the public is aware of what to do during an attack, and responders know how to best respond during an attack.

4.5.9.2 Range of Magnitude

The severity of terrorist incidents depends upon the type of method used, the proximity of the attack to people, animals, or other assets, and the duration of exposure to the incident or to a device (in the case of chemical, radiological, or biological agent attacks). A worst-case scenario of an active shooter incident would be if an active shooter attacked a public event in Bucks County. There would be potential casualties and fatalities across all demographics.

4.5.9.3 Previous Occurrence

There has been a high consciousness of terrorist activity in the press with catastrophic events. The most significant terrorist attack on US soil occurred on September 11, 2001; Flight 93, the fourth hijacked aircraft in the attack, crashed in Somerset County, Pennsylvania. There have been no reported terrorist incidents in Bucks County in the past. Nationally, terrorism continues to be an issue of significant importance. The following narratives do not include all national terroristic attacks that have occurred in the United States.

May 2003: A series of over 24 sniper attacks concentrated along the Cap-City Beltway I-270 in the Columbus Metropolitan Area caused widespread fear across Ohio and leaving one dead.

May 1, 2012: Five self-described anarchists were arrested in an alleged plot to blow up a bridge in Cuyahoga Valley National Park in Brecksville, Ohio. The group was being monitored as part of an FBI undercover operation and had considered other plots previously. One of the suspects expressed a desire to cause financial damage to companies while avoiding casualties.

July 20, 2012: In Aurora, Colorado, during the midnight screening of The Dark Knight Rises, a gunman dressed in tactical clothing, set off tear gas grenades and shot into the audience with multiple firearms. Twelve people were killed, and seventy others were injured.

December 2, 2015: In San Bernardino, CA a planned shooting occurred at the Inland Regional Center which resulted in 16 deaths and 23 casualties. A shootout occurred between the suspects, ultimately leading to their deaths.

June 12, 2016: A 29-year old man armed with an automatic assault rifle, walked into a gay nightclub in Orlando, Florida, killing 49 people and injuring 53 more. The man swore allegiance to the leader of the Islamic State of Iraq and the Levant. It has been marked as the deadliest terror attack since the 9/11 attacks in 2001 in the United States.

Multiple dates, 2018: A chemical company employee and his girlfriend (both 32) detonated explosives throughout Upper Bucks County, worrying local residents. After searching for the individuals for months, local law enforcement, aided by the FBI apprehended the two.

August 4, 2019: A gunman entered a bar in the Oregon Historic District in Dayton, Ohio. At around 1 AM, he opened fire on the bar, killing 10 and injuring 27 others. The gunman was shot dead by responding police. The incident was then investigated by the FBI as Domestic Terrorism.

May 14, 2022: A gunman motivated by racially motivated violent extremist ideology carried out a mass shooting at the Tops Friendly Markets grocery store in Buffalo, New York. Ten people were killed and three others were injured. Federal authorities investigated the attack as an act of domestic terrorism, citing the attacker's extremist writings and stated intent to target a specific racial group. The incident reinforced concerns regarding lone-actor domestic terrorism in the northeastern United States.

August 2023: Federal authorities arrested a juvenile suspect in Philadelphia following a counterterrorism investigation that revealed communication with an al-Qaida-affiliated terrorist organization and efforts to acquire materials for constructing improvised explosive devices. The FBI determined the individual posed a credible threat to public safety, and the investigation was conducted as a terrorism-related plot, though charges were handled under state statutes due to the suspect's age.

4.5.9.4 Potential for Future Occurrence

An important consideration in estimating the likelihood of a terrorist incident is the existence of facilities, landmarks, or other buildings of national importance. Bucks County does not contain sites with national symbolism (e.g., the Statue of Liberty); however, terrorism takes many forms, and terrorists have a wide range of local, state, and national political interests or personal agendas, making the identification of potential targets especially difficult. The likelihood of a terrorist attack is considered unlikely, as defined by the Risk Factor Methodology (see Table 4.6-1).

4.5.9.5 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 Pennsylvania, planning efforts can be put in place to reduce the risk of attack. FEMA's Integrating Manmade Hazards into Mitigation Planning (2003) encourages site-specific assessments that 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?

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 Heating, Ventilating and Air Conditioning (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?

The Department of Homeland Security's Cybersecurity and Infrastructure Security Agency has recently been focusing on securing soft targets and crowded places. Places such as sports venues, schools and transportation systems need to be protected because they are publicly accessible spaces that large numbers of people use, and they have limited security making them vulnerable. It is important to think about these types of spaces when trying to address terrorism as a hazard (CISA, 2021).

4.5.9.6 Equity in Vulnerable Communities

Vulnerable populations, including low-income households, seniors, and individuals with disabilities, may experience greater impacts from terrorism-related incidents due to reduced access to emergency information, transportation, and recovery resources. Disruptions resulting from terrorism, such as evacuations, infrastructure shutdowns, or prolonged security measures, can disproportionately affect residents who rely on public services and fixed incomes. In Bucks County, potential targets such as transportation infrastructure, energy facilities, and government buildings are located near populated areas, including Lower Bucks communities and borough centers, where vulnerable populations are more commonly concentrated.

4.5.10 Transportation Incidents

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. (FEMA, 2018)

4.5.10.1 Location and Extent

For this analysis a transportation incident is defined as an incident involving highway, air, or rail travel. Incidents as a result of infrastructure failure are considered under Section 4.3.14, while incidents involving hazardous materials are considered under Section 4.3.17 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 Bucks County, there are a total of 3,562 linear miles of roads, including 2,500 miles of local municipal road, 20 miles of turnpike, and approximately 965 miles of state roads. In 2024, PennDOT statistics indicated roughly 9.5 million daily vehicle miles traveled within Bucks County (PennDOT, 2024a). Figure 4.3.20-1 shows the road network in Bucks County and the average annual daily traffic that can be expected on those roads. The county is crossed by several major road networks, and transportation accidents involving those networks can have impacts on secondary roads. Major roads in the county include the I-476 Northeast Extension, the Pennsylvania Turnpike, I-95, and limited access highways including Route 1 and Route 202. In addition, there are several other important components to the county transportation infrastructure, as shown in Figure 4.3.20-2. These include numerous airports, heliports, and railroad lines.

Figure 4.5.10-1 Average Annual Daily Traffic in Bucks County

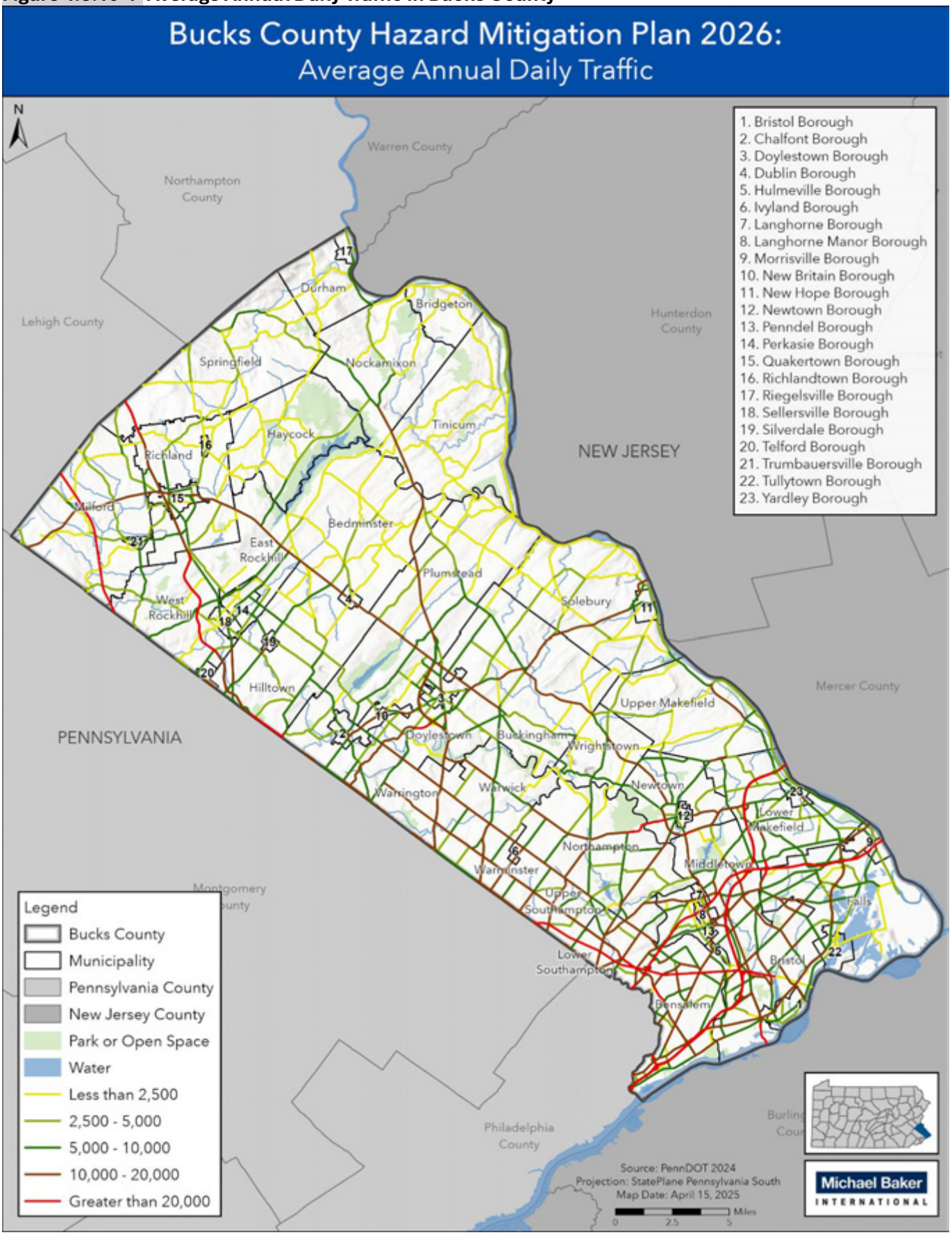
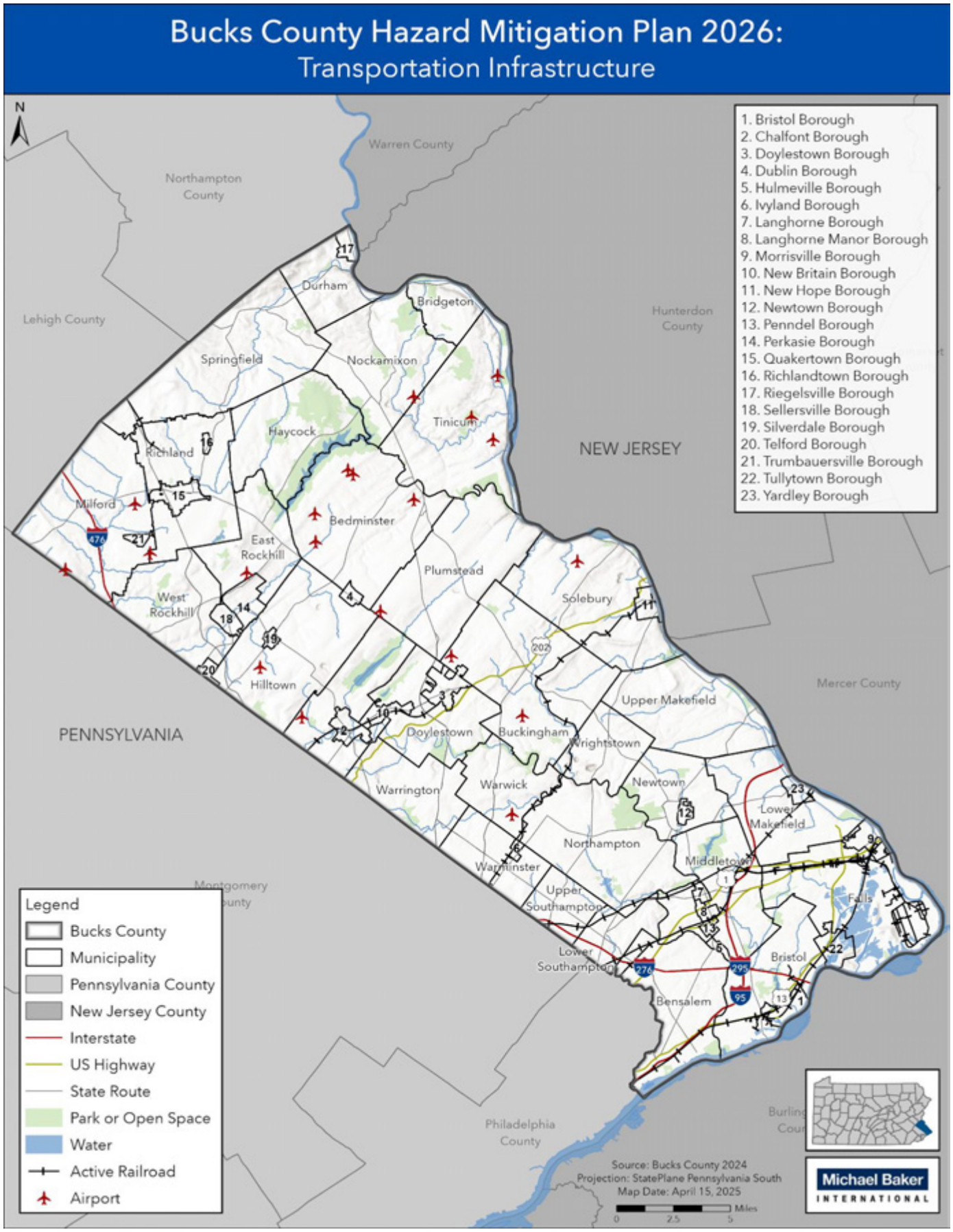


Figure 4.5.10-2 Transportation Infrastructure in Bucks County



Major transportation corridors are more vulnerable to transportation incidents, especially in areas where the daily traffic count may be between 48,001 and 119,000. A large number of secondary roads means that the population is in conflict with vehicle traffic.

Also, airport and heliport data includes both public and private facilities. When thinking about risk it is important to consider that private facility data does not have the same oversight that public facility data does and therefore may not be the most up to date information.

4.5.10.2 Range of Magnitude

At a minimum, transportation incidents can result in damage to the vehicles and minor injuries to passengers and drivers. At worst, significant transportation incidents can result in death or serious injury or extensive property loss or damage coupled with business interruptions and hours of congestion. Road and railway accidents in particular have the potential to result in hazardous materials releases if the vehicle involved in an accident is hauling hazardous materials. The expected impacts of transportation incidents are amplified by the fact that there is often little warning of incidents.

The worst-case scenario for a transportation incident impacting Bucks County would be a road accident which results in a hazardous material spill in a densely populated area, such as near university campuses. Such an event would constitute an immediate health hazard to the university population and requiring an evacuation of campus.

The potential impacts of transportation incidents on community lifelines are as follows:

Table 4.5.10-1 Lifelines Most Likely to be Impacted by Transportation Incidents

Lifelines	Notes
	Direct harm to the community, including drivers, bicyclists, and pedestrians.
	Medical personnel might be needed due to the significant risk of injury and death that transportation incidents represent.
	Potential negative consequences of incidents occurring while transporting these materials.

4.5.10.3 Previous Occurrence

The most common transportation incidents in the County are highway incidents involving motor vehicles. The County's most serious road transportation concerns involve the Pennsylvania Turnpike and I-95. These routes have the highest annual average traffic counts in the county. 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 accidents 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.

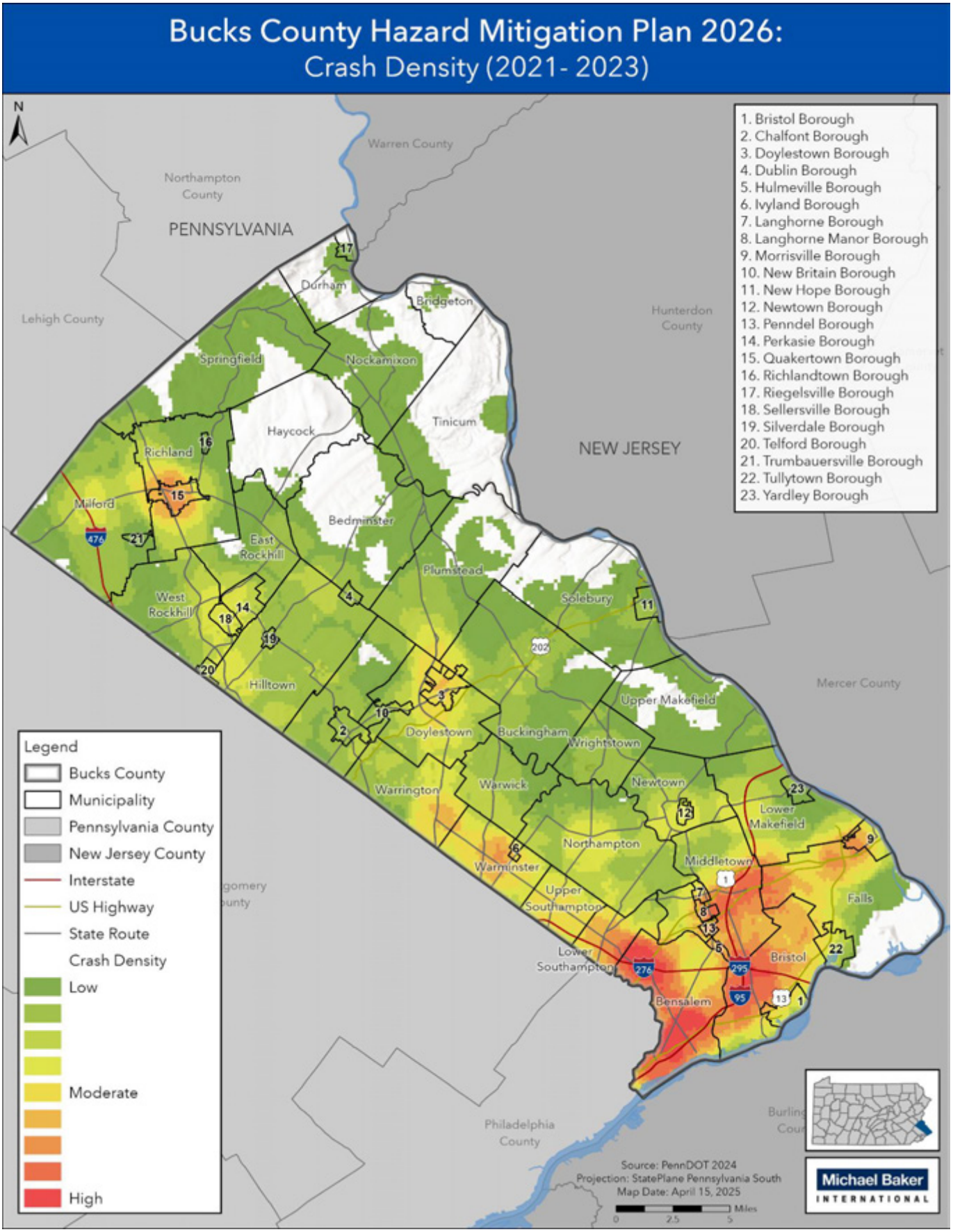
Table 4.5.10-2 summarizes the overall vehicular crash data from 2010-2024 for Bucks County. Total crashes have remained largely the same throughout this period with a slight drop off during the COVID-19 pandemic. There do not appear to be comparable records available of rail or air traffic incidents that have affected Bucks County.

Table 4.5.10-2 Total Number of Crashes, Traffic Deaths, and Pedestrian Deaths in Bucks County from 2010-2024 (PennDOT, 2024b).

Year	Total Crashes	Traffic Deaths	Pedestrian Deaths
2010	6,094	45	8
2011	6,174	61	10
2012	5,900	65	10
2013	5,891	44	6
2014	5,779	44	8
2015	5,932	55	8
2016	6,159	52	8
2017	6,175	50	11
2018	6,193	54	12
2019	6,103	48	12
2020	4,825	52	6
2021	5,648	55	17
2022	5,533	52	7
2023	5,395	54	7
2024	5,608	48	9

Figure 4.5.10-3 shows the density of transportation crashes throughout Bucks County. Red and yellow areas show roadways where the most crashes occurred between 2015 and 2019. In Bucks County, most incidents occur along I-95, I-295, I-276, SR-1, and SR-13. Crashes are also densely concentrated around the more populated communities in the southern portion of the County.

Figure 4.5.10-3 Traffic Incidents Hotspots in Bucks County from 2021 to 2023



4.5.10.4 Potential for Future Occurrence

Bucks County has experienced up to 0.6% population growth since 2020 according to the US Census Bureau QuickFacts, which could indicate that traffic volumes have risen accordingly. 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. While air and rail-related transportation incidents are not as likely to impact the County because of their lower frequency, it is possible that highway incidents may increase slightly without proper mitigation strategies in place.

Overall, the probability of future transportation incidents in Bucks County can be considered likely according to the Risk Factor Methodology (see Table 4.6-1).

4.5.10.5 Vulnerability Assessment

A transportation-related incident can occur on any stretch of road in Bucks County. However, severe incidents are more likely on the County's highways, which experience heavier traffic volumes including heavy freight vehicles. The combination of high traffic volume, severe winter weather in the County and large numbers of hazardous materials haulers increase the chances of traffic incidents occurring. Incidents may also occur on any rail line or air flight path.

Because of the widespread transportation network in Bucks County, a large number of structures are exposed to the threat of transportation incidents. Table 4.5.10-3 describes populations vulnerable to transportation incidents; Table 4.5.10-4 lists the critical facilities vulnerable to transportation incidents in Bucks County; Table 4.5.10-5 lists the total structures vulnerable transportation incidents; Table 4.5.10-6 lists the total structures in the road crash zone by land use; Table 4.3.20-7 lists the total structures in the rail crash zone by land use; and Table 4.5-10-8 lists the total structures in the air crash zone by land use.

The communities with the highest number of total structures 0.5 miles away from a major highway are Bensalem Township (11,780), Bristol Township (9,540), and Middletown Township (9,375). The communities with the highest number of total structures within 0.5 miles of an active rail line are Bensalem Township (7,124), Middletown Township (6,452), and Bristol Township (6,076). The communities with the highest number of total structures within 5 miles of an airport are Warwick Township (745), Buckingham Township (301) and Richland Township (273). In Bucks County as a whole, there are 68,382 total structures within 0.5 miles of a major highway, or 27% of the total structure inventory. There are 64,641 total structures within 0.5 miles of an active rail line, or 25% of the total structure inventory, and there are 2,588 total structures within 0.5 miles of an airport, or 1% of the total structure inventory. Thirty-one percent of all the County's critical facilities, or 267 facilities, are located within 0.5 miles of a major highway. 282, or 33%, of the County's critical facilities are located within 0.5 miles of an active rail line, and 24 or 3%, of the County's critical facilities are within 5 miles of an airport. For all three transportation routes – roadway, rail, and air – residential structures are the most vulnerable to transportation accidents with 59,214, 54,558, and 2,008 residential structures to the roadway, rail, and air incident zones.

In addition to the airports and heliports shown in Figure 4.5.10-2, there may be additional airports and heliports in New Jersey that the municipalities along the border could be vulnerable to. While the locations of these facilities were not available for this analysis, these municipalities should be aware that they may have additional structures or critical facilities that are vulnerable to incidents from these facilities.

Table 4.5.10-3 Populations Vulnerable to Transportation Incidents (Bucks County GIS, 2025) (DHS, 2025)

Municipality	Total Population	Population Within 0.5 Mile of Major Highway	Pct Population Within 0.5 Mile of Major Highway	Population Within 0.5 Miles of Active Rail	Pct Population Within 0.5 Miles of Active Rail	Population Within 0.5 Miles of Airport	Pct Population Within 0.5 Miles of Airport
Bedminster Township	7,518	0	0%	0	0%	429	6%
Bensalem Township	62,819	31,531	50%	17,004	27%	0	0%
Bridgeton Township	1,234	0	0%	0	0%	0	0%
Bristol Borough	9,861	7,287	74%	9,861	100%	0	0%
Bristol Township	54,369	26,474	49%	16,060	30%	0	0%
Buckingham Township	20,847	3,151	15%	2,200	11%	601	3%
Chalfont Borough	4,253	2,554	60%	3,257	77%	0	0%
Doylestown Borough	8,300	5,129	62%	2,812	34%	0	0%
Doylestown Township	17,971	6,246	35%	2,434	14%	0	0%
Dublin Borough	2,177	0	0%	0	0%	0	0%
Durham Township	1,094	0	0%	0	0%	0	0%
East Rockhill Township	5,819	0	0%	1,279	22%	96	2%
Falls Township	34,672	19,291	56%	10,021	29%	0	0%
Haycock Township	2,201	0	0%	0	0%	0	0%
Hilltown Township	16,395	0	0%	1,350	8%	451	3%
Hulmeville Borough	982	457	47%	0	0%	0	0%
Ivyland Borough	955	0	0%	955	100%	0	0%
Langhorne Borough	1,643	852	52%	849	52%	0	0%
Langhorne Manor Borough	1,496	1,496	100%	1,199	80%	0	0%
Lower Makefield Township	33,224	11,740	35%	9,296	28%	0	0%
Lower Southampton Township	20,487	4,995	24%	8,584	42%	0	0%
Middletown Township	45,967	23,795	52%	15,054	33%	0	0%
Milford Township	10,238	1,775	17%	0	0%	454	4%
Morrisville Borough	9,809	6,970	71%	5,272	54%	0	0%
New Britain Borough	2,836	2,836	100%	2,791	98%	0	0%
New Britain Township	12,223	5,999	49%	1,476	12%	270	2%
New Hope Borough	2,612	911	35%	2,367	91%	0	0%
Newtown Borough	2,268	0	0%	0	0%	0	0%
Newtown Township	19,904	0	0%	0	0%	0	0%
Nockamixon Township	3,379	0	0%	0	0%	74	2%
Northampton Township	39,915	0	0%	3,206	8%	0	0%
Penndel Borough	2,515	2,491	99%	1,867	74%	0	0%
Perkasie Borough	9,120	0	0%	5,136	56%	321	4%
Plumstead Township	14,038	0	0%	0	0%	484	3%
Quakertown Borough	9,359	0	0%	4,319	46%	0	0%
Richland Township	13,858	0	0%	4,867	35%	676	5%
Richlandtown Borough	1,353	0	0%	0	0%	0	0%
Riegelsville Borough	847	0	0%	0	0%	0	0%

Municipality	Total Population	Population Within 0.5 Mile of Major Highway	Pct Population Within 0.5 Mile of Major Highway	Population Within 0.5 Miles of Active Rail	Pct Population Within 0.5 Miles of Active Rail	Population Within 0.5 Miles of Airport	Pct Population Within 0.5 Miles of Airport
Sellersville Borough	4,567	0	0%	3,551	78%	0	0%
Silverdale Borough	805	0	0%	0	0%	0	0%
Solebury Township	8,708	3,293	38%	1,263	15%	69	1%
Springfield Township	5,172	0	0%	400	8%	0	0%
Telford Borough	2,199	0	0%	1,985	90%	0	0%
Tinicum Township	3,818	0	0%	0	0%	295	8%
Trumbauersville Borough	883	0	0%	0	0%	0	0%
Tullytown Borough	2,268	1,979	87%	1,333	59%	0	0%
Upper Makefield Township	8,861	0	0%	0	0%	0	0%
Upper Southampton Township	15,269	3,183	21%	3,606	24%	0	0%
Warminster Township	33,603	0	0%	5,718	17%	0	0%
Warrington Township	25,639	2,571	10%	0	0%	0	0%
Warwick Township	14,851	0	0%	828	6%	1,035	7%
West Rockhill Township	5,446	65	1%	1,163	21%	0	0%
Wrightstown Township	3,286	0	0%	470	14%	0	0%
Yardley Borough	2,605	0	0%	1,131	43%	0	0%
Total	**646,538**	**177,071**	**27%**	**154,964**	**24%**	**5,255**	**1%**

Table 4.5.10-4 Critical Facilities Vulnerable to Transportation Incidents (Bucks County GIS, 2025) (DHS, 2025)

Municipality	Total Critical Facilities	Critical Facilities Within .5 Mi of a Major Highway	Percent Critical Facilities Within .5 Mi of a Major Highway	Critical Facilities Within .5 Mi of an Active Rail Line	Percent Critical Facilities Within .5 Mi of an Active Rail Line	Critical Facilities Within .5 Mi of an Airport	Percent Critical Facilities Within .5 Mi of an Airport
Bedminster Township	13	0	0%	0	0%	6	46%
Bensalem Township	66	35	53%	26	39%	0	0%
Bridgeton Township	3	0	0%	0	0%	0	0%
Bristol Borough	19	14	74%	19	100%	0	0%
Bristol Township	62	33	53%	21	34%	0	0%
Buckingham Township	22	10	45%	2	9%	3	14%
Chalfont Borough	8	7	88%	8	100%	0	0%
Doylestown Borough	23	21	91%	12	52%	0	0%
Doylestown Township	30	12	40%	5	17%	0	0%
Dublin Borough	4	0	0%	0	0%	0	0%
Durham Township	1	0	0%	0	0%	0	0%
East Rockhill Township	9	0	0%	1	11%	1	11%
Falls Township	62	28	45%	32	52%	0	0%
Haycock Township	2	0	0%	0	0%	0	0%
Hilltown Township	13	0	0%	0	0%	2	15%
Hulmeville Borough	3	0	0%	0	0%	0	0%

Municipality	Total Critical Facilities	Critical Facilities Within .5 Mi of a Major Highway	Percent Critical Facilities Within .5 Mi of a Major Highway	Critical Facilities Within .5 Mi of an Active Rail Line	Percent Critical Facilities Within .5 Mi of an Active Rail Line	Critical Facilities Within .5 Mi of an Airport	Percent Critical Facilities Within .5 Mi of an Airport
Ivyland Borough	5	0	0%	5	100%	0	0%
Langhorne Borough	4	4	100%	0	0%	0	0%
Langhorne Manor Borough	4	4	100%	4	100%	0	0%
Lower Makefield Township	29	11	38%	11	38%	0	0%
Lower Southampton Township	23	4	17%	8	35%	0	0%
Middletown Township	52	28	54%	22	42%	0	0%
Milford Township	12	2	17%	0	0%	2	17%
Morrisville Borough	13	9	69%	8	62%	0	0%
New Britain Borough	9	9	100%	9	100%	0	0%
New Britain Township	15	9	60%	4	27%	1	7%
New Hope Borough	8	6	75%	8	100%	0	0%
Newtown Borough	3	0	0%	0	0%	0	0%
Newtown Township	31	0	0%	0	0%	0	0%
Nockamixon Township	8	0	0%	0	0%	1	13%
Northampton Township	37	0	0%	2	5%	0	0%
Penndel Borough	5	5	100%	5	100%	0	0%
Perkasie Borough	8	0	0%	8	100%	0	0%
Plumstead Township	25	0	0%	0	0%	1	4%
Quakertown Borough	22	0	0%	11	50%	0	0%
Richland Township	11	0	0%	4	36%	1	9%
Richlandtown Borough	3	0	0%	0	0%	0	0%
Riegelsville Borough	2	0	0%	0	0%	0	0%
Sellersville Borough	6	0	0%	6	100%	0	0%
Silverdale Borough	3	0	0%	0	0%	0	0%
Solebury Township	11	0	0%	1	9%	2	18%
Springfield Township	8	0	0%	1	13%	0	0%
Telford Borough	1	0	0%	1	100%	0	0%
Tinicum Township	10	0	0%	0	0%	3	30%
Trumbauersville Borough	4	0	0%	0	0%	0	0%
Tullytown Borough	8	8	100%	6	75%	0	0%
Upper Makefield Township	9	0	0%	0	0%	0	0%
Upper Southampton Township	24	7	29%	8	33%	0	0%
Warminster Township	40	0	0%	13	33%	0	0%
Warrington Township	26	1	4%	0	0%	0	0%
Warwick Township	16	0	0%	1	6%	1	6%
West Rockhill Township	14	0	0%	5	36%	0	0%
Wrightstown Township	5	0	0%	2	40%	0	0%
Yardley Borough	6	0	0%	3	50%	0	0%
Total	**860**	**267**	**31%**	**282**	**33%**	**24**	**3%**

Table 4.5.10-5 Structures Vulnerable to Transportation Incidents (Bucks County GIS, 2025)

Municipality	Total Structures	Structures Within .5 Mi of a Major Highway	Percent Structures Within .5 Mi of a Major Highway	Structures Within .5 Mi of an Active Rail Line	Percent Structures Within .5 Mi of an Active Rail Line	Structures Within .5 Mi of an Airport	Percent Structures Within .5 Mi of an Airport
Bedminster Township	3,278	0	0%	0	0%	218	7%
Bensalem Township	22,234	11,780	53%	7,124	32%	0	0%
Bridgeton Township	790	0	0%	0	0%	0	0%
Bristol Borough	4,024	2,909	72%	4,002	99%	0	0%
Bristol Township	20,102	9,540	47%	6,076	30%	0	0%
Buckingham Township	8,367	1,274	15%	1,023	12%	301	4%
Chalfont Borough	1,788	971	54%	1,366	76%	0	0%
Doylestown Borough	3,486	2,494	72%	1,606	46%	0	0%
Doylestown Township	6,807	2,582	38%	1,082	16%	0	0%
Dublin Borough	741	0	0%	0	0%	0	0%
Durham Township	656	0	0%	0	0%	0	0%
East Rockhill Township	2,652	0	0%	491	19%	79	3%
Falls Township	11,954	6,326	53%	3,715	31%	0	0%
Haycock Township	1,232	0	0%	0	0%	0	0%
Hilltown Township	6,428	0	0%	359	6%	163	3%
Hulmeville Borough	410	137	33%	0	0%	0	0%
Ivyland Borough	359	0	0%	359	100%	0	0%
Langhorne Borough	568	291	51%	284	50%	0	0%
Langhorne Manor Borough	349	349	100%	221	63%	0	0%
Lower Makefield Township	13,771	5,943	43%	3,893	28%	0	0%
Lower Southampton Township	8,340	2,255	27%	3,615	43%	0	0%
Middletown Township	17,420	9,375	54%	6,452	37%	0	0%
Milford Township	4,430	747	17%	0	0%	206	5%
Morrisville Borough	3,241	2,154	66%	1,993	61%	0	0%
New Britain Borough	1,151	1,151	100%	1,101	96%	0	0%
New Britain Township	4,937	2,253	46%	702	14%	100	2%
New Hope Borough	1,446	279	19%	1,239	86%	0	0%
Newtown Borough	1,054	0	0%	0	0%	0	0%
Newtown Township	8,544	0	0%	0	0%	0	0%
Nockamixon Township	1,827	0	0%	0	0%	42	2%
Northampton Township	15,081	0	0%	1,741	12%	0	0%
Penndel Borough	743	703	95%	589	79%	0	0%
Perkasie Borough	3,546	0	0%	1,975	56%	109	3%
Plumstead Township	5,957	0	0%	0	0%	140	2%
Quakertown Borough	3,259	0	0%	1,604	49%	0	0%
Richland Township	6,621	0	0%	2,307	35%	273	4%
Richlandtown Borough	447	0	0%	0	0%	0	0%
Riegelsville Borough	465	0	0%	0	0%	0	0%
Sellersville Borough	1,914	0	0%	1,554	81%	0	0%
Silverdale Borough	337	0	0%	0	0%	0	0%
Solebury Township	4,322	1,779	41%	940	22%	67	2%
Springfield Township	2,719	0	0%	168	6%	0	0%
Telford Borough	763	0	0%	693	91%	0	0%
Tinicum Township	2,352	0	0%	0	0%	136	6%
Trumbauersville Borough	386	0	0%	0	0%	1	0%
Tullytown Borough	900	817	91%	643	71%	0	0%
Upper Makefield Township	3,775	0	0%	0	0%	0	0%

Municipality	Total Structures	Structures Within .5 Mi of a Major Highway	Percent Structures Within .5 Mi of a Major Highway	Structures Within .5 Mi of an Active Rail Line	Percent Structures Within .5 Mi of an Active Rail Line	Structures Within .5 Mi of an Airport	Percent Structures Within .5 Mi of an Airport
Upper Southampton Township	6,233	1,358	22%	1,697	27%	0	0%
Warminster Township	13,677	0	0%	2,233	16%	0	0%
Warrington Township	9,377	883	9%	0	0%	0	0%
Warwick Township	6,284	0	0%	280	4%	745	12%
West Rockhill Township	2,502	32	1%	607	24%	8	0%
Wrightstown Township	1,497	0	0%	278	19%	0	0%
Yardley Borough	1,350	0	0%	629	47%	0	0%
Total	**256,893**	**68,382**	**27%**	**64,641**	**25%**	**2,588**	**1%**

Table 4.5.10-6 Structures in Road Crash Zones by Type per Municipality (Bucks County GIS, 2025)

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Road Crash Zones
Bedminster Township	3,278	0	0	0	0	0	0	0	0	0	0	0	0
Bensalem Township	22,234	2	729	160	79	27	10,350	76	116	28	3	210	11,780
Bridgeton Township	790	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Borough	4,024	0	360	20	66	63	2,349	12	15	17	2	5	2,909
Bristol Township	20,102	0	557	226	82	31	8,288	27	108	39	2	178	9,540
Buckingham Township	8,367	29	211	0	20	11	967	3	10	5	2	16	1,274
Chalfont Borough	1,788	0	81	8	7	9	815	3	36	3	2	7	971
Doylestown Borough	3,486	1	487	13	51	10	1,905	4	4	8	0	11	2,494
Doylestown Township	6,807	20	58	0	39	11	2,370	7	27	5	2	43	2,582
Dublin Borough	741	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	656	0	0	0	0	0	0	0	0	0	0	0	0
East Rockhill Township	2,652	0	0	0	0	0	0	0	0	0	0	0	0
Falls Township	11,954	11	361	56	43	21	5,666	14	28	9	7	109	6,326
Haycock Township	1,232	0	0	0	0	0	0	0	0	0	0	0	0
Hilltown Township	6,428	0	0	0	0	0	0	0	0	0	0	0	0
Hulmeville Borough	410	1	8	8	0	0	110	0	4	2	0	4	137
Ivyland Borough	359	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Borough	568	0	67	0	15	6	202	0	0	0	0	1	291
Langhorne Manor Borough	349	0	0	0	18	1	319	0	1	0	0	10	349
Lower Makefield Township	13,771	22	355	0	15	15	5,213	7	193	5	2	116	5,943
Lower Southampton Township	8,340	1	285	121	6	4	1,810	2	9	3	1	13	2,255
Middletown Township	17,420	4	501	38	83	23	8,519	31	36	11	3	122	9,375
Milford Township	4,430	42	21	13	3	10	567	1	17	6	3	64	747
Morrisville Borough	3,241	2	164	3	23	18	1,906	9	4	11	4	10	2,154
New Britain Borough	1,151	1	132	19	23	2	957	2	4	2	0	9	1,151
New Britain Township	4,937	1	69	0	13	6	2,109	0	20	0	4	31	2,253

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Road Crash Zones
New Hope Borough	1,446	0	41	0	10	0	209	1	3	3	1	10	279
Newtown Borough	1,054	0	0	0	0	0	0	0	0	0	0	0	0
Newtown Township	8,544	0	0	0	0	0	0	0	0	0	0	0	0
Nockamixon Township	1,827	0	0	0	0	0	0	0	0	0	0	0	0
Northampton Township	15,081	0	0	0	0	0	0	0	0	0	0	0	0
Penndel Borough	743	0	131	24	10	0	526	1	1	2	0	8	703
Perkasie Borough	3,546	0	0	0	0	0	0	0	0	0	0	0	0
Plumstead Township	5,957	0	0	0	0	0	0	0	0	0	0	0	0
Quakertown Borough	3,259	0	0	0	0	0	0	0	0	0	0	0	0
Richland Township	6,621	0	0	0	0	0	0	0	0	0	0	0	0
Richlandtown Borough	447	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	465	0	0	0	0	0	0	0	0	0	0	0	0
Sellersville Borough	1,914	0	0	0	0	0	0	0	0	0	0	0	0
Silverdale Borough	337	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	4,322	12	137	1	3	7	1,558	2	17	12	2	27	1,779
Springfield Township	2,719	0	0	0	0	0	0	0	0	0	0	0	0
Telford Borough	763	0	0	0	0	0	0	0	0	0	0	0	0
Tinicum Township	2,352	0	0	0	0	0	0	0	0	0	0	0	0
Trumbauersville Borough	386	0	0	0	0	0	0	0	0	0	0	0	0
Tullytown Borough	900	2	72	116	12	7	556	12	15	10	1	14	817
Upper Makefield Township	3,775	0	0	0	0	0	0	0	0	0	0	0	0
Upper Southampton Township	6,233	3	153	57	3	0	1,112	1	3	5	0	21	1,358
Warminster Township	13,677	0	0	0	0	0	0	0	0	0	0	0	0
Warrington Township	9,377	7	25	0	3	0	809	0	18	2	0	19	883
Warwick Township	6,284	0	0	0	0	0	0	0	0	0	0	0	0
West Rockhill Township	2,502	0	0	0	0	0	22	0	0	0	0	10	32
Wrightstown Township	1,497	0	0	0	0	0	0	0	0	0	0	0	0
Yardley Borough	1,350	0	0	0	0	0	0	0	0	0	0	0	0
Total	**256,893**	**161**	**5,005**	**883**	**627**	**282**	**59,214**	**215**	**689**	**188**	**41**	**1,068**	**68,382**

Table 4.5.10-7 Structures in Rail Crash Zones by Type per Municipality (Bucks County GIS, 2025)

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Rail Crash Zones
Bedminster Township	3,278	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bensalem Township	22,234	0	564	175	62	0	0	22	6,021	55	91	20	2	112	7,124
Bridgeton Township	790	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Rail Crash Zones
Bristol Borough	4,024	0	433	22	88	0	0	70	3,324	13	28	17	2	5	4,002
Bristol Township	20,102	0	369	157	54	0	0	23	5,254	16	79	24	0	100	6,076
Buckingham Township	8,367	53	6	0	8	0	0	5	870	6	3	11	4	57	1,023
Chalfont Borough	1,788	0	82	8	8	0	0	9	1,204	3	38	3	2	9	1,366
Doylestown Borough	3,486	1	442	1	32	0	0	4	1,118	3	1	4	0	0	1,606
Doylestown Township	6,807	12	28	0	32	0	0	5	965	4	16	2	1	17	1,082
Dublin Borough	741	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	656	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East Rockhill Township	2,652	5	1	1	3	0	4	1	437	3	2	3	0	31	491
Falls Township	11,954	7	283	145	29	0	0	16	3,054	18	39	28	10	86	3,715
Haycock Township	1,232	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hilltown Township	6,428	2	3	9	0	0	0	1	341	0	0	2	0	1	359
Hulmeville Borough	410	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ivyland Borough	359	0	9	11	3	0	0	5	323	0	2	0	0	6	359
Langhorne Borough	568	1	29	0	5	0	0	2	240	0	0	3	0	4	284
Langhorne Manor Borough	349	0	0	0	18	0	0	1	196	0	1	0	0	5	221
Lower Makefield Township	13,771	2	181	0	16	0	0	19	3,558	5	40	7	2	63	3,893
Lower Southampton Township	8,340	2	261	36	3	0	0	11	3,258	4	13	2	1	24	3,615
Middletown Township	17,420	2	352	37	55	0	4	26	5,731	25	34	8	2	176	6,452
Milford Township	4,430	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Morrisville Borough	3,241	2	152	9	24	0	0	18	1,748	8	6	11	5	10	1,993
New Britain Borough	1,151	1	132	19	23	0	0	1	908	2	4	2	0	9	1,101
New Britain Township	4,937	14	11	10	3	0	0	4	634	4	3	0	1	18	702
New Hope Borough	1,446	0	235	0	21	0	1	7	925	5	3	6	4	32	1,239
Newtown Borough	1,054	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Newtown Township	8,544	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nockamixon Township	1,827	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northampton Township	15,081	7	107	131	0	0	2	5	1,373	3	68	5	0	40	1,741
Penndel Borough	743	0	129	24	10	0	0	0	420	1	1	2	0	2	589
Perkasie Borough	3,546	3	166	11	30	0	0	12	1,677	0	44	9	1	22	1,975
Plumstead Township	5,957	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quakertown Borough	3,259	0	157	38	33	0	0	7	1,347	7	3	3	0	9	1,604

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Military	Mining	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures in Rail Crash Zones
Richland Township	6,621	20	47	55	16	0	0	5	2,008	0	60	12	1	83	2,307
Richlandtown Borough	447	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	465	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sellersville Borough	1,914	0	82	4	24	5	0	4	1,352	1	11	3	0	68	1,554
Silverdale Borough	337	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	4,322	9	112	1	3	0	1	2	762	0	12	11	1	26	940
Springfield Township	2,719	3	24	8	2	0	0	0	91	4	3	6	0	27	168
Telford Borough	763	0	20	12	15	0	0	2	593	2	46	1	0	2	693
Tinicum Township	2,352	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trumbauersville Borough	386	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tullytown Borough	900	2	72	116	11	0	0	7	382	12	15	11	1	14	643
Upper Makefield Township	3,775	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Upper Southampton Township	6,233	3	189	57	5	0	0	4	1,408	2	3	4	0	22	1,697
Warminster Township	13,677	0	212	210	33	0	0	2	1,734	4	21	9	2	6	2,233
Warrington Township	9,377	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warwick Township	6,284	17	82	114	0	0	0	0	32	2	13	3	0	17	280
West Rockhill Township	2,502	26	19	30	6	0	0	4	491	2	6	9	0	14	607
Wrightstown Township	1,497	10	11	0	1	0	4	3	208	0	0	3	0	38	278
Yardley Borough	1,350	0	24	1	3	0	0	2	571	2	0	6	1	19	629
TOTAL	**256,893**	**204**	**5,026**	**1,452**	**679**	**5**	**16**	**309**	**54,558**	**216**	**709**	**250**	**43**	**1,174**	**64,641**

Structures in Air Crash Zones by Type per Municipality (Bucks County GIS, 2025)

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures In Air Crash Zones
Bedminster Township	3,278	57	2	0	1	0	143	1	1	1	0	12	218
Bensalem Township	22,234	0	0	0	0	0	0	0	0	0	0	0	0
Bridgeton Township	790	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Borough	4,024	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Township	20,102	0	0	0	0	0	0	0	0	0	0	0	0
Buckingham Township	8,367	17	41	31	3	3	188	3	10	0	1	4	301
Chalfont Borough	1,788	0	0	0	0	0	0	0	0	0	0	0	0

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures In Air Crash Zones
Doylestown Borough	3,486	0	0	0	0	0	0	0	0	0	0	0	0
Doylestown Township	6,807	0	0	0	0	0	0	0	0	0	0	0	0
Dublin Borough	741	0	0	0	0	0	0	0	0	0	0	0	0
Durham Township	656	0	0	0	0	0	0	0	0	0	0	0	0
East Rockhill Township	2,652	0	0	1	0	1	47	19	2	1	0	8	79
Falls Township	11,954	0	0	0	0	0	0	0	0	0	0	0	0
Haycock Township	1,232	0	0	0	0	0	0	0	0	0	0	0	0
Hilltown Township	6,428	12	3	0	0	0	143	0	3	0	0	2	163
Hulmeville Borough	410	0	0	0	0	0	0	0	0	0	0	0	0
Ivyland Borough	359	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Borough	568	0	0	0	0	0	0	0	0	0	0	0	0
Langhorne Manor Borough	349	0	0	0	0	0	0	0	0	0	0	0	0
Lower Makefield Township	13,771	0	0	0	0	0	0	0	0	0	0	0	0
Lower Southampton Township	8,340	0	0	0	0	0	0	0	0	0	0	0	0
Middletown Township	17,420	0	0	0	0	0	0	0	0	0	0	0	0
Milford Township	4,430	23	4	21	0	0	137	3	4	3	0	11	206
Morrisville Borough	3,241	0	0	0	0	0	0	0	0	0	0	0	0
New Britain Borough	1,151	0	0	0	0	0	0	0	0	0	0	0	0
New Britain Township	4,937	6	0	0	0	0	92	0	1	0	0	1	100
New Hope Borough	1,446	0	0	0	0	0	0	0	0	0	0	0	0
Newtown Borough	1,054	0	0	0	0	0	0	0	0	0	0	0	0
Newtown Township	8,544	0	0	0	0	0	0	0	0	0	0	0	0
Nockamixon Township	1,827	5	1	0	0	0	33	0	0	0	0	3	42
Northampton Township	15,081	0	0	0	0	0	0	0	0	0	0	0	0
Penndel Borough	743	0	0	0	0	0	0	0	0	0	0	0	0
Perkasie Borough	3,546	0	0	1	0	0	101	0	3	0	0	4	109
Plumstead Township	5,957	11	29	16	1	0	74	1	3	0	0	5	140
Quakertown Borough	3,259	0	0	0	0	0	0	0	0	0	0	0	0
Richland Township	6,621	5	0	0	0	0	268	0	0	0	0	0	273
Richlandtown Borough	447	0	0	0	0	0	0	0	0	0	0	0	0
Riegelsville Borough	465	0	0	0	0	0	0	0	0	0	0	0	0
Sellersville Borough	1,914	0	0	0	0	0	0	0	0	0	0	0	0
Silverdale Borough	337	0	0	0	0	0	0	0	0	0	0	0	0
Solebury Township	4,322	6	0	0	0	4	53	0	0	1	0	3	67
Springfield Township	2,719	0	0	0	0	0	0	0	0	0	0	0	0
Telford Borough	763	0	0	0	0	0	0	0	0	0	0	0	0
Tinicum Township	2,352	13	1	0	1	2	94	2	2	0	0	21	136
Trumbauersville Borough	386	1	0	0	0	0	0	0	0	0	0	0	1
Tullytown Borough	900	0	0	0	0	0	0	0	0	0	0	0	0
Upper Makefield Township	3,775	0	0	0	0	0	0	0	0	0	0	0	0

Municipality	Total Structures	Agriculture	Commercial	Industrial	Institutional	Recreation	Residential	Transportation	Undeveloped	Utility	Water	Wooded	Total Structures In Air Crash Zones
Upper Southampton Township	6,233	0	0	0	0	0	0	0	0	0	0	0	0
Warminster Township	13,677	0	0	0	0	0	0	0	0	0	0	0	0
Warrington Township	9,377	0	0	0	0	0	0	0	0	0	0	0	0
Warwick Township	6,284	1	18	78	0	2	628	1	9	2	2	4	745
West Rockhill Township	2,502	1	0	0	0	0	7	0	0	0	0	0	8
Wrightstown Township	1,497	0	0	0	0	0	0	0	0	0	0	0	0
Yardley Borough	1,350	0	0	0	0	0	0	0	0	0	0	0	0
Total	**256,893**	**158**	**99**	**148**	**6**	**12**	**2,008**	**30**	**38**	**8**	**3**	**78**	**2,588**

4.5.10.6 Equity in Vulnerable Communities

Individuals without access to private vehicles, seniors, and low-income households are more vulnerable to transportation incidents because they rely heavily on public roads and transit for employment, medical care, and essential services. Transportation accidents can limit mobility, delay emergency response, and disrupt access to critical services for these populations. In Bucks County, vulnerable communities are often located near high-volume roadways and rail lines, particularly in Lower Bucks County and older boroughs, where traffic density and freight movement increase the likelihood of transportation-related incidents.

4.5.11 Urban Fire and Explosion

Urban fires and explosions involve a structure or property fire within an urban or developed area. For hazard mitigation purposes, major urban fires involving large buildings and/or multiple properties are of primary concern.

4.5.11.1 Location and Extent

Statewide, this hazard occurs in the denser, more urbanized areas and occurs most often in residential structures (US Fire Administration, 2019). Urban fires can more easily spread from building to building in these denser areas.

Urban fires and explosions can be triggered or exacerbated by other disaster events such as floods, storms, drought, transportation accidents, hazardous materials releases, criminal activity such as arson, and terrorism. Urban fires have the potential to cause extensive damage to residential, commercial, or public property. Damage ranges from minor smoke and/or water damage to the destruction of buildings. People are often displaced for several months to years depending on the magnitude of the event. Urban fires and explosions can also cause injuries and death; in Pennsylvania in 2023, the fire mortality rate was approximately 16 deaths per million residents, or about 208 fire-related deaths per year. This is higher than the national average of 13.1 deaths per million residents and places it in the upper half of states nationwide (US Fire Administration, 2023).

4.5.11.2 Range of Magnitude

The effects of a major urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials (FEMA, 1997). The impacts of urban fire and explosion events vary based on the size of the incident and the population and structure where it occurs. Although most fires are small structural fires, the cumulative effect of these small incidents can be great in terms of property damage and lives lost. Many small incidents have the potential for a fire disaster if early warning and fire department services are not available. The secondary effects of urban fire events relate to the ability of public, private, and non-profit entities to provide post-incident relief.

There are additional economic consequences related to this hazard. Urban fires and explosions may result in lost wages due to temporarily or permanently closed businesses, destruction and damage involving business and personal assets, loss of tax base, recovery costs, and lost investments on destroyed property. Human services agencies (community support programs, health and medical services, public assistance programs, and social services) can be affected by urban fire and explosion events as well. Effects may consist of physical damage to facilities and equipment, disruption of emergency communications, loss of health and medical facilities and supplies, and an overwhelming load of victims who are suffering from the effects of the urban fire, including loss of their home or place of business.

One of the worst-case urban fire events occurred in Falls Township in 1982, when a fire leveled an entire 1.2 million square-foot K-Mart Distribution Center, causing more than $200 million in damages (NFPA, 1982). Another notable fire occurred at the Bristol Township School in September 2013. During the course of the response a fire hydrant failed and blew up, causing injury to one of the responding firefighters. A second firefighter was also injured during the response. The fire was later ruled as arson (Philly Fire News, 2013).

The worst explosion event on record occurred in 2005 when construction caused a gas explosion at an apartment home in New Hope. The three-unit apartment building was destroyed, one resident was injured, and five people were left homeless as a result (Marcovitz, 2005).

Table 4.5.11-1 Lifelines Most Likely to be Impacted by Urban Fire and Explosion

Lifelines	Notes
	Government personnel will need to respond where community safety is threatened.
	Shelter is at risk as fires and explosions have a direct impact on houses and other forms of shelter
	Medical personnel may be needed for response and recovery.

4.5.11.3 Previous Occurrence

Fire incidents in Bucks County are primarily documented through the Bucks County Department of Emergency Communications 911 Computer Aided Dispatch (CAD) system, which records all fire related dispatches, including structure fires, vehicle fires, brush fires, fire alarms, and fire investigations. Publicly available information on fire incidents is limited; the public facing Bucks County 911 Incident Report is a static Power BI dashboard that provides a fixed snapshot of recent incidents only and does not allow users to access or filter historical data. While the County does not currently publish static annual fire incident totals, historical fire incident data for the period 2001 through 2020 is documented in the Bucks County 2021 Hazard Mitigation Plan Update.

Review of the historical data indicates that fire incidents represent a chronic and recurring hazard in Bucks County rather than an episodic risk. From 2001 through 2010, annual fire related dispatch totals remained relatively stable at approximately 7,000 incidents per year countywide. Beginning around 2011, reported fire incident totals increased substantially across nearly all municipalities, reflecting expanded dispatch classifications and reporting practices rather than localized anomalies. This increase persisted through the mid-2010s, indicating a sustained higher level of fire related response activity countywide.

The data also show that fire incidents are not evenly distributed geographically. Higher density and more urbanized municipalities particularly those in Lower and Central Bucks County consistently account for a disproportionate share of fire responses, while smaller boroughs and rural townships experience significantly lower call volumes. This spatial concentration underscores the influence of population density, building stock, commercial activity, and infrastructure complexity on fire incident frequency.

Analysis of countywide fire event types for the 2015–2020 period further indicates that the most common fire related incidents involve residential structures, brush and vegetation fires, and fumes or electrical issues within buildings. Dwelling fires and brush fires together account for a substantial portion of all fire events, highlighting both residential risk and the presence of wildland urban interface conditions within the county. Electrical and fumes related incidents reflect ongoing vulnerability associated with aging structures and mechanical systems. Historical information indicates that Bucks County experiences several thousand fire related responses annually, with persistent exposure across all municipalities and elevated concentrations in higher population areas.

4.5.11.4 Potential for Future Occurrence

The future occurrence of urban fire and explosion events can be considered likely as defined by the Risk Factor Methodology probability criteria (see Table 4.6-1). Minor events are likely to happen more frequently than major fires or explosions in the future. The greatest urban fire and explosion threats in Bucks County are industrial or hazardous material fires. While residential fires are more common, industrial fires have a potentially higher risk because of the possibility of there being flammable chemicals and a sustained fuel source at industrial sites. Areas with greater population density are at greater risk for fires.

4.5.11.5 Vulnerability Assessment

Areas where large buildings are located or where development is closely spaced are more vulnerable to urban fire and explosion events. In Bucks County, the jurisdictions with the highest population densities (greater than 5,000 persons per square mile) include Penndel and Bristol Boroughs (US Census, 2023). In order to adequately assess vulnerability to urban fires and explosions, detailed information on the design specifications, specifically fire codes, used for the construction of individual buildings is required.

The Fire Marshal Department advises the County Commissioners in matters regarding fire protection and safety within Bucks County. The Fire Marshal Department operates and maintains a juvenile fire-setter intervention program in order to address the juvenile fire-setting problem and reduce the threat of fire from the youth population. The department operates a number of other urban fire mitigation programs (Bucks County, 2021b):

- Inspects all County Government owned and leased properties for fire safety.
- Inspect provider homes for the Bucks County Area Agency on Aging and Foster Care Homes for the Children and Youth Agency.
- Maintains fire alarms, security alarms, and panic alarms in all Bucks County owned and leased properties.
- Operates a central station to monitor all County owned emergency alarms.
- Maintains thousands of Bucks County portable fire extinguishers.

As of December 31, 2006, all communities in Pennsylvania are required to comply with the Uniform Construction Codes. This includes requirements to comply with both the International Fire Code and the International Wildland

Urban Interface Code. The adoption and enforcement of these codes will hopefully decrease the overall vulnerability of structures in Bucks County. However, these regulations will only affect new construction, as well as additions and renovations to existing structures. Older buildings that do not meet the criteria established in these modern fire codes will continue to remain vulnerable to urban fire and explosion events.

In Bucks County a Future of Fire Service Report was recently completed that recognizes a shortage of volunteers to help with emergency response to fires. This report is discussed in more detail in Section 5 Capability Assessment.

4.5.11.6 Equity in Vulnerable Communities

Low-income households, renters, and seniors may face increased risk from urban fires and explosions due to their residence in older, higher-density buildings with aging electrical or gas systems. These populations may also have limited ability to recover from property loss due to lower insurance coverage and fewer financial reserves. In Bucks County, boroughs and older developed areas, including Bristol Borough, Morrisville Borough, Penndel Borough, and Quakertown Borough, contain higher proportions of vulnerable populations living in structures more susceptible to fire or explosion hazards.

4.5.12 Utility Interruption

Urban 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 (Bonner, 2017):

- Geomagnetic Storms.
- Fuel or Resource Shortage.
- Electromagnetic Pulse.
- Information Technology Failure.
- Ancillary Support Equipment.
- Public Works Failure.
- Telecommunications System Failure.
- Transmission Facility or Linear Utility Accident.
- Major Energy, Power, Utility Failure.

4.5.12.1 Location and Extent

Utility interruptions include any impairment of the functioning of telecommunications, gas, electric, water, or waste networks. Interruptions or outages occur because of geomagnetic storms, fuel or resource shortage, electromagnetic pulses, information technology failures, transmission facility or linear utility accident, and major energy, power, or utility failure.

These kinds of interruptions rarely spontaneously occur on their own; this hazard is often secondary to other hazard events, particularly transportation accidents, lightning strikes, floods, windstorms, extreme heat or cold events, coastal storms, and winter storms. For example, severe thunderstorms or winter storms could bring down power lines and cause widespread disruptions in electricity service. Strong heat waves may result in rolling blackouts where power may not be available for an extended period. Local outages may be caused by traffic accidents or wind damage. National and international current events can also impact the supply of fuels to the County.

Utility interruptions and power failures can take place throughout the County. The focus of utility interruptions as a hazard in Bucks County include fuel, electric, or utility failure, though utility failure can also include water, waste, and telecommunications networks. Bucks County is served by three high-powered electric providers; PPL, Inc., PECO Energy, and First Energy. Natural gas service is available in many parts of the county through PPL, Inc., PECO Energy Company, and UGI. Local telephone service is provided by Version and Frontier Communications, and all major long-distance and cellular providers are available in Bucks County (BCEDC, 2021).

According to the 2023 American Community Survey (ACS) 5-year survey, in Bucks County, 37.4% of housing units use utility gas, followed by 30.5% of home using electric heat and 24.5% of homes using fuel oil/kerosene (US Census, 2023). As a result, an interruption in any three of those utilities could affect a significant number of residents. Utility interruptions have the potential to take place throughout the County in any location where a utility is present, including along any of its 243 miles of natural gas pipeline and 48 miles of liquid petroleum pipeline. In addition, an increasing reliance on internet access and telecommunications could also impact a large number of residents at any given time.

In Bucks County there are over 80 community water suppliers that utilize 239 public wells and 8 water filtration plants. Major community water suppliers primarily include private water companies, municipal water departments, and water supply authorities. Approximately 82% of households in the County rely on public water supply. Public suppliers serve portions of 47 of the 54 municipalities in Bucks County; only Bridgeton, Durham, Haycock, Nockamixon, Tinicum, Upper Makefield, and Wrightstown Townships contain no major community water supply systems (BCPC, 2011a).

4.5.12.2 Range of Magnitude

Most severe utility interruptions and power failures are regional events. With the loss of power, electric-powered equipment and systems will not be operational. Examples may include 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 conditioning, basement flooding (sump pump failure), lack of light, loss of water (well pump failure), lack of phone service, or lack of internet service. These issues are more of a nuisance than a hazard but can cause damage or harm depending on the population affected and the severity of the outage. For example, loss of heating and cooling capability is more dangerous in the winter and summer months, when heat sensitive populations like the elderly and very young count on utilities to maintain a safe temperature.

The severity of a utility interruption can be compounded with extreme weather events, especially winter weather, extreme wind, or windstorm 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 can also hinger 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 physical checks.

In a possible worst-case scenario in Bucks County, a winter storm event could cause widespread power outages, leaving citizens without heat during subzero temperatures for several days, stranded as they wait for roads to be plowed. 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 may also be difficult to repair because of the magnitude of the storm. A power outage during an extreme heat event would have a similar impact. A lack of air conditioning would put vulnerable populations at risk.

An additional possible worst case scenario for a utility interruption would be if an earthquake occurred at the New Madrid fault along the Missouri/Tennessee border, having a crippling effect on the power supply of the entire East Coast and creating the potential for multiple pipeline breaks all along the East Coast. This event would likely result in long term interruptions in fuel, electricity, gas, and telecommunications in Bucks County and across Pennsylvania and the region, resulting in little aide being available to alleviate the effects of this outage and help restore utilities.

The potential impacts of utility interruption on community lifelines are detailed in Table 4.5.12-1.

Table 4.5.12-1 Most Likely Lifelines Impacted by Utility Interruption

Lifelines	Notes
	Government facilities may be impacted directly and the capability to administer services diminished.
	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.
	Fuel usage may increase as a result of electricity no longer being available for an extended period of time.

4.5.12.3 Previous Occurrence

Energy emergencies may be caused by nationwide shortages or localized supply problems. Bucks County, like most of Pennsylvania, experienced problems in 1972-73 and again in 1976-77. During the 1972-73 incident, the County was particularly affected by heating oil shortages. Voluntary cutbacks in energy use helped ease the shortage. In 1976-77, the main problem was a gasoline shortage. This time voluntary cutbacks were insufficient, and an odd-even rationing plan was enforced.

Additionally, the County reports yearly occurrences of minor outages, as well as a notable ice storm event in January 2004 which led to widespread power outages.

In October 2012, Hurricane Sandy made landfall near Atlantic City, NJ and tracked through Southeastern Pennsylvania while heading north. In addition to a variety of impacts from flooding and wind damage, 1.8 million Pennsylvania residents experienced power outages. More than 300,000 of these homes were in Bucks and Montgomery Counties. PECO serves 1.6 million customers in the greater Philadelphia region; 850,000 were without power at some point which topped the previous record of 520,000 during a 1994 ice storm. As a result of hurricane sandy many residents were without power for days or weeks, depending on the ability for crews to make repairs in remote areas (Callahan, 2013).

On August 4, 2020 more than 600,000 customers in the Southeastern Pennsylvania region lost power due to complications from Tropical Storm Isaias. Outages were heaviest in Chester and Bucks Counties. About 98,000 Bucks County residents, or 43% of its customers lost power, according to PECO. A spokesperson noted this was one of the worst storms to impact utilities in the region in recent years (Maykuth, 2020).

On May 7, 2021, Colonial Pipeline was shut down after a cyberattack occurred on the pipeline. The eastern coast of the country, specifically Pennsylvania, New Jersey, and Delaware, and Mississippi and Tennessee have seen spikes

in gasoline prices as the pipeline shutdown has resulted in a limited amount of gasoline available. Pennsylvania and New Jersey's gas prices have risen eight cents within a week; Delaware's gas prices are up ten cents (Prigeon, 2021). Unusually strong wind gusts were responsible downed trees, power outages and road closures reported throughout Bucks County on February 16, 2025. PECO reported more than 360 power outages effecting nearly 23,000 customers in Bucks County (Ciaviglia, 2025).

On June 19, 2025, A severe storm swept through Central and Lower Bucks County Thursday evening with winds clocked as high as 70 mph, knocking out power to thousands and leaving a trail of closed roads, downed power lines, and fallen trees and branches. PECO reported that the severe weather caused extensive damage to its electric system and impacted thousands in its five-county service area. At its height, more than 80,000 PECO customers in Bucks County were without power (Werner, 2025).

4.5.12.4 Potential for 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 Pennsylvania (Frankson et al, 2017). This could increase the occurrence of power outages in the future.

The Philadelphia region is expected to see large increases in precipitation and numbers of very hot and very cold days (Climate Central, 2019). 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 future probability of utility interruptions can be considered likely according to the Risk Factor Methodology (see Table 4.6-1).

Aging infrastructure also brings risk in the form of potential utility interruptions, particularly for places like Bucks County 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 as a result 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; repair, not replacement is generally the choice 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 on.

4.5.12.5 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, wind storms, 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., have also decreased our vulnerability to future shortages. However, severe weather extremes, accidents, labor strikes, terrorism, or nationwide shortages could cause significant energy shortage problem.

4.5.12.6 Equity in Vulnerable Populations

Seniors, medically dependent individuals, and low-income households are particularly vulnerable to utility interruptions because they rely on continuous access to electricity, heating, cooling, water, and communications for health and safety. Households with limited financial resources may struggle to afford backup power sources or temporary relocation during extended outages. In Bucks County, concentrations of vulnerable populations are found in Lower Bucks and service-center boroughs, where aging infrastructure and higher population density increase the impacts of utility disruptions. Extended outages in these areas can quickly escalate into public health and safety concerns.

4.6 VULNERABILITY ASSESSMENT SUMMARY

4.6.1 Ranking Methodology

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A Risk Factor (RF) is a tool used to measure the degree of risk for identified hazards in a planning area. The RF can also be used to assist local community officials in ranking and prioritizing those hazards that pose the most significant threat to their area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, and consensus from the planning team and information collected through development of the hazard profiles included in Section 4.3. The RF approach produces numerical values that allow identified hazards to be ranked against one another; the higher the RF value, the greater the hazard risk.

RF values were obtained by assigning varying degrees of risk to five categories for each of the 24 hazards profiled in the 2026 HMP Update. Those categories include probability, impact, spatial extent, warning time, and duration. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor is shown in Table 4.6-1. 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 example equation:

Risk Factor Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Table 4.6-1 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. In addition to the RF, a column on climate change impacts was added to summarize the anticipated impacts on the frequency, intensity, and duration of each hazard due to climate change. This mirrors the analysis done in the latest state HMP. Climate change ratings reflect what was done in the state plan and include some considerations to findings that are specific to Bucks County. More information can be found in hazard profiles.

Table 4.6-1 Risk Factor Methodology

Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
PROBABILITY *What is the likelihood of a hazard event occurring in a given year?*	UNLIKELY POSSIBLE LIKELY HIGHLY LIKELY	Less Than 1% Annual Probability Between 1% and 49.9% Annual Probability Between 50% and 90% Annual Probability Greater Than 90% Annual Probability	1 2 3 4	30%
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	MINOR	Very few injuries, if any. Only minor property damage and 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	

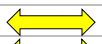
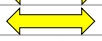
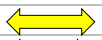
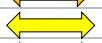
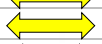
Table 4.6-1 Risk Factor Methodology

Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
	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 localized or regional?*	NEGLIGIBLE	Less than 1% of area affected.	1	20%
	SMALL	Between 1% and 10.9% of area affected.	2	
	MODERATE	Between 11% and 25% of area affected.	3	
	LARGE	Geater 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	
CLIMATE CHANGE *How will climate change impact the other 5 ratings for the hazard?*	NEGATIVE IMPACT	Expected to increase risks	↑	N/A
	POTENTIAL NEGATIVE	Potential to increase risks.	↔	
	LITTLE TO NO IMPACT	No impact or small risk increase through indirect means.	↔	
	POSITIVE IMPACT	Risk expected to decrease.	↓	

Using the methodology described in Section 4.6.1, Table 4.6-2 lists the Risk Factor calculated for each of the 24 hazards identified in the 2026 HMP Update. Hazards identified as high risk have risk factors of 2.5. or greater. Risk Factors ranging from 2.0 to 2.4 were deemed moderate risk hazards. Hazards with Risk Factors 1.9 and less are considered low risk.

Table 4.6-2 Risk Factor by Hazard

Hazard Risk	Hazard Natural (N) Or Human-Made (M)	Risk Assessment Category						Risk Factor
		Probability (1-4)	Impact (1-4)	Spatial Extent (1-4)	Warning Time (1-4)	Duration (1-4)	Climate Change	
HIGH	Flood, Flash Flood, Ice Jam (N)	4	3	3	2	3	↑	3.2
	Transportation Incident (M)	4	3	1	4	1	↔	2.8
	Winter Storm (N)	3	2	4	2	2	↔	2.7

Hazard Risk	Hazard Natural (N) Or Human-Made (M)	Risk Assessment Category						Risk Factor
		Probability (1-4)	Impact (1-4)	Spatial Extent (1-4)	Warning Time (1-4)	Duration (1-4)	Climate Change	
	Wildfire (N)	3	3	1	4	3		2.7
	Utility Interruption (M)	4	2	1	4	2		2.6
MODERATE	Tornado, Windstorm (N)	3	3	1	3	1		2.4
	Drought (N)	2	2	3	1	4		2.3
	Extreme Temperatures (N)	3	2	2	1	3		2.3
	EH: Hazardous Materials Release	3	2	1	4	2		2.3
	Nuclear Incident (M)	1	2	2	4	4		2.1
	Pandemic (N)	1	2	4	1	3		2.1
	EH: Conventional Oil and Gas Wells (M)	2	2	1	4	2		2.0
	EH: Gas and Oil Pipeline (M)	2	2	1	4	2		2.0
	EH: Unconventional Oil and Gas Wells (M)	2	2	1	4	2		2.0
	Dam Failure (M)	1	3	1	4	2		2.0
LOW RISK HIGH	Terrorism	1	3	1	4	1		1.8
	Radon (N)	2	1	2	1	4		1.8
	Landslide (N)	2	2	1	3	1		1.8
	Earthquake (N)	1	1	3	4	1		1.7
	Hailstorm (N)	2	1	2	3	1		1.7
	Invasive Species (N)	3	1	1	2	1		1.7
	Disorientation (M)	2	1	1	4	2		1.7
	Levee Failure (M)	1	2	1	4	1		1.6
	Subsidence, Sinkhole (N)	1	1	1	4	1		1.3

Based on these results, there are five high risk hazards, ten moderate risk hazards and nine low risk hazards in Bucks County. Mitigation actions were developed for all high, moderate, and low risk hazards (see Section 6.4). There were four hazards that increased in Risk Factor and one that decreased after consulting with participants and reviewing data. Transportation Incidents and Wildfire saw the largest increases, due to their Impact ratings moving from 1 to 3. Transportation Incidents moved from a Moderate Risk hazard at 2.2 to a High Risk hazard at 2.8. Wildfire made a similar move from 2.1 to 2.7. Tornado, Windstorm jumped from 1.96 to 2.4, driven by its Probability and Impact ratings moving from 2 to 3. The fourth hazard to increase was Terrorism, which went from a 1.6 to 1.8 rating due to an Impact increase from 2 to 3.

Winter Storm was the only hazard to decrease in rating, with its Probability dropping from 4 to 3 after discussions with municipalities indicated they have experienced this hazard less in recent years.

A risk assessment result for the entire county does not mean that each municipality has the same risk to each hazard. Municipalities completed a Hazard Risk Assessment Survey during the planning process evaluate their jurisdictional risk to each hazard. Results from these surveys were reassessed by the HMPT, and the update risk assessment was used to complete Table 4.6-3 which shows the different municipalities in Bucks County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the county as a whole. Overall, the most prominent shifts reported in hazards since the 2021 HMP update were a decrease in the frequency of winter storms and an increase in the frequency of windstorms that cause utility interruptions. An increase in the perceived threat of terrorism was also reported. Finally, a hazard profile about invasive species was added due to recommendations from in person engagement.

Table 4.6-3 Municipal Risk Compared to County-level Risk

Municipality	Flood, Flash Flood, Ice Jam	Winter Storm	Extreme Temperatures	Hurricane, Tropical Storm, Nor'easter	Environmental Hazards	Wildfire	Pandemic	Utility Interruption	Transportation Accidents	Gas & Liquid Pipelines	Drought	Tornado & Windstorm	Dam Failure	Urban Fire & Explosion	Terrorism	Lightning Strike	Landslide	Structural Collapse	Cyber Terrorism	Earthquake	Radon Exposure	Subsidence & Sinkholes	Hailstorm
Bedminster Township	=	=	=	=	<	=	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=	<	>
Bensalem Township	=	=	=	=	<	=	>	=	>	<	=	>	=	=	=	=	=	=	=	=	=	<	=
Bridgeton Township	=	=	=	=	<	>	=	=	=	<	>	=	<	<	=	=	=	=	=	=	=	<	=
Bristol Borough	>	>	=	=	<	=	>	=	>	<	<	=	=	>	=	=	=	=	=	=	<	<	=
Bristol Township	>	=	=	=	=	=	=	=	>	<	=	=	=	=	=	=	=	=	=	=	<	<	=
Buckingham Township	=	=	=	=	<	>	=	=	=	=	>	>	>	=	=	=	=	=	=	=	=	>	>
Chalfont Borough	=	=	=	=	<	<	=	=	>	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Doylestown Borough	=	=	=	=	<	<	>	=	=	<	=	=	=	=	>	=	=	=	=	=	=	<	=
Doylestown Township	=	=	=	=	<	=	=	=	=	=	=	=	>	=	=	=	=	=	=	=	=	<	=
Dublin Borough	>	=	=	=	<	<	=	=	=	<	=	=	=	=	=	=	<	=	=	=	=	<	=
Durham Township	=	=	=	=	<	=	=	=	=	<	>	=	<	<	=	=	>	=	=	=	>	>	>
East Rockhill Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=
Falls Township	=	=	=	=	=	=	=	=	>	<	=	>	=	=	=	=	=	=	=	=	=	<	=
Haycock Township	=	=	=	=	<	>	=	=	=	<	>	=	=	<	=	=	=	=	=	=	=	<	=
Hilltown Township	=	=	=	=	=	=	=	=	=	<	>	=	>	=	=	=	=	=	=	=	=	<	>
Hulmeville Borough	=	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Ivyland Borough	>	=	=	=	<	<	=	=	>	<	=	=	=	=	=	=	<	=	=	=	=	<	=
Langhorne Borough	>	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	<	=	=	=	=	<	=
Langhorne Manor Borough	>	=	=	=	<	=	=	=	>	<	<	=	=	=	=	=	<	=	=	=	=	<	=
Lower Makefield Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=
Lower Southampton Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	>	=	=	=	=	<	=
Middletown Township	=	=	=	=	=	=	>	=	>	<	=	=	>	=	=	=	=	=	=	=	=	<	=
Milford Township	=	=	=	=	<	=	=	=	=	>	>	=	=	=	=	=	=	=	=	=	=	<	>
Morrisville Borough	=	=	=	=	<	=	=	=	>	<	=	=	<	=	=	=	=	=	=	=	=	<	=
New Britain Borough	=	=	=	=	<	=	=	=	>	<	=	=	=	=	=	=	=	=	=	=	=	<	=
New Britain Township	=	=	=	=	<	=	=	=	=	<	=	=	>	=	=	=	=	=	=	=	=	<	=

Table 4.6-3 Municipal Risk Compared to County-level Risk

Municipality	Flood, Flash Flood, Ice Jam	Winter Storm	Extreme Temperatures	Hurricane, Tropical Storm, Nor'easter	Environmental Hazards	Wildfire	Pandemic	Utility Interruption	Transportation Accidents	Gas & Liquid Pipelines	Drought	Tornado & Windstorm	Dam Failure	Urban Fire & Explosion	Terrorism	Lightning Strike	Landslide	Structural Collapse	Cyber Terrorism	Earthquake	Radon Exposure	Subsidence & Sinkholes	Hailstorm
New Hope Borough	=	=	=	=	<	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=	=	<	=
Newtown Borough	>	=	=	=	<	<	=	=	=	=	<	=	=	=	=	=	<	=	=	=	=	<	=
Newtown Township	=	=	=	=	<	=	=	=	=	=	=	=	>	=	=	=	=	=	=	=	=	<	=
Nockamixon Township	=	=	=	=	<	>	=	=	=	=	>	=	>	=	=	=	=	=	=	=	=	<	>
Northampton Township	=	=	=	=	<	=	=	=	=	=	=	=	>	=	=	=	>	=	=	=	=	<	=
Penndel Borough	=	=	=	=	<	<	=	=	>	<	=	=	=	>	=	=	=	=	=	=	=	<	=
Perkasie Borough	=	=	=	=	=	<	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Plumstead Township	=	=	=	=	<	=	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=	<	>
Quakertown Borough	=	=	=	=	=	<	=	=	>	=	=	=	=	=	=	=	<	=	=	=	=	<	=
Richland Township	=	=	=	=	=	=	=	=	=	<	>	=	=	=	=	=	=	=	=	=	=	<	>
Richlandtown Borough	>	=	=	=	<	<	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Riegelsville Borough	>	=	=	=	<	=	=	=	=	<	<	=	<	=	=	=	=	=	=	=	>	>	=
Sellersville Borough	=	=	=	=	<	<	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Silverdale Borough	>	=	=	=	<	=	=	=	=	<	=	=	<	=	=	=	<	=	=	=	=	<	=
Solebury Township	=	=	=	=	<	>	=	=	=	=	=	=	>	=	=	=	=	=	=	=	=	<	>
Springfield Township	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	>	>	>
Telford Borough	>	=	=	=	<	<	=	=	=	<	<	=	<	=	=	=	<	=	=	=	=	<	=
Tinicum Township	=	=	=	=	<	>	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=	<	>
Trumbauersville Borough	=	=	=	=	<	<	=	=	=	<	=	=	=	=	=	=	<	=	=	=	=	<	=
Tullytown Borough	=	=	=	=	<	<	=	=	>	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Upper Makefield Township	=	=	=	=	<	=	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=	<	>
Upper Southampton Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=
Warminster Township	=	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=
Warrington Township	=	=	=	=	=	<	=	=	=	=	>	=	>	=	=	=	=	=	=	=	>	<	=
Warwick Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	>	=	=	=		<	=

Table 4.6-3 Municipal Risk Compared to County-level Risk

Municipality	Flood, Flash Flood, Ice Jam	Winter Storm	Extreme Temperatures	Hurricane, Tropical Storm, Nor'easter	Environmental Hazards	Wildfire	Pandemic	Utility Interruption	Transportation Accidents	Gas & Liquid Pipelines	Drought	Tornado & Windstorm	Dam Failure	Urban Fire & Explosion	Terrorism	Lightning Strike	Landslide	Structural Collapse	Cyber Terrorism	Earthquake	Radon Exposure	Subsidence & Sinkholes	Hailstorm
West Rockhill Township	=	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Wrightstown Township	=	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=	=	=	=	=	<	=
Yardley Borough	>	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	>	=	=	=	=	<	=

4.6.1 Future Development and Vulnerability

Risk and vulnerability to natural hazard events are not static. Risk will increase or decrease as counties and municipalities see changes in land use and development as well as changes in population. Bucks County is expected to experience a variety of factors that will, in some areas, increase vulnerability to hazards while in other areas, vulnerability may stay static or even be reduced.

Population change and the age of the housing stock are main indicators of vulnerability change in Bucks County. As discussed in Section 2.3, the total population of Bucks County is estimated to have increased by 0.5 percent from 2010-2019, indicating the overall population of the County has generally stayed the same. Twenty-five municipalities increased in population while twenty-nine decreased in population during this time period. Areas of higher density, in the larger municipalities and growing municipalities, face increased vulnerability and increased exposed structures with most hazard events. Increases in population results in increased vulnerability to hazards such as wildfires, floods, and winter storms as more people will be impacted.

Climate change is also an important topic that could affect Bucks County in the future. The Pennsylvania Department of Environmental Protection (PA DEP) states that climate change in Pennsylvania adds more flooding events, more heat and respiratory deaths, more disease and pests, and harm to agriculture. As climate change intensifies, the warmer and wetter the Commonwealth will become. In the past century, temperatures increased 1.8°F within Pennsylvania. By 2050, Pennsylvania is expected to see temperatures increase by 5.9°F. In terms of precipitation, Pennsylvania is expected to see an 8% increase by 2050. The increase in temperature and precipitation will impact public health, infrastructure, emergency services, agriculture, tourism, and recreation. In 2018 alone, PennDOT had over $125.7 million dollars in repairs to infrastructure from flood and landslides (PADEP, 2021c).

In Bucks County, the temperature has increased by 3.2°F from September 2014 to September 2019, one of the fastest rates within the Commonwealth. The only other county in Pennsylvania to have a higher increase in average temperature was Philadelphia with a 3.4°F increase (Bagenstose, 2019).

Section 2.3 also discusses the projected population change in Bucks County by 2040. Figure 2.3-1 shows the percent population change from 2010-2030 for each municipality while Table 2.3-4 shows the percent population change from 2010-2040. The largest population increases are expected to occur in the Northern to middle portions of the county. This includes Bedminster Township, Hilltown Township, Richland Township, Plumstead Township, and Milford Township. The smallest population increases are expected to be seen in more densely populated areas along the southern edge of the Delaware River, like the Falls Township, Bristol Township, Bristol Borough or the northern border, like Riegelsville Borough, Durham Township, and Springfield Township. The Planning Commission has also started to see a trend towards multi-family developments and apartments for instance in Middletown, Morrisville, Doylestown Borough, and Doylestown Township.

Current zoning and development regulations dictate how future development should safely occur within the SFHA. However, there are structures within the SFHA that were constructed prior to the first Flood Insurance Rate Maps were available and floodplain management regulations were in effect. This suggests that there is potential for additional loss due to flooding in the future. SFHA 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 the SFHA 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 enough protection.

In addition, remote and sparsely populated municipalities also face higher vulnerability to certain hazards because they may not have as easy access to care facilities or response personnel. For instance, the less populated municipalities such as Riegelsville Borough, Trumbauersville Borough, Hulmeville Borough, and Ivyland Borough face increased vulnerability to winter storms due to isolation, access issues, and longer emergency response times. Roughly 19% of Bucks County's population is over the age of 65. 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 aging housing stock in Bucks County is another source of current and future vulnerability in many hazard events. As discussed in Section 4.3.14.5, many homes in the County were built before 1940. Bucks County can experience gusts of wind up to 160 miles per hour during windstorms, tornadoes, hurricane, tropical storms, or nor'easters. The structure of these older houses may be more at risk of destruction under these strong wind conditions. These structures may also be at risk during flooding and winter storm events if the materials are either not strong enough to withstand the pressure or weight of the precipitation or are liable to leak, causing further risk of destruction to the house. 26,783 homes in Bucks County, or 10.7% of the total residential stock within the County, were built in 1939 or earlier (US Census, 2019).

The 2011 Bucks County Comprehensive Plan is the current Comprehensive Plan for Bucks County and is the policy basis for zoning decisions and other land development policies in the County. This plan is described as "a guide for local officials, residents, developers, business owners, and interested agencies… to coordinate development and preservation in appropriate areas of the county." The future land use plan proposes areas targeted as growth areas and preservation areas. Growth should be concentrated in town centers and secondary town centers, while rural resources and natural resources should be left undeveloped. The future land use plan is intended to "reaffirm the county's long-term goals of sustainability and good stewardship." Guiding principles are detailed to prioritize preservation and hazard mitigation when locating new development (BCPC, 2011a). 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.

5.0 CAPABILITY ASSESSMENT

5.1 Update Process Summary

The purpose of the capability assessment is to identify strengths and weaknesses that affect the ability of the county 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:

- Document Review - an inventory of the county's existing planning and regulatory tools and a review and incorporation of existing plans and other technical information as appropriate.
- Discussion of participation in the National Flood Insurance Program.
- Municipal Self-Assessment - an analysis of municipal capacity from a planning, policy, staffing, training, outreach, and political will standpoint.

Bucks County has a number of resources it can utilize to implement hazard mitigation initiatives, including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities, and participation in local, regional, state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during, and after a hazard event.

The 2026 plan update included a Capability Assessment Survey, which was developed based on the most recent PEMA and FEMA guidance, then distributed to all 54 municipalities, in an effort to identify local capabilities and resources which support hazard mitigation in Bucks County. The 2026 HMP was built from the previous (2021) plan to provide an updated inventory of the most critical local planning tools available within each municipality, and summarizes fiscal and technical capabilities available through programs within and outside of the county. This latest plan update also identifies emergency management capabilities and processes used for implementation of the National Flood Insurance Program (NFIP).

The Capability Assessment survey asked about the most common plans, tools, and programs found in Bucks County communities; about staff and personnel resources available to these municipalities; about financial resources; about the community political willingness to enact policies and programs related to mitigation; and requested a self-assessment of capabilities. In addition, communities completed FEMA's National Flood Insurance Program (NFIP) Worksheet as a part of assessing their capabilities. The NFIP Worksheet was developed to obtain information on participation in and compliance with the NFIP as well as to identify areas for potential mitigation actions. A number of the data points and statistics available via FEMA's Community Information System (CIS) were pre-populated on the worksheet, allowing municipalities to focus their comments on how they implement the NFIP in their community. 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.

This mitigation strategy, including the goals and actions, is incorporated into relevant planning mechanisms based on their 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 County's Comprehensive Plan through collaboration with the county and local Planning department. Likewise, information from relevant planning documents was used to inform and update the Hazard Mitigation Plan. A general list of relevant plans and documents and corresponding areas for incorporation are listed below:

Table 5.1-1 Relevant Documents

Relevant Documents	Hazard Mitigation Planning Elements
Comprehensive Plan/Land Use Plan, Bucks2040 Vision Plan, Zoning/Subdivision Regulations, Floodplain Ordinance, Open Space Plan, Countywide Action Plan, Annual Reports	Demographic data, land use, development trends, and floodplain management information
Stormwater Management Act 167 Plan, Long-Range Transportation Plan, Capital Improvement Plan	Stormwater management and infrastructure data and projects
Evacuation Plan, Emergency Operations/Response Plan, Continuity of Operations Plan	All-hazards information for evacuation, response and recovery
2020 Bucks County Hazard Mitigation Plan	Mitigation progress and solutions

5.2 Capability Assessment Findings

Challenges

Bucks County has significant flood exposure along the approximately 64 miles of the Delaware River that border the County. Though the Delaware River provides the county with natural resources, scenic beauty, and recreational activity, the river and its tributaries have contributed to numerous flooding events. There have been 161 flood events since 2000 (see Table 4.3.4-2); these flood events most typically are the result of heavy precipitation causing flooding along rivers and streams especially the Delaware River and Neshaminy Creek.

Bucks County and its municipalities are working hard to mitigate the negative impacts of flooding. For example, the County has acquired or elevated flood-prone properties by utilizing grant funding, including to mitigate repetitive loss properties. There is strong planning and regulatory capability between the municipalities and the county government. Planning related to mitigation, flooding, watersheds, stormwater management, and comprehensive planning should decrease the county's vulnerability to hazards in the future.

Bucks County is actively developing a Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR). The following capability gaps have been identified for Bucks County (Matthews, 2021):

Hazard Capability Gaps

Flooding / Hurricane: The capability gap for this event is to be able to provide timely rescue services during flooding events due to limited manpower trained in and equipment for Swift Water Rescue teams.

Hazardous Materials: The capability gap for this event lies with the ability for the Bucks County Special Operations HazMat Team to solely respond to hazardous material incidents. The current team is made up of primarily volunteer personnel with a limited number of Emergency Services staff providing coordination and response abilities.

Structure Collapse: The capability gap for this event lies with the ability for the Bucks County Special Operations Technical Rescue Team to solely respond to incidents. The current team is made up of primarily volunteer personnel with a limited number of Emergency Services staff providing coordination and response abilities.

Terrorism – Cyber: Cybersecurity continues to be a high-risk threat to the County's infrastructure. Currently however, Bucks County does not possess a cyber incident plan/annex to its Emergency Action Plan nor does it regularly communicate with externally regulated critical infrastructure to ensure its resilience to an attack.

Planning Capability Gaps

Emergency Action Plans: Not all 54 municipalities regularly submit updated Emergency Action Plans and there is a varying amount of experience and abilities across the Municipal Emergency Managers, with a majority of them being volunteer. This presents some difficulty when trying to engage all 54 jurisdictions in hazard identification and prevention efforts.

Administrative and Technical Capability Gaps

Firefighters: Due to continued dwindling numbers in properly trained and available volunteer firefighters, gaps were identified for the ability to respond effectively to fire events, including multiple occurring at one time. Municipalities would likely need to enact mutual aid.

Emergency Medical Services (EMS): Gaps were identified for the County's EMS system to effectively respond to a mass casualty incident requiring the transport of 50 people within 1 hour of incident onset. Gaps identified were due to the continued difficulty presented by individual organizations to recruit and retain paramedics and EMTs. Additionally, Bucks County has no immediate mass transportation resources operated by the county for transportation of injured persons. Mutual aid would be heavily utilized.

Mass Care Services: Gaps exist with the county's ability to solely respond to the need for mass sheltering. This would include the ability to provide shelter and food for approximately 2 weeks. County is currently reliant upon Mutual Aid and partner organizations in addition to requiring additional support from state and federal resources.

Community Capability Gaps

Community Resiliency: Gaps were identified in ensuring that households are appropriately covered by risk-appropriate insurance for flood, wind, and seismic events.

Public Information, Warning, Mass Notification: Gaps were identified for the County's ability to provide immediate mass notification or warning to limited English proficiency persons as well as those with functional disabilities.

Supply Chain Integrity and Security: Gaps exist in regards to the sustainability of private sector supply chains during a disaster. Bucks County currently has limited engagements with the private sector supply chain as it relates to being involved in indent management for restoration. Gaps were identified in the ability to promote awareness of threats, dependencies, vulnerabilities, and strategies with these private sectors.

An additional report that identifies capability gaps for Bucks County is The Future of Bucks County's Fire Services. An update to the original 1990 Bucks County Community Facilities: Emergency Services Report, the document identifies the rapid decline in active firefighters within the County. Bucks County is estimated to be facing a lack of 770 active firefighters to service the area. While there is plenty of equipment to be used within Bucks, there are not

enough firefighters. The report states the solution to the lack of volunteers will be solved through regulatory, operational, and financial changes to entice and encourage additional firefighters to support the communities within Bucks County (BCPC, 2021b).

5.2.1 Planning and Regulatory Capabilities

Bucks County and participating jurisdictions have several planning and regulatory tools in place to support the goals of hazard mitigation planning. Additionally, these regulations provide opportunities for further mitigating the potentially negative effects of natural hazards.

Pennsylvania municipalities have the authority to govern more restrictively than the state and federal minimum requirements, as long as they are in compliance with all criteria established in the Pennsylvania Municipalities Planning Code (MPC). Municipalities can develop their own policies and programs and implement their own rules and regulations to protect and serve their local residents. Bucks County and municipalities have used, and could continue to use, planning and regulatory tools to support the goals of this hazard mitigation plan and to provide opportunities for further mitigating the potentially negative effects of hazards.

Municipalities implement land use controls via the adoption and enforcement of zoning, subdivision and land development ordinances, building codes, building permit ordinances, floodplain, and stormwater management ordinances. When effectively prepared and administered, these regulations can lead to hazard mitigation. For example, the adoption of the NFIP and the Pennsylvania Floodplain Management Act (Act 166 of 1978) established minimum floodplain management criteria. A municipality must adopt and enforce these minimum criteria to be eligible for participation in the NFIP. Municipalities have the option of adopting a single-purpose ordinance or incorporating these provisions into their zoning and/or subdivision and land development ordinances, or building codes, thereby mitigating the potential impacts of local flooding.

Plans and Regulations

Some of the most important planning and regulatory capabilities that can be utilized for hazard mitigation include comprehensive plans, building codes, floodplain ordinances, subdivision and land development ordinances, and zoning ordinances. These tools provide mechanisms for the implementation of adopted mitigation strategies.
The purpose of a plan/ordinance review as part of this planning process is to:

- Identify existing initiatives.
- Provide an inventory and review of sample plans and ordinances and identify sections in these documents that address hazard mitigation-related issues.
- Provide a platform to integrate plans and other documents so recommendations and strategies are not in contradiction with one another (e.g., between the HMP and comprehensive plan).

A review of updated and existing zoning and subdivision ordinances, comprehensive plans, open space and recreation plans, stormwater management plans, sediment and erosion control plans, and emergency operations plans, among others, are summarized below by level of administration (Commonwealth, regional/county, and municipal).

Land Use Planning and Regulation Tools

The subsections below provide details on the types of plans and ordinances that Bucks County and the municipalities use to support the goals of this hazard mitigation plan and provide opportunities for further mitigating the potentially negative effects of natural hazards through land use regulation.

Comprehensive Plans

Comprehensive Plans promote sound land use and regional cooperation among local governments to address planning issues. A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. 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 and housing needs over time. Pennsylvania's MPC (Act 247 of 1968), as reauthorized and amended, requires counties to prepare and maintain a county comprehensive plan and to update it every 10 years. County governments are required by law to adopt a comprehensive plan, while local municipalities may do so at their option.

With regard to hazard mitigation planning, Section 301(a)2 of the MPC requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the Plan give consideration to floodplains and other areas of special hazards and other similar uses. The MPC also requires comprehensive plans to include a plan for community facilities and services and recommends giving consideration to storm drainage and floodplain management.

The existing countywide Comprehensive Plan for Bucks County was adopted in 2011. The County's comprehensive plan update, the *Bucks2040 Vision Plan*, a land use visioning plan, was published and adopted in January 2024 as a first step in the Comprehensive Plan update process. The Comprehensive Plan serves as a development guide for local officials, residents, developers, business owners, and interested agencies throughout the county. The plan identifies areas that should be targeted for both strategic development and future preservation throughout the county. The comprehensive plan details eight guiding principles that were used to identify development and preservation areas in Bucks:

- Protect natural, historic, and scenic resources;
- Preserve and expand parks, open space, and agricultural resources;
- Promote energy conservation and efficiency;
- Protect water resources and reduce waste;
- Mitigate hazards to life and property;
- Provide adequate community facilities and services;
- Enhance transportation mobility;
- Promote economic opportunity, housing diversity, and efficient use of land (BCPC, 2011a)

Additionally, all but four municipalities have developed and adopted comprehensive plans. Municipalities without comprehensive plans include Hulmeville Borough, Langhorne Manor Borough, Nockamixon Township, and Penndel Borough.

Open Space Plan

Bucks County also adopted the Open Space and Greenways Plan in 2011, used to develop a decision making, implementation and management tool which can protect and create linkages between the county's natural resources, open space and farmland, recreational facilities, and historic and cultural resources. The plan identifies corridors that could potentially host trails for public recreation, wildlife viewing, lessons in history, and alternative transportation. This acts as a guidance document for municipalities, conservation groups, landowners, and developers to identify greenways that should be preserved from development (BCPC, 2011b). Since the adoption of the Open Space and Greenways Plan, Bucks County has published six trail feasibility studies: (1) Mill-Queen Anne-Black Ditch Creeks, 2014; (2) Upper Neshaminy Creek Trail, 2014; (3) Lower Neshaminy Creek Trail, 2016; (4) Middle Neshaminy Creek Trail, 2019; (5) Newtown Rail Trail, 2019, and; (6) Liberty Bell Trail.

Municipal Waste Plan

Bucks County updated the Municipal Waste Management Plan for 2018-2028 for the Pennsylvania Department of Environmental Protection between 2014 and 2019. Municipal waste management plans provide ten-year guidance for solid waste management. This includes regulation of haulers, designation of disposal sites for municipal solid waste and recyclables, documentation of flow of municipal waste generated, and assurance of disposal capacity for ten years. The plan provides detailed descriptions of waste generated, waste facilities, and safe disposal practices in Bucks County (BCPC, 2019a).

Emergency Operations Plans

The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan (EOP) which is updated every two years. At least 30 of the jurisdictions in the County have or are in the process of developing an EOP. A countywide EOP also exists. Municipalities are not required to sign on to the County EOP, because County staff prefers to keep municipal emergency management coordinators actively engaged at a more local level (BCEMA, n.d.).

Emergency Debris Management Plan

In 2017, the County published their Emergency Debris Management Plan, which is focused on helping the county to respond to a natural or manmade debris-generating event (BCEMA, 2017). The plan helps identify agencies and activities that are involved in debris operations in order to help coordinate response in the case of an event. Initiatives in this plan help address debris that may be caused by hazard events, including tornadoes, floods, winter storms, earthquakes and civil disturbance.

High Hazard Potential Dam Emergency Action Plans

Pennsylvania requires a dam owner of a high hazard potential dam to prepare, update and periodically test and Emergency Action Plan. In order to meet this requirement, Emergency Action Plans have been prepared for high hazard dams located in Bucks County. Each Emergency Action Plan addresses ways to safeguard lives and reduce property damage within the inundation area; procedures for effective dam surveillance; procedures for prompt notification of emergency management officials; warning and evacuation procedures; and emergency response actions that will be taken in the event of potential or imminent failure of the dam (PA DEP, 2021d).

Zoning Ordinances

Zoning ordinances allow for local communities to regulate the use of land in order to protect the interested and safety of the general 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. All municipalities in Bucks County have zoning regulations.

Subdivision and Land Development Ordinances

Subdivision and land development ordinances (SALDOs) are intended to regulate the development of housing, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and size of roads and the location of infrastructure can reduce exposure of development to hazard events. Most jurisdictions within Bucks County have adopted and enforce a subdivision and land development ordinance: see Table 5.2-2.

Floodplain 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 in fact, encouraged, to adopt standards which exceed NFIP requirements. Bucks County's floodplain ordinances use the Pennsylvania Model Floodplain Ordinance, and some exceed the minimums; more information on the model ordinance is in Section 5.2.1.3.

Building Codes

Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can be adopted that require resistant or resilient building design practices to address hazard impacts common to a given community. In 2003, the Commonwealth of Pennsylvania implemented Act 45 of 1999, the Uniform Construction Code (UCC), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures. The UCC was amended most recently in 2017. Act 25 of 2017 and Act 36 of 2017, the amendments to the Pennsylvania Construction Code Act, went into effect October 25, 2017. The UCC was revised in 2018 to include Chapter 11, Appendix E of the International Building Code of 2018 and any other accessibility requirements contained in the 2018 I-codes. These revisions became effective on June 15, 2019. All 54 municipalities in Bucks County are required to adhere to the UCC.

Municipal Capabilities

Tables 5.2-1 include the planning capabilities that were identified by the municipalities during the planning process, as well as through Bucks County records. Empty cells are not necessarily reflective of that capability not being in place, only that it could not be confirmed from the planning process. Table 5.2-2 shows what codes and ordinances were reported to be in place.

Table 5.2-1 Summary of Planning Tools Adopted by Each Municipality

Municipality	Comprehensive/ Master Land Use Plan	Climate Change Adaptation Plan	Emergency Operations Plan	Brownfields Redevelopment Plan	NFIP Community Rating System	Community Wildfire Protection Plan	Continuity of Operations Plan	Disaster Recovery Plan	Economic Development Plan	Flood Mitigation Plan	Land Acquisition for Open Space and Public Recreation	Transportation Plan	Stormwater Management Plan
Bedminster Township	X				X								
Bensalem Township	X				X		X						
Bridgeton Township	X				X								
Bristol Borough	X				X		X						
Bristol Township	X				X		X						
Buckingham Township	X	X	X		X	X					X		X
Chalfont Borough	X				X								
Doylestown Borough	X				X		X						
Doylestown Township	X		X		X		X						X
Dublin Borough	X		X		No SFHA								
Durham Township	X				X								
East Rockhill Township	X		X		X					X	X		X
Falls Township	X				X								
Haycock Township	X		X		X						X		X
Hilltown Township	X				X		X						
Hulmeville Borough					X								
Ivyland Borough	X				No SFHA		X						
Langhorne Borough	X		X		X					X			X
Langhorne Manor Borough					X								X
Lower Makefield Township	X	X	X		X		X				X	X	X
Lower Southampton Township	X		X		X		X	X		X			X
Middletown Township	X				X		X						
Milford Township	X				X		X						
Morrisville Borough	X				X								
New Britain Borough	X		X		X								X

Municipality	Comprehensive/ Master Land Use Plan	Climate Change Adaptation Plan	Emergency Operations Plan	Brownfields Redevelopment Plan	NFIP Community Rating System	Community Wildfire Protection Plan	Continuity of Operations Plan	Disaster Recovery Plan	Economic Development Plan	Flood Mitigation Plan	Land Acquisition for Open Space and Public Recreation	Transportation Plan	Stormwater Management Plan
New Britain Township	X				X								
New Hope Borough	X				X								
Newtown Borough	X				X								
Newtown Township	X		X		X		X						X
Nockamixon Township					X		X						
Northampton Township	X				X		X						
Penndel Borough					X								
Perkasie Borough	X				X								
Plumstead Township	X				X		X						
Quakertown Borough	X				X								
Richland Township	X				X						X		X
Richlandtown Borough	X				No SFHA								
Riegelsville Borough	X		X		X		X		X	X	X		
Sellersville Borough	X				X		X						
Silverdale Borough	X				X								
Solebury Township	X	X	X		X		X	X	X	X	X	X	X
Springfield Township	X				X		X				X		
Telford Borough	X				No SFHA								
Tinicum Township	X		X		X		X	X		X	X		X
Trumbauersville Borough	X				X		X						
Tullytown Borough	X		X		X					X			X
Upper Makefield Township	X		X		X		X			X	X		X
Upper Southampton Township	X				X		X						
Warminster Township	X		X		X		X	X		X		X	X
Warrington Township	X		X		X		X	X					
Warwick Township	X		X		X		X	X					X
West Rockhill Township	X				X		X						

Municipality	Comprehensive/ Master Land Use Plan	Climate Change Adaptation Plan	Emergency Operations Plan	Brownfields Redevelopment Plan	NFIP Community Rating System	Community Wildfire Protection Plan	Continuity of Operations Plan	Disaster Recovery Plan	Economic Development Plan	Flood Mitigation Plan	Land Acquisition for Open Space and Public Recreation	Transportation Plan	Stormwater Management Plan
Wrightstown Township	X		X		X						X		X
Yardley Borough	X		X		X		X						X

Table 5.2-2 Summary of Codes and Ordinances Adopted by Each Municipality

Municipality	Building Code	Floodplain Management Ordinance/NFIP Compliance	Fire Department Inspections	International Property Maintenance Code	Other Hazard-Specific Ordinances (Stormwater, Steep Slope and Wildfire)	Site Plan Development Review Ordinance	Subdivision Development Review Ordinance	Zoning Ordinance
Bedminster Township	X	X					X	X
Bensalem Township	X	X					X	X
Bridgeton Township	X	X					X	X
Bristol Borough	X	X					X	X
Bristol Township	X	X					X	X
Buckingham Township	X	X	X	X	X	X	X	X
Chalfont Borough	X	X					X	X
Doylestown Borough	X	X					X	X
Doylestown Township	X	X	X	X	X		X	X
Dublin Borough	X		X				X	X
Durham Township	X	X					X	X
East Rockhill Township	X	X		X	X		X	X
Falls Township	X	X					X	X
Haycock Township	X	X		X	X		X	X
Hilltown Township	X	X					X	X
Hulmeville Borough	X	X					X	X
Ivyland Borough	X						X	X
Langhorne Borough	X	X		X	X	X	X	X
Langhorne Manor Borough	X	X		X	X	X	X	X
Lower Makefield Township	X	X	X	X	X	X	X	X
Lower Southampton Township	X	X	X	X		X	X	X
Middletown Township	X	X					X	X
Milford Township	X	X					X	X
Morrisville Borough	X	X					X	X
New Britain Borough	X	X	X	X	X		X	X
New Britain Township	X	X					X	X
New Hope Borough	X	X	X	X	X	X	X	X
Newtown Borough	X	X					X	X
Newtown Township	X	X	X				X	X
Nockamixon Township	X	X					X	X
Northampton Township	X	X					X	X
Penndel Borough	X	X					X	X
Perkasie Borough	X	X					X	X
Plumstead Township	X	X					X	X
Quakertown Borough	X	X					X	X
Richland Township	X	X		X	X		X	X

Municipality	Building Code	Floodplain Management Ordinance/NFIP Compliance	Fire Department Inspections	International Property Maintenance Code	Other Hazard-Specific Ordinances (Stormwater, Steep Slope and Wildfire)	Site Plan Development Review Ordinance	Subdivision Development Review Ordinance	Zoning Ordinance
Richlandtown Borough	X						X	X
Riegelsville Borough	X	X				X	X	X
Sellersville Borough	X	X					X	X
Silverdale Borough	X	X					X	X
Solebury Township	X	X	X		X	X	X	X
Springfield Township	X	X			X		X	X
Telford Borough	X						X	X
Tinicum Township	X	X			X	X	X	X
Trumbauersville Borough	X	X					X	X
Tullytown Borough	X	X	X	X	X	X	X	X
Upper Makefield Township	X	X	X	X	X	X	X	X
Upper Southampton Township	X	X					X	X
Warminster Township	X	X	X	X		X	X	X
Warrington Township	X	X	X	X		X	X	X
Warwick Township	X	X	X	X	X		X	X
West Rockhill Township	X	X					X	X
Wrightstown Township	X	X	X	X	X	X	X	X
Yardley Borough	X	X					X	X

5.2.2 Stormwater Management Planning and Regulation Tools

The proper management of stormwater runoff can improve conditions and decrease the chance of flooding. The Pennsylvania legislature enacted the Stormwater Management Act (Act 167 of 1978), commonly called Act 167, requiring counties to develop stormwater management plans for designated watersheds. This planning effort 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 ordinances, or is addressed on a site-to-site or municipal boundary basis. Municipalities within the same watershed may require different levels of control of stormwater. The result is often the total disregard of downstream impacts or the compounding of existing flooding problems.

Act 167 Stormwater Management Plans are intended to improve stormwater management practices, mitigate potential negative impacts from future land uses, and to improve the condition of impaired waterways. This type of plan provides local ordinances that incorporate standards and criteria to manage and maintain peak runoff flows throughout the combined watersheds as development occurs. Also, it is not the intent of this plan to solve existing flooding or runoff problems, but to identify them for future correction and assure that problems do not get worse. More specifically, this plan does not require the municipalities to correct existing drainage problems.

Bucks County has strong watershed and stormwater management planning and Municipal Environmental Advisory Councils that complement other regulations to protect property owners from floodwaters and the natural landscape from pollution and hazardous materials; see Table 5.2-3 for specific stormwater management plans and regulations in place in Bucks County municipalities.

Table 5.2-3 Watershed and Stormwater Management Planning and Regulations in Bucks County Municipalities

Municipality	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)	Stormwater Management Plans or Criteria Location	Peak Rate Control	Required to Submit a NPDES Small MS4 Permit?	Total Maximum Daily Loads (TMDLs) within the township?	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)
Bedminster Township	Tohickon Creek and Perkiomen Creek	East Branch Perkiomen SMP 2004 and Tohickon Creek SMP 2002	Stand Alone	Yes	No		Tohickon Creek and Perkiomen Creek	East Branch Perkiomen SMP 2004 and Tohickon Creek SMP 2002
Bensalem Township	Neshaminy Creek Poquessing Creek and Delaware River South		Yes – Bensalem Twp. SMP Section 201-105 SALDO & Water Quality Ordinance, Section 301 (2005-01).	Yes	Yes	Yes	Neshaminy Creek Poquessing Creek and Delaware River South	
Bridgeton Township	Delaware River North		Yes - Stand Alone 9/12/02	Yes	No		Delaware River North	
Bristol Borough	Delaware River South and Neshaminy Creek	Neshaminy Creek Watershed SMP 2011 and DE South SMP 2004	Yes – Stand Alone	Yes	Yes	Yes	Delaware River South and Neshaminy Creek	Neshaminy Creek Watershed SMP 2011 and DE South SMP 2004
Bristol Township	Neshaminy Creek and Delaware River South		Yes – SALDO Section 518; Neshaminy Creek SMP & Storm. Mgmt. Ord. 9/2005	Yes	Yes	Yes	Neshaminy Creek and Delaware River South	
Buckingham Township	Neshaminy Creek and Delaware River South		Yes – Stand Alone	Yes	Yes		Neshaminy Creek and Delaware River South	
Chalfont Borough	Neshaminy Creek		Storm Mngt. Ord. Chapter 26 Waters (Based on Neshaminy 2010)	Yes	Yes	Yes	Neshaminy Creek	
Doylestown Borough	Neshaminy Creek		Yes – SALDO Ordinance amendment No. 2005-4		Yes		Neshaminy Creek	
Doylestown Township	Neshaminy Creek	Neshaminy Act 167 Plan (May 3, 2011)	Yes – Code of Ord.'s - Chapter 148	Yes	Yes	Yes	Neshaminy Creek	Neshaminy Act 167 Plan (May 3, 2011)

Municipality	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)	Stormwater Management Plans or Criteria Location	Peak Rate Control	Required to Submit a NPDES Small MS4 Permit?	Total Maximum Daily Loads (TMDLs) within the township?	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)
Dublin Borough	Tohickon Creek and E. Branch Perkiomen Creek		Yes. SALDO 1985 Article VII Section 705	Yes	No		Tohickon Creek and E. Branch Perkiomen Creek	
Durham Township	Delaware River North		Yes--Stormwater Management Ord. 8/2003	Yes	No		Delaware River North	
East Rockhill Township	Tohickon Creek and Perkiomen Creek	Tohickon Creek Watershed Plan (2002)	Yes – SALDO, Section 22-516 & Water Ord. - 26-301	Yes	Yes		Tohickon Creek and Perkiomen Creek	Tohickon Creek Watershed Plan (2002)
Falls Township	Delaware River South	Delaware River South SMP 2004	Stormwater Management Ordinance 4/5/2005 & SALDO 191-46	Yes	Yes	Yes	Delaware River South	Delaware River South SMP 2004
Haycock Township	Tohickon Creek and Delaware River North		Yes – Stormwater Management Ord.#91 10/7/2002	Yes	No		Tohickon Creek and Delaware River North	
Hilltown Township	Neshaminy Creek E. Branch Perkiomen Creek and Tohickon Creek		Yes – SALDO-Section 140-40	Yes	Yes		Neshaminy Creek E. Branch Perkiomen Creek and Tohickon Creek	
Hulmeville Borough	Neshaminy Creek		Code of Ord. Jan. 2002 - Chpt. 26, Part 3	Yes	Yes		Neshaminy Creek	
Ivyland Borough	Neshaminy Creek		Yes – SALDO - Section 606	Yes	Yes		Neshaminy Creek	
Langhorne Borough	Neshaminy Creek and Delaware River South		Yes--Ord. 1993 Neshaminy Creek Watershed & SALDO - Section 717	Yes	Yes		Neshaminy Creek and Delaware River South	
Langhorne Manor Borough	Neshaminy Creek and Delaware River South		Yes--Ord. 1993 Neshaminy Creek Watershed	Yes	Yes		Neshaminy Creek and Delaware River South	
Lower Makefield Township	Neshaminy Creek and Delaware River South		Yes – 5/18/2011 SALDO-Article XIII Section 178-93	Yes	Yes	Yes	Neshaminy Creek and Delaware River South	
Lower Southampton Township	Neshaminy Creek and Poquessing Creek	Neshaminy Act 167 Plan (2008)	Yes--Ord. #415 SALDO Section 604 & Chapter 17 Sections 101-908	Yes	Yes		Neshaminy Creek and Poquessing Creek	Neshaminy Act 167 Plan (2008)

Municipality	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)	Stormwater Management Plans or Criteria Location	Peak Rate Control	Required to Submit a NPDES Small MS4 Permit?	Total Maximum Daily Loads (TMDLs) within the township?	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)
Middletown Township	Neshaminy Creek and Delaware River South		Yes – Amended Ord. 00-09 8/16/2000 & (Section 406 SALDO)	Yes	Yes	Yes	Neshaminy Creek and Delaware River South	
Milford Township	Perkiomen Creek and Tohickon Creek		Yes – SALDO Section 512	Yes	Yes / IP		Perkiomen Creek and Tohickon Creek	
Morrisville Borough	Delaware River South		ZO-Section 465.15.I & SALDO Section 390-47 & Storm Sewage System & Stormwater Ordinance #951	Yes	Yes	Yes	Delaware River South	
New Britain Borough	Neshaminy Creek		Storm Mgmt. Ord. Amendment-- SALDO 1996	Yes	Yes		Neshaminy Creek	
New Britain Township	Neshaminy Creek	Neshaminy Creek SMP	Stormwater Mgmt. Ord. Chapter 25 Stand Alone 4_4_11	Yes	Yes	Yes	Neshaminy Creek	Neshaminy Creek SMP
New Hope Borough	Delaware River South		Yes-Article V Section 5.05 SALDO	Yes	No		Delaware River South	
Newtown Borough	Neshaminy Creek	Neshaminy Creek SMP	Stormwater Ord. #333 (2/1993), SALDO-- Section 606	Yes	Yes		Neshaminy Creek	Neshaminy Creek SMP
Newtown Township	Neshaminy Creek and Delaware River South	De River South (2004) and Neshaminy Creek SMP (2010)	Stand Alone Chapter 26 Water Part 2 Stormwater Management	Yes	Yes	Yes	Neshaminy Creek and Delaware River South	De River South (2004) and Neshaminy Creek SMP (2010)
Nockamixon Township	Delaware River North and Tohickon Creek	Delaware River North Act 167 Plan (2002) and Tohickon Creek (2002)as one standalone ordinance	Yes – Nockamixon Twp. Storm. Mgmt. Ord.106 Sept.18,2002 & SALDO Section 196-516	Yes	No		Delaware River North and Tohickon Creek	Delaware River North Act 167 Plan (2002) and Tohickon Creek (2002)as one standalone ordinance

Municipality	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)	Stormwater Management Plans or Criteria Location	Peak Rate Control	Required to Submit a NPDES Small MS4 Permit?	Total Maximum Daily Loads (TMDLs) within the township?	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)
Northampton Township	Neshaminy Creek and Little Neshaminy Creek		Yes – Chpt. 113 Ord. #499 Stormwater Mgmt. And Grading (Feb. 11, 2005)	Yes	Yes		Neshaminy Creek and Little Neshaminy Creek	
Penndel Borough	Delaware River South and Neshaminy Creek	Delaware River South Act 167 Plan (2005) Neshaminy Act 167 Plan (2005) as two stand alone ordinance	Yes – Storm. Mngt. Ord. 92-5, Amend. Dec. 1992 & Storm. Mgmt. Ord No. 2005-3--Article IV & Ord. No. 05-4, Article III.	Yes	Yes		Delaware River South and Neshaminy Creek	Delaware River South Act 167 Plan (2005) Neshaminy Act 167 Plan (2005) as two stand alone ordinance
Perkasie Borough	East Branch Perkiomen and Tohickon Creek		SALDO - Section 164-32	Yes	Yes		East Branch Perkiomen and Tohickon Creek	
Plumstead Township	Neshaminy Creek Delaware River South and Tohickon Creek	Neshaminy Creek SMP ('92) Delaware River South and Tohickon Creek	SALDO Section 22-923 & Twp. Stormwater Mgmt. Ord. 2002-15 adopted 9/17/2002 Amended 2007	Yes	Yes	Yes	Neshaminy Creek Delaware River South and Tohickon Creek	Neshaminy Creek SMP ('92) Delaware River South and Tohickon Creek
Quakertown Borough	Perkiomen Creek and Tohickon Creek		Yes--Act 167 ordinance adopted 2002	Yes	Yes		Perkiomen Creek and Tohickon Creek	
Richland Township	Perkiomen Creek Tohickon Creek and Delaware River North		Yes – Stormwater Mgmt. Ordinance & SALDO - Section 22-611	Yes	Yes / IP		Perkiomen Creek Tohickon Creek and Delaware River North	
Richlandtown Borough	Tohickon Creek		Storm. Mgmt. Ord. and SALDO Sec.524 and 525	Yes	Yes		Tohickon Creek	

Municipality	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)	Stormwater Management Plans or Criteria Location	Peak Rate Control	Required to Submit a NPDES Small MS4 Permit?	Total Maximum Daily Loads (TMDLs) within the township?	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)
Riegelsville Borough	Delaware River North		Under Development SALDO - Section 7005l; ZO - Section 1100 (g)	Yes	No		Delaware River North	
Sellersville Borough	E. Branch Perkiomen Creek		Yes – Stormwater Management Ord. #635 & SALDO - Section 135-34	Yes	Yes		E. Branch Perkiomen Creek	
Silverdale Borough	E. Branch Perkiomen Creek		SALDO - Section 516	Yes	Yes		E. Branch Perkiomen Creek	
Solebury Township	Delaware River South and Neshaminy Creek	Delaware River South SMP and Neshaminy 2011 SMP May 24, 2011	Yes – Stand-alone 2011-06	Yes	Yes / IP	Yes	Delaware River South and Neshaminy Creek	Delaware River South SMP and Neshaminy 2011 SMP May 24, 2011
Springfield Township	Delaware River North and Tohickon Creek		Yes – SALDO 1996 & Ord. # 114 4/1996	Yes	Yes / IP		Delaware River North and Tohickon Creek	
Telford Borough	E. Branch Perkiomen Creek		(tentative adoption of Act 167 plan)		Yes		E. Branch Perkiomen Creek	
Tinicum Township	Delaware River North and Tohickon Creek		Yes – SALDO Amend. 1/16/90 & Stormwater Management Ordinance, 2005	Yes	No		Delaware River North and Tohickon Creek	

Municipality	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)	Stormwater Management Plans or Criteria Location	Peak Rate Control	Required to Submit a NPDES Small MS4 Permit?	Total Maximum Daily Loads (TMDLs) within the township?	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)
Trumbauersville Borough	Perkiomen Creek and Tohickon Creek		Yes – SALDO - Section 512 & Ord. No. 197-02 (Stormwater Management Ordinance)	Yes	Yes / IP		Perkiomen Creek and Tohickon Creek	
Tullytown Borough	Delaware River South	Delaware River South SMP	Yes – Section 700	Yes	Yes	Yes	Delaware River South	Delaware River South SMP
Upper Makefield Township	Delaware River South and Neshaminy Creek	Delaware River South SMP and Neshaminy Creek SMP 2011	Yes – ZO-- Section 903.B.9 & SALDO Part 3- 327 (Retention/ Detention Basins) Part 3-318 (Str, Drainage System)	Yes	Yes		Delaware River South and Neshaminy Creek	Delaware River South SMP and Neshaminy Creek SMP 2011
Upper Southampton Township	Pennypack Creek and Neshaminy Creek	Neshaminy Creek SMP	Yes – SALDO - Section 160-67	Yes	Yes	Yes	Pennypack Creek and Neshaminy Creek	Neshaminy Creek SMP
Warminster Township	Neshaminy Creek and Little Neshaminy Creek	Neshaminy Creek watershed SMP 2011	Yes – Stand Alone	Yes	Yes		Neshaminy Creek and Little Neshaminy Creek	Neshaminy Creek watershed SMP 2011
Warrington Township	Pennypack Creek and Little Neshaminy Creek	Neshaminy Creek SMP 2010	Yes – Stand Alone Chapter 26 Stormwater Management	Yes	Yes		Pennypack Creek and Little Neshaminy Creek	Neshaminy Creek SMP 2010
Warwick Township	Neshaminy Creek and Little Neshaminy Creek		Yes – Storm. Mngt. Ord. 157-14, SALDO. Adopted 6-6-2005 by Ord. No. 2005-2	Yes	Yes		Neshaminy Creek and Little Neshaminy Creek	

Municipality	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)	Stormwater Management Plans or Criteria Location	Peak Rate Control	Required to Submit a NPDES Small MS4 Permit?	Total Maximum Daily Loads (TMDLs) within the township?	Watershed boundaries within municipality	Act 167 Plan Ordinance (date of adoption)
West Rockhill Township	Perkiomen Creek E. Branch Perkiomen Creek and Tohickon Creek	Tohickon Creek Watershed Plan (2002)	Yes – Article V -- Section 516 -- SALDO 2010	Yes	Yes / IP		Perkiomen Creek E. Branch Perkiomen Creek and Tohickon Creek	Tohickon Creek Watershed Plan (2002)
Wrightstown Township	Delaware River South and Neshaminy Creek	Neshaminy Creek SMP and DE South SMP	Neshaminy Creek Watershed Storm. Mgmt. Ord. 226 3/2005 & Delaware R. South Watershed Act 167 Storm. Mgmt. Ord. 2253/ 2005 & Ord. 232 & SALDO Section 516	Yes	Yes		Delaware River South and Neshaminy Creek	Neshaminy Creek SMP and DE South SMP
Yardley Borough	Delaware River South	DE River South SMP	Yes – Storm Sewerage System Section 611 SALDO & Mentioned as future goal in Comp. Plan	Yes	Yes		Delaware River South	DE River South SMP

IP-Individual Permit
SMP-Stormwater Management Plan

5.2.3 Subsidence Regulation Tools

Five municipalities in Bucks County have risk for subsidence due to limestone or other karst topography. These municipalities regulate development to mitigate the impact of karst topography, sinkholes, and surface depressions using regulations described in Table 5.2-4.

Table 5.2-4 Regulations in Place for Municipalities with Risk for Subsidence and Sinkholes

Municipality	Regulations
Buckingham Township	Regulates location of buildings, hazardous materials, on-lot wastewater disposal systems, fill, landfill, drainage systems, detention basins, underground utilities, and blasting. Regulates testing for limestone, wells, wastewater, stormwater facilities, and impervious surface.
Durham Township	Regulates their Karst Geology Region by requiring proposed development to supply geological testing and surveys and provide advanced stormwater requirements to direct the water away from this region.

Municipality	Regulations
Riegelsville Borough	Regulates impervious surface and stormwater.
Solebury Township	Regulates Carbonate Geology Overlay District by limiting the location of buildings, hazardous materials, on-lot wastewater disposal systems, and recycling and refuse facilities. Regulates impervious surface and stormwater.
Springfield Township	Requires a Carbonate Geology Study prior to issuance of a zoning permit for any earth disturbance and prior to preliminary plan approval for each subdivision and/or land development located within areas of the Township underlain by carbonate bedrock. Sets requirements for inspections during building and for repair and maintenance if a hazard appears after building. Regulates impervious surface and stormwater.

5.2.4 Bucks County Planning Commission Model Alternative Energy Ordinance

In early 2021, the Bucks County Planning Commission presented the Model Ordinance for Alternative Energy. The model ordinance offers communities within the County draft language of purpose and objective, definitions, applicability, land use and dimensional regulations, provisions for encouraging passive energy conservation, bonus provisions, permit and special exception application requirements, supplemental design, installation, and maintenance requirements, liability and insurance requirements, decommissioning, and public inquiries, inspections, violations, and remedies. Alternative energy allows residents to be less dependent on fossil fuels by opting for energy provided through solar, water, wind, or geothermal sources, thus protecting public health, safety, and welfare. Additionally, alternative energy sources can increase the resiliency of a community by being less reliant on a traditional power grid. Cleaner air quality and reduced greenhouse gasses are a few positive impacts alternative energy can have on the environment. As Bucks County and its jurisdictions continue to see development, incentivizing the inclusion of alternative energy in redevelopment and new development will support a healthier and more resilient community.

5.3 Participation in the National Flood Insurance Program

The Pennsylvania Floodplain Management Act (Act 166 of 1978) requires every municipality with flood hazard areas identified by FEMA to participate in the NFIP and permits all municipalities to adopt floodplain management regulations. The overriding purpose of the minimum floodplain management regulations as outlined in the CFR is to ensure that participating communities consider flood hazards, to the extent that they are known, in all official actions relating to land management and use. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their community. This helps keep insurance rates low and makes sure that the risk of flood damage is not increased by property development.

Table 5.3-1 summarizes NFIP data for the 54 municipalities in Bucks County; 49 participate in the NFIP. The Borough of Trumbauersville had previously participated, but is not currently active. There has been no change in NFIP participation between the 2021 Bucks County Hazard Mitigation Plan and the 2026 update. The table includes the date of their initial FIRM, the date of their current effective FIRM, the number of policies, and total coverage.

Table 5.3-1 Bucks County Municipal National Flood Insurance Program Information (PEMA, 2026).

Municipality	Initial FIRM Date	Current Effective Map Date	# Policies	TOTAL COVERAGE	Is the Community in Good Standing
Bedminster Township	12/01/83	03/16/15	18	$5,306,000.00	Yes
Bensalem Township	07/17/78	03/21/17	189	$50,873,000.00	Yes
Bridgeton Township	9/30/77	3/16/15	59	$14,244,000.00	Yes
Bristol Borough	12/18/79	3/21/17	175	$58,000,000.00	Yes

Municipality	Initial FIRM Date	Current Effective Map Date	# Policies	TOTAL COVERAGE	Is the Community in Good Standing
Bristol Township	9/29/78	3/21/17	464	$124,585,000.00	Yes
Buckingham Township	3/15/79	3/21/17	54	$17,911,000.00	Yes
Chalfont Borough	12/28/76	3/21/17	29	$9,174,000.00	Yes
Doylestown Borough	6/1/84	3/21/17	33	$11,264,000.00	Yes
Doylestown Township	9/29/78	3/21/17	46	$12,603,000.00	Yes
Dublin Borough	-	-	-	-	-
Durham Township	8/15/78	3/16/15	18	$4,617,000.00	Yes
East Rockhill Township	8/1/77	3/16/15	8	$2,443,000.00	Yes
Falls Township	9/30/80	3/21/17	66	$19,401,000.00	Yes
Haycock Township	9/3/80	3/16/15	9	$2,678,000.00	Yes
Hilltown Township	1/30/81	3/21/17	16	$4,510,000.00	Yes
Hulmeville Borough	9/30/77	3/21/17	26	$6,861,000.00	Yes
Ivyland Borough	-	-	-	-	-
Langhorne Borough	7/2/80	3/16/15	-	-	Yes
Langhorne Manor Borough	2/15/84	3/16/15	2	$563,000.00	Yes
Lower Makefield Township	9/30/77	3/21/17	268	$81,990,000.00	Yes
Lower Southampton Township	3/15/77	3/21/17	57	$18,600,000.00	Yes
Middletown Township	12/4/79	3/21/17	201	$51,818,000.00	Yes
Milford Township	6/1/82	3/16/15	24	$7,518,000.00	Yes
Morrisville Borough	9/30/77	3/16/15	40	$9,758,000.00	Yes
New Britain Borough	4/2/79	3/21/17	4	$1,108,000.00	Yes
New Britain Township	9/30/77	3/21/17	32	$11,437,000.00	Yes
New Hope Borough	12/15/77	3/16/15	200	$55,843,000.00	Yes
Newtown Borough	12/18/79	3/21/17	6	$2,400,000.00	Yes
Newtown Township	12/18/79	3/21/17	39	$15,910,675.00	Yes
Nockamixon Township	11/2/77	3/16/15	10	$3,179,793.00	Yes
Northampton Township	2/15/80	3/21/17	94	$31,070,000.00	Yes
Penndel Borough	5/18/99	3/16/15	-	-	Yes
Perkasie Borough	3/1/77	3/16/15	34	$9,948,000.00	Yes
Plumstead Township	9/29/78	3/21/17	28	$9,990,000.00	Yes
Quakertown Borough	7/5/77	3/16/15	105	$29,644,000.00	Yes
Richland Township	6/15/81	3/16/15	26	$7,128,000.00	Yes
Richlandtown Borough	-	-	-	-	-
Riegelsville Borough	4/17/78	3/16/15	70	$15,620,000.00	Yes
Sellersville Borough	2/15/78	3/16/15	19	$5,381,000.00	Yes
Silverdale Borough	1/5/84	3/16/15	-	-	-
Solebury Township	4/15/77	3/16/15	89	$29,517,000.00	Yes
Springfield Township	1/3/79	3/16/15	11	$3,018,000.00	Yes
Telford Borough	-	-	-	-	-
Tinicum Township	2/1/79	3/16/15	83	$24,088,000.00	Yes
Trumbauersville Borough	5/18/99	3/16/15	-	-	No
Tullytown Borough	2/1/80	3/21/17	4	$1,425,000.00	Yes
Upper Makefield Township	10/17/78	3/21/17	135	$40,159,000.00	Yes

Municipality	Initial FIRM Date	Current Effective Map Date	# Policies	TOTAL COVERAGE	Is the Community in Good Standing
Upper Southampton Township	4/3/78	3/21/17	60	$17,311,000.00	Yes
Warminster Township	3/1/78	3/16/15	66	$19,601,122.00	Yes
Warrington Township	9/29/78	3/21/17	66	$19,969,000.00	Yes
Warwick Township	9/29/78	3/16/15	50	$15,593,000.00	Yes
West Rockhill Township	7/5/84	3/16/15	10	$3,283,000.00	Yes
Wrightstown Township	8/15/78	3/21/17	14	$4,167,000.00	Yes
Yardley Borough	8/1/77	3/16/15	186	$47,961,000.00	Yes

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. For communities that participate in the NFIP, substantial damage determinations are required by local floodplain management ordinances. These provisions must be in place for residents of a community to purchase flood insurance through the NFIP. The determination about whether a structure is "substantially damaged" is made at the local government level, generally by a building official or floodplain manager. Substantial damage applies to a structure in the SFHA for which the total cost of repairs is 50 percent or more of the structure's market value before the disaster occurred, regardless of the cause of damage. This percentage could vary among jurisdictions but must not be below NFIP standards. Preliminary damage assessments after a disaster can be used when making substantial damage determinations. If a building within the floodplain is determined to be substantially damaged after a disaster, it will need to be brought into compliance through methods such as elevating the structure and floodproofing utilities. This should be monitored by the local community in order to stay in compliance with the NFIP. All NFIP participating communities in Bucks County have either adopted a stand-alone ordinance or have arranged for County administration of floodplain regulations.

Table 5.3-2 below lists the designated individual or agency responsible for implementing the requirements of the NFIP for each participating municipality as of January 2026.

Table 5.3-2 Floodplain Administrators by Municipality (DCED, 2025).

Municipality	Floodplain Administrator
Bedminster Township	Phil Neas
Bensalem Township	Kenneth Farrall
Bridgeton Township	Keystone Municipal Service
Bristol Borough	James J. Dillon
Bristol Township	Robert McTague
Buckingham Township	Richard G. Myers
Chalfont Borough	Richard O'Brien
Doylestown Borough	Karyn Hyland
Doylestown Township	Stephanie Mason
Dublin Borough	Colleen M. Pursell
Durham Township	Todd Myers

Municipality	Floodplain Administrator
East Rockhill Township	Steve Baluh
Falls Township	Joseph G. Jones
Haycock Township	Timothy Fulmer
Hilltown Township	Timothy Fulmer
Hulmeville Borough	William Wheeler
Ivyland Borough	Christopher Peterson
Langhorne Borough	Mary Zimmerman
Langhorne Manor Borough	Carroll Engineering
Lower Makefield Township	James Majewski
Lower Southampton Township	Joseph Galdo - Acting
Middletown Township	Jim Ennis
Milford Township	Gregg Kravitsky
Morrisville Borough	James Dillon
New Britain Borough	Mike Italia
New Britain Township	Daniel C. Fox
New Hope Borough	Lisa Littlefield
Newtown Borough	Mike Italia
Newtown Township	Barry Isett & Associates
Nockamixon Township	Steve Baluh
Northampton Township	Michael Solomon
Penndel Borough	Building Inspection Underwriters
Perkasie Borough	Andrea Coaxum
Plumstead Township	Wynn Associates, Inc.
Quakertown Borough	Kyle McCallister
Richland Township	Rich Brittingham
Richlandtown Borough	Calvin Trovinger
Riegelsville Borough	Todd Myers Cowan Associates, Inc.
Sellersville Borough	Brenda L. Detweiler
Silverdale Borough	Wynn Associates Inc.
Solebury Township	Wynn Associates, Inc.
Springfield Township	Tim Fulmer
Telford Borough	-
Tinicum Township	Curt Genner
Trumbauersville Borough	Dani McClanahan
Tullytown Borough	n/a
Upper Makefield Township	David Nyman
Upper Southampton Township	Susan Mazzitelli
Warminster Township	Mike Italia
Warrington Township	Allen Mason
Warwick Township	Tom Jones
West Rockhill Township	Wynn Associates, Inc.
Wrightstown Township	Keystone Municipal Service Gary Smith
Yardley Borough	Susan Mazzetelli

5.4 Community Rating System

The NFIP's Community Rating System (CRS) provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations; acquisition; relocation, or flood-proofing of flood-prone buildings, preservation of open space; and other measures that reduce flood damage or protect the natural resources and functions of floodplains.

The CRS was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. Section 541 of the 1994 Act amends Section 1315 of the 1978 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 the 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 percent for Class 9 communities up to 45 percent 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.

Lower Makefield Township and Warwick Township joined the CRS program in 2016; Upper Makefield Township joined in 2017; Yardley Borough began the process to participate in 2019.

Table 5.4-1 CRS Participation for Bucks County Jurisdictions (FEMA, 2025)

NFIP #	Community Name	Initial Effective Date	Current Effective Date	CRS Class	% Discount
420191	Lower Makefield, Township of	01-May-16	01-May-16	7	15
420207	Upper Makefield, Township of	01-Oct-17	01-Oct-22	8	10
420209	Warwick, Township of	01-May-16	01-May-16	7	15
420210	Yardley, Borough of	01-May-19	01-Apr-22	8	10

5.5 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 in order to effectively execute mitigation activities. Common examples of skill sets and technical personnel needed for hazard mitigation include: planners with knowledge of land development/ management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with the education or expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, fiscal staff to handle complex grant application processes. Within Bucks County, administrative and technical capability varies between the municipalities due mainly to population size and resources. Even neighboring municipalities may exhibit extreme variations in technical capability.

Emergency Management

In Pennsylvania, Emergency Management begins at the municipal level, as required by the PA Emergency Management Service Code. Every county, city, borough, and township in the Commonwealth are required to have an Emergency Management Coordinator who is recommended by the local jurisdiction, to the Governor, for official appointment. The ultimate responsibility for Emergency Management always rests with the chief elected officials and governing body; however, the Emergency Management Coordinator's role is to develop plans, conduct training, and coordinate all available resources in the community pre- and post-disaster. The Bucks County Emergency Management Agency coordinates countywide emergency management efforts and each municipality has a designated local Emergency Management Coordinator. A significant amount of information used to develop this plan was obtained from the emergency management coordinators.

Local Emergency Planning Committee

Effective partnerships are created in advance of a disaster by the Emergency Management Coordinator through the development of a proactive, comprehensive emergency operations plan and other planning, training, and exercise programs. Bucks County formed the Local Emergency Planning Committee (LEPC) to implement the requirements of Title III of the Superfund Amendments and Reauthorization Act of 1986. The LEPC is dedicated to enhancing community safety and preparedness through developing hazardous materials awareness, planning for hazardous materials emergency response, and encouraging partnerships between the community and industry. The LEPC meets five times a year, and works with the emergency response organizations, industry, and the community.

Voluntary Organizations Active in Disaster

The Bucks County Voluntary Organizations Active in a Disaster (VOAD) is a coalition of nonprofits, businesses, faith-based groups, and individuals who are identified to help if a disaster occurs. The VOAD was established by the Bucks County Emergency Management Agency and the United Way of Bucks County to identify volunteers, and determine their skill set, to best match volunteers to non-emergency service response needs after a disaster (VOAD, 2021).

County Planning Commission

In Pennsylvania, planning responsibilities are delegated to each county and local municipality through the MPC. Planning agencies are established as an advisor to the governing body on matters of community growth and

development. A governing body may appoint individuals to serve as legal and engineering advisors to the planning agency. In addition to the duties and responsibilities authorized by Article II of the MPC, a governing body may, by ordinance, delegate approval authority to a planning agency for subdivision and land development applications. A governing body has considerable flexibility, not only as to which powers and duties are assigned to a planning agency, but also as to what form an agency will possess. A governing body can create a planning commission, a planning department, or both.

The purpose of the Bucks County Planning Commission is to assist the County Commissioners and all 54 constituent municipalities with the introduction, establishment, and administration of sound land use practices and policies. This includes making recommendations on public and private proposals for development and preparing and administering planning regulations. Subdivision and land development plans are also reviewed and approved by the commission, which works in conjunction with municipal planning commissions where applicable. Continual education of planning commissions and County commissioners is a key function of the Bucks County Planning Commission. Commission staff include specialists in planning, landscape architecture, graphic design, transportation and trails planning, and Geographic Information Systems (GIS). The commission's Digital Library includes resources such as model ordinances and guidelines, transportation planning resources, municipal comprehensive plans, stormwater management plans, and countywide plans. It is publicly available at https://www.buckscounty.gov/2240/Digital-Library.

Engineering

A municipal engineer performs duties as directed in the areas of construction, reconstruction, maintenance, and repair of streets, roads, pavements, sanitary sewers, bridges, culverts, and other engineering work. The municipal engineer reviews and/or prepares plans, specifications, and estimates of the work undertaken within the municipality.

When staff responsible for planning and engineering the structures people rely on are familiar with the hazards that can impact the community, there is a great potential for synergy. These staff members will design communities and structures with hazard impacts in mind, resulting in more sustainable communities and stronger structures. Although some individual municipalities do not have a staff member with an understanding of hazards (natural or otherwise), the county Planning Department may provide consultation in many facets of planning and employ a hazard reduction planner whose focus is the mitigation of natural hazards.

Floodplain Administrator

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 mitigation planning and can make recommendations based on the needs and conditions of the community. All municipalities that participate in the NFIP have a designated FPA. In some municipalities floodplain management duties are assigned to a staff position with several roles. It is not out of the ordinary for a municipal official to hold more than one title, such as a municipal engineer, code enforcement officer, or municipal manager. In addition, municipalities may utilize a contracted engineering firm.

Grant-Writing Staff or Other Fiscal Staff

Many communities may not have the financial resources that are required to implement all their potential programs (e.g., mitigation measures). Therefore, they must rely on grants and other fundraising opportunities to obtain the

money necessary to perform mitigation projects. Many grants are competitive, and individuals can provide donations to a vast array of causes, so the community must demonstrate that it can use those funds better than other applicants. This may be difficult but having a specialist on staff will likely increase the community's chances of receiving funding. Many of the funding streams that can be used for hazard mitigation have substantial management and reporting requirements. Employing or having access to staff specializing in grants management will help the community ensure that it does not lose a grant opportunity because it did not meet the administrative requirements of that grant.

Staff With Experience Using Mapping (GIS) Software

Spatial and tabular data are linked in a computerized, visual format through the use of sophisticated GIS technology. Bucks County has GIS capabilities and can assist municipalities as needed. The county has a comprehensive database and is undertaking initiatives to make GIS more accessible and usable by local municipalities. The county now provides municipalities, and their residents, access to interactive maps which contain relevant land use, assessment, and floodplain layers/data. Various maps can be accessed at the following link: https://maps.buckscounty.gov/.

The county can contact municipalities directly to share more information about opportunities for GIS assistance.

Municipal Planning Commissions

As established by the MPC, municipal planning commissions advise municipal staff on matters relating to land use, zoning, or development decisions, providing recommendations for action after reviewing plans, proposals, and applications. Through this, they play a role in guiding community development. Planning commissions may also be responsible for implementing any general or comprehensive plans in the community. Members are typically appointed by the municipal board or council.

Municipal Capabilities

Table 5.5-1 identifies which staff and technical assistance municipalities have available to them. Based on assessment results, municipalities in Bucks County have moderate administrative and technical staff needed to conduct hazard mitigation-activities. There seems to be sufficient emergency management staff across the County and a majority of municipalities have engineering capabilities either in-house or via outside consultants. However, personnel with GIS software experience and grant-writing staff/other fiscal staff with was less likely with among the communities. However, the County may be able to support the jurisdictions with available staff and/or expertise to the communities that lack the administrative and technical capabilities. All municipalities in the County have an identified emergency management coordinator.

Table 5.5-1 Boards, Commissions, or Departments by Municipality, as Reported on Capability Assessment Surveys

Municipality	Engineering Department	Code Enforcement Department	Board of Education	Emergency Department	Maintenance Department	Mitigation Implementation Team	Mutual Aid Agreements	Planning Commission/Zoning Board	Public Utility Board(s)	Public Works Department	Purchasing Department
Bedminster Township				X							
Bensalem Township	X			X							
Bridgeton Township				X							
Bristol Borough	X			X							
Bristol Township	X			X							
Buckingham Township	X	X		X	X			X	X	X	X
Chalfont Borough				X							
Doylestown Borough	X			X							
Doylestown Township	X	X		X				X		X	
Dublin Borough	X	X		X	X			X		X	X
Durham Township				X							
East Rockhill Township	X	X		X	X			X		X	
Falls Township				X							
Haycock Township	X	X		X				X		X	
Hilltown Township	X			X							
Hulmeville Borough				X							
Ivyland Borough	X			X							
Langhorne Borough	X	X	X	X			X	X		X	
Langhorne Manor Borough		X		X				X			
Lower Makefield Township	X	X		X	X		X	X		X	
Lower Southampton Township	X	X	X	X			X	X		X	X
Middletown Township	X			X							
Milford Township	X			X							
Morrisville Borough				X							
New Britain Borough	X	X	X	X			X	X		X	X
New Britain Township				X							
New Hope Borough	X	X	X	X	X		X	X		X	X
Newtown Borough				X							
Newtown Township	X	X		X			X	X	X	X	X
Nockamixon Township	X			X							
Northampton Township	X			X							
Penndel Borough				X							
Perkasie Borough				X							
Plumstead Township	X			X							
Quakertown Borough				X							
Richland Township	X	X		X				X		X	
Richlandtown Borough				X							

Municipality	Engineering Department	Code Enforcement Department	Board of Education	Emergency Department	Maintenance Department	Mitigation Implementation Team	Mutual Aid Agreements	Planning Commission/Zoning Board	Public Utility Board(s)	Public Works Department	Purchasing Department
Riegelsville Borough	X	X		X	X		X	X		X	
Sellersville Borough	X			X							
Silverdale Borough				X							
Solebury Township	X	X	X	X	X	X	X	X		X	X
Springfield Township	X	X		X				X		X	
Telford Borough				X							
Tinicum Township	X	X		X	X		X	X		X	
Trumbauersville Borough	X			X							
Tullytown Borough	X	X		X	X			X		X	
Upper Makefield Township	X	X	X	X			X	X		X	X
Upper Southampton Township	X			X							
Warminster Township	X	X		X	X		X	X		X	
Warrington Township	X	X		X	X		X	X		X	X
Warwick Township	X	X		X	X		X	X		X	X
West Rockhill Township	X			X							
Wrightstown Township		X		X	X			X		X	
Yardley Borough	X	X	X	X						X	X

Table 5.5-2 Available Staff and Technical Assistance by Municipality, as Reported on Capability Assessment Surveys

Municipality	Land Use/Development Planner	Engineering	Emergency Manager	Floodplain Manager	Staff with experience using GIS	Grant-writing staff or other fiscal staff	Chief Building Officer	Business Administrator	Chief Financial Officer	Clerk	Community Planner	Land Use/Development Planner	Engineering
Bedminster Township			X										
Bensalem Township			X		X	X							
Bridgeton Township			X										
Bristol Borough	X		X	X	X								
Bristol Township	X		X	X	X	X							
Buckingham Township	X	X	X	X	X	X	X		X		X	X	X
Chalfont Borough			X										
Doylestown Borough	X		X	X	X	X							
Doylestown Township	X		X	X	X	X	X		X				
Dublin Borough		X	X					X					X
Durham Township			X										

Municipality	Land Use/Development Planner	Engineering	Emergency Manager	Floodplain Manager	Staff with experience using GIS	Grant-writing staff or other fiscal staff	Chief Building Officer	Business Administrator	Chief Financial Officer	Clerk	Community Planner	Land Use/Development Planner	Engineering
East Rockhill Township	X	X	X	X								X	X
Falls Township			X										
Haycock Township	X	X	X	X	X			X					X
Hilltown Township	X		X	X	X	X							
Hulmeville Borough			X										
Ivyland Borough	X		X	X		X							
Langhorne Borough		X	X			X				X			X
Langhorne Manor Borough			X				X	X		X			
Lower Makefield Township	X	X	X	X	X	X	X	X	X	X	X	X	X
Lower Southampton Township	X	X	X	X			X	X		X		X	X
Middletown Township	X		X	X	X	X							
Milford Township	X		X	X	X	X							
Morrisville Borough			X										
New Britain Borough	X	X	X	X	X	X	X	X			X	X	X
New Britain Township			X										
New Hope Borough		X	X	X		X	X		X	X	X		X
Newtown Borough			X										
Newtown Township	X		X	X			X	X	X	X		X	
Nockamixon Township	X		X	X		X							
Northampton Township	X		X	X	X	X							
Penndel Borough			X										
Perkasie Borough			X										
Plumstead Township	X		X	X	X	X							
Quakertown Borough			X										
Richland Township	X	X	X	X			X						X
Richlandtown Borough			X										
Riegelsville Borough	X	X	X	X		X	X	X	X	X			X
Sellersville Borough	X		X	X	X	X							
Silverdale Borough			X										
Solebury Township	X	X	X	X	X	X	X	X	X	X	X	X	X
Springfield Township	X	X	X	X	X		X	X		X			X
Telford Borough			X										
Tinicum Township	X	X	X	X	X	X	X	X	X	X			X
Trumbauersville Borough	X		X										
Tullytown Borough		X	X		X	X							X
Upper Makefield Township	X	X	X	X	X	X		X	X	X		X	X
Upper Southampton Township	X		X	X		X							
Warminster Township	X	X	X	X	X								X
Warrington Township	X	X	X	X	X		X		X	X		X	X

Municipality	Land Use/Development Planner	Engineering	Emergency Manager	Floodplain Manager	Staff with experience using GIS	Grant-writing staff or other fiscal staff	Chief Building Officer	Business Administrator	Chief Financial Officer	Clerk	Community Planner	Land Use/Development Planner	Engineering
Warwick Township	X	X	X	X	X	X	X	X	X	X	X	X	X
West Rockhill Township	X		X	X		X							
Wrightstown Township	X	X	X	X	X			X		X	X	X	X
Yardley Borough	X		X	X									

Other local organizations that could act as partners include Bucks County Conservation District, Penn State Extension, environmental groups, and watershed associations.

- State agencies which can provide technical assistance for mitigation activities include, but are not limited to:
- Pennsylvania Department of Community and Economic Development;
- Pennsylvania Department of Conservation and Natural Resources;
- Pennsylvania Department of Environmental Protection; and
- Pennsylvania Department of Transportation.

Federal agencies which can provide technical assistance for mitigation activities include, but are not limited to: Army Corp of Engineers;

- Department of Housing and Urban Development (HUD);
- Department of Agriculture (DoA);
- Economic Development Administration;
- Emergency Management Institute (EMI);
- Environmental Protect Agency (EPA);
- FEMA; and
- Small Business Administration.

5.6 Financial Capability

The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of local financial resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Based on survey results, most municipalities within the County perceive fiscal capability to be limited. As mentioned in Section 5.2.2, some communities do not have access to grant writers thus their capacity to pursue and administer grant-funded opportunities is limited.

Capital Improvement Plan

The capital improvement plan is a multiyear policy guide that identifies needed capital projects and is used to coordinate the financing and timing of public improvements. Capital improvements relate to streets, stormwater

systems, water distribution, sewage treatment, and other major public facilities. A capital improvement plan should be prepared by the respective county's planning commission and should include a capital budget. While the capital improvement plan is not a funding source, this budget identifies the highest priority projects recommended for funding in the next annual budget. The capital improvement plan is dynamic and can be tailored to specific circumstances.

Community Development Block Grants (CDBG)

These grants are designed to assist the vulnerable populations within the community by ensuring affordable housing, creating jobs, and providing direct services. The amount of each grant is determined by a formula that accounts for the community's need, poverty, population, housing, and comparison to other areas. The annual appropriation is divided among the states and local jurisdictions (referred to as "non-entitlement communities" and "entitlement communities"). The following are entitlement communities:

- Central cities of MSAs.
- Cities with at least 50,000 people.
- Some urban counties with at least 200,000 people.
- States provide CDBG funds to non-entitlement jurisdictions.

The majority of CDBG funds are required to be spent to benefit low- and moderate-income people. Also, there is a set of national objectives for the program, including addressing existing conditions that pose a threat to the health and welfare of the community (e.g., low-income housing in a floodplain). All municipalities within Bucks County have access to CDBG funding, be it directly through the federal or state government or through a competitive county selection process.

Water and Sewer Authority Fees

Water authorities are multipurpose authorities with water projects, many of which operate both water and sewer systems. The financing of water systems for lease back to the municipality is 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 Pennsylvania Public Utility Commission. The PA DEP has a program to assist with consolidation of small individual water systems to make system upgrades more cost effective.

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. In areas with no public water supply, flat rate charges are calculated on average use per dwelling unit.

General Obligation, Revenue, Special Tax Bonds, and Other Methods

Jurisdictions may decide to dedicate general bonds or similar financing to implement hazard mitigation projects. General obligation bonds are municipal bonds that can be paid back via a variety of revenue sources, including taxes,

and are used to fund a variety of projects. Revenue bonds are required to be paid back via revenues generated from the project they fund. Special tax bonds can be repaid via taxes that do not need to be linked directly to the project being financed.

Local programs which may provide additional financial support for mitigation actions include, but are not limited to:

- Development impact fees
- Gas / electric utility fees
- Partnering arrangements or intergovernmental agreements
- Special purpose taxes
- Stormwater utility fees

State and Federal Resources

The decision and capacity to implement mitigation-related activities is often strongly dependent on availability of local financial resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to leverage state or federal mitigation grant funding opportunities that require local-match contributions.

State funding sources that may be available for hazard mitigation planning activities include but are not limited to the following.

- Commonwealth Financing Authority (CFA)/DCED Abandoned Mine Drainage Abatement and Treatment Program.
- CFA/DCED Baseline Water Quality Data Program.
- CFA/DCED First Industries Fund.
- CFA/DCED Flood Mitigation Program.
- CFA/DCED H2O PA Flood Control Projects.
- CFA/DCED H2O PA High Hazard Unsafe Dam Projects.
- CFA/DCED H2O PA Water Supply, Sanitary Sewer and Storm Water Projects.
- CFA/DCED Orphan or Abandoned Well Plugging Program.
- CFA/DCED PA Small Water and Sewer.
- CFA/DCED Sewage Facilities Program.
- CFA/DCED Watershed Restoration Protection Program.
- DCED Business Financing Programs.
- DCED Local Government Capital Project Loan Program.
- DCED Municipal Assistance Program.
- DCED/DEP Coal Refuse Energy and Reclamation Tax Credit Program.
- DCED/DEP Private Dam Financial Assurance Program.
- DCNR Community Conservation Partnerships Program.
- DEP Growing Greener Plus Grants Program.
- PennDOT Pennsylvania Infrastructure Bank Loan.
- Pennsylvania Infrastructure Investment Authority (also known as PENNVEST).
- Pennsylvania Redevelopment Assistance Capital Program.

Federal funding sources that may be available for hazard mitigation planning activities at the time the HMP update was prepared include but are not limited to the following.

- Appalachian Regional Commission POWER Initiative Grant Program.
- Department of Energy Weatherization Assistance Program.
- Department of Homeland Security Grant Program.
- Department of Transportation/Federal Highway Administration Emergency Relief Program.
- Department of Commerce/Economic Development Administration Revolving Loan Fund (ACEDC RLF recipient).
- FEMA Community Disaster Loan Program.
- FEMA NFIP.
- FEMA NFIP Community Rating System.
- FEMA Environmental Planning and Historic Preservation Program.
- FEMA Flood Mitigation Assistance Program.
- FEMA Hazard Mitigation Grant Program (HMGP).
- FEMA Individuals and Households Program.
- FEMA National Dam Safety Program.
- FEMA Public Assistance Program.
- FEMA Regional Catastrophic Preparedness Grant Program.
- Housing and Urban Development (HUD)/Federal Housing Administration (FHA) Title I Property Improvement Loans.
- 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.
- Small Business Administration Disaster Loan Programs.
- USDA Natural Resources Conservation Service (NRCS) Easement Programs.
- USDA/Farm Service Agency (FSA) Emergency Conservation Program.
- USDA/FSA Emergency Farm Loans.
- USDA/Emergency Forest Restoration Program.
- USDA Non-insured Crop Disaster Assistance Program.
- 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.

Table 5.6-1 below shows the financial capabilities for municipalities, as reported in their Capability Assessment surveys.

Table 5.6-1 Financial Capabilities by Municipality, as Reported on Capability Assessment Surveys

Municipality	Capital Improvements Program	Funding Programs – Federal (Non-FEMA)	Utility Fees for Stormwater, Water, Sewer, Gas, or Electric Services	Community Development Block Grant	FEMA - Hazard Mitigation Assistance	FEMA – Public Assistance 406 Mitigation	Funding Programs – State	Funding Programs – Philanthropic	General obligation bonds and/or special tax bonds	Impact fees for new development	Tax levies for specific projects
Bedminster Township											
Bensalem Township	X										
Bridgeton Township											
Bristol Borough	X										
Bristol Township	X										
Buckingham Township	X		X	X			X		X		
Chalfont Borough											
Doylestown Borough	X										
Doylestown Township	X										
Dublin Borough											
Durham Township											
East Rockhill Township	X										
Falls Township											
Haycock Township				X	X		X		X	X	
Hilltown Township											
Hulmeville Borough											
Ivyland Borough	X										
Langhorne Borough	X	X	X	X	X		X	X		X	X
Langhorne Manor Borough											
Lower Makefield Township	X	X			X		X		X	X	
Lower Southampton Township			X						X		
Middletown Township	X										
Milford Township	X										
Morrisville Borough											
New Britain Borough					X		X		X		
New Britain Township											
New Hope Borough											
Newtown Borough											
Newtown Township	X									X	
Nockamixon Township	X										
Northampton Township	X										
Penndel Borough											
Perkasie Borough											
Plumstead Township	X										

Municipality	Capital Improvements Program	Funding Programs – Federal (Non-FEMA)	Utility Fees for Stormwater, Water, Sewer, Gas, or Electric Services	Community Development Block Grant	FEMA - Hazard Mitigation Assistance	FEMA – Public Assistance 406 Mitigation	Funding Programs – State	Funding Programs – Philanthropic	General obligation bonds and/or special tax bonds	Impact fees for new development	Tax levies for specific projects
Quakertown Borough											
Richland Township	X				X					X	
Richlandtown Borough											
Riegelsville Borough	X		X				X				
Sellersville Borough	X										
Silverdale Borough											
Solebury Township	X	X			X		X		X	X	
Springfield Township					X						
Telford Borough											
Tinicum Township				X	X	X	X				
Trumbauersville Borough	X										
Tullytown Borough							X				
Upper Makefield Township	X										
Upper Southampton Township	X										
Warminster Township	X		X	X	X	X	X			X	
Warrington Township	X										
Warwick Township	X	X			X		X				
West Rockhill Township	X										
Wrightstown Township											
Yardley Borough					X	X					

5.7 Education and Outreach

Education and outreach programs and methods are used to implement mitigation activities and communicate hazard-related information. Education and outreach programs are used to implement mitigation activities and communicate hazard-related information. Examples include 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. In addition to these activities, the County has a communication tool called "Ready Bucks" used to alert residents about hazard and other important community news (Bucks County, 2021d). For example, the tool can be used to relay critical information about severe weather events, sudden road closures, missing persons, and evacuations. Residents can sign up for the free alerts online at: http://www.buckscounty.org/readybucks.

Some communities have their own public information or communications office to manage outreach initiatives. Overall, programs not relating to certification are not common within the county. Table 5.7-1 shows the Education and Outreach capabilities reported by municipalities.

Table 5.7-1 Available Education and Outreach Capabilities by Municipality, as Reported on Capability Assessment Surveys

Municipality	StormReady Certification	Seasonal Emergency Management and Mitigation Outreach	Firewise USA Certification	Local Citizen Groups or Non-Profit Organizations Focused on Environmental Protection, Emergency Preparedness, Access and Functional Needs Populations, etc.	Natural Disaster or Safety Related School Programs	Ongoing Public Education or Information Program (E.G., Environmental Education, Fire Safety, Household Preparedness, Responsible Water Use, Etc.)	Public-Private Partnership Initiatives Addressing Disaster-Related Issues
Bedminster Township							
Bensalem Township							
Bridgeton Township							
Bristol Borough			X				
Bristol Township							
Buckingham Township		X		X		X	
Chalfont Borough							
Doylestown Borough			X				
Doylestown Township						X	
Dublin Borough							
Durham Township							
East Rockhill Township							
Falls Township							
Haycock Township							
Hilltown Township							
Hulmeville Borough							
Ivyland Borough							
Langhorne Borough				X		X	

Municipality	StormReady Certification	Seasonal Emergency Management and Mitigation Outreach	Firewise USA Certification	Local Citizen Groups or Non-Profit Organizations Focused on Environmental Protection, Emergency Preparedness, Access and Functional Needs Populations, etc.	Natural Disaster or Safety Related School Programs	Ongoing Public Education or Information Program (E.G., Environmental Education, Fire Safety, Household Preparedness, Responsible Water Use, Etc.)	Public-Private Partnership Initiatives Addressing Disaster-Related Issues
Langhorne Manor Borough							
Lower Makefield Township				X		X	
Lower Southampton Township				X	X	X	
Middletown Township			X				
Milford Township							
Morrisville Borough							
New Britain Borough				X	X	X	
New Britain Township							
New Hope Borough							
Newtown Borough							
Newtown Township		X			X	X	
Nockamixon Township							
Northampton Township			X				
Penndel Borough							
Perkasie Borough							
Plumstead Township							
Quakertown Borough							
Richland Township			X				
Richlandtown Borough							
Riegelsville Borough		X					
Sellersville Borough			X				
Silverdale Borough							
Solebury Township	X	X	X	X	X	X	X
Springfield Township				X			
Telford Borough							
Tinicum Township		X	X	X	X	X	
Trumbauersville Borough			X				
Tullytown Borough						X	
Upper Makefield Township		X	X	X	X	X	X
Upper Southampton Township							
Warminster Township				X		X	
Warrington Township							
Warwick Township				X		X	
West Rockhill Township			X				

Municipality	StormReady Certification	Seasonal Emergency Management and Mitigation Outreach	Firewise USA Certification	Local Citizen Groups or Non-Profit Organizations Focused on Environmental Protection, Emergency Preparedness, Access and Functional Needs Populations, etc.	Natural Disaster or Safety Related School Programs	Ongoing Public Education or Information Program (E.G., Environmental Education, Fire Safety, Household Preparedness, Responsible Water Use, Etc.)	Public-Private Partnership Initiatives Addressing Disaster-Related Issues
Wrightstown Township						X	
Yardley Borough							

5.8 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. The planning framework is the collection of plans, policies, codes, and programs that guide land use and development, how those are maintained and implemented, and the roles of a range of partner agencies to evaluate and update them. Effective integration of hazard mitigation occurs when the planning framework fosters development that does not increase risks from known hazards or leads to redevelopment that reduces risk from known hazards (FEMA, 2013).

Ensuring that the goals and actions of hazard mitigation are applied to other planning efforts promotes safe and resilient growth, effective emergency management, and an overall reduction of risk. The most important planning and regulatory mechanisms that can be utilized for hazard mitigation – hazard mitigation plans, emergency operations plans, comprehensive plans, building codes, floodplain ordinances, and subdivision and zoning ordinances – have been discussed in more detail in Section 5.2. These local planning mechanisms provide a vehicle for the implementation of adopted mitigation strategies and ensure that growth is not steered towards high hazard areas. Table 5.8-1 includes a summary of planning frameworks that were identified in Bucks County.

Table 5.8-1 Planning Framework in Bucks County

Planning Level	Plan
State	2023 Commonwealth of Pennsylvania Standard All-Hazard Mitigation Plan
	Keystone Principles and Criteria for Growth, Investment, and Resource Conservation, 2005
Regional	Delaware Valley Regional Planning Commission: Connections 2045
	Lehigh Valley Comprehensive Plan
	Philadelphia 2035 Comprehensive Plan
County	Bucks County Waterfront Revitalization Plan, 2005
	Landmark Towns of Bucks County
	Bucks County Open Space and Greenway Plan, 2011
	Bucks County Natural Areas Inventory Update, 2011
	Bucks County Bicycle Plan, 2012
	Bucks County Hazard Vulnerability Analysis (HVA)
	Bucks County Comprehensive Plan Update, 2011
	Bucks County Flood Recovery and Mitigation Strategy
	Neshaminy Creek Supplemental Watershed Work Plan, 2017
	Bucks County Natural Areas Program, 2013
	Bucks County Emergency Operations Plan

Planning Level	Plan
	Bucks County Pedestrian Safety Study, ongoing
	Bucks County Debris Management Plan, 2017
	2018-2028 Municipal Waste Management Plan, 2019
	Bucks County Agricultural Preservation Program, 2019
	Bucks County Sustainability for County Operations Plan, 2024
Municipality	Local Emergency Operations Plans
	Municipality Local Land Use Regulations
	Act 167 Stormwater Management Plans
	Municipal Comprehensive Plans

Information from several of these documents has been incorporated into this plan and mitigation actions have been developed to further integrate these planning mechanisms into the hazard mitigation planning process. The County HVA provided direction for hazard identification as well as extensive information on past occurrences including anecdotal information. Floodplain management ordinance information was used to aid in the establishment of local capabilities in addition to participation in the NFIP. These plans share common philosophies and strategies that are embodied in the Commonwealth's Keystone Principles, which provides a strategy for interagency coordination in addressing the goals and objectives for the realization of economic development and resource conservation in the Commonwealth (PGDEC, 2005). More detailed information on integration from some of these plans is included below.

Bucks County Comprehensive Plan

The Bucks County Comprehensive Plan was adopted in 2011. The plan establishes a shared vision of how the County would like to guide future growth and conserve resources as well as the policy recommendations for attaining these goals.

In addition, the 2011 Bucks Comprehensive Plan outlines eight "Guiding Principles" that identify key priorities of the County, identified earlier in this section. The Guiding Principles serve to guide future decisions and actions by the County, local municipalities, and residents to ensure that the shared vision of the County is achieved in a cohesive manner. The comprehensive plan includes detailed strategies and actions for each of the identified principles. Principle 5: Mitigate Hazards to Life and Property provides the most specific relation to the goals and objectives of the Hazard Mitigation Plan; however, some of the other principles also are related to the goals and objectives of this plan. Table 5.8-2 includes a full list of the mitigation-related actions and their associated strategy and guiding principle.

Table 5.8-2 Hazard Mitigation Related Actions in Bucks County (BCPC, 2011a)

Strategy	Action
Principle 1: Protect Natural, Historic, and Scenic Properties	
Land/Water Interface Resources – Floodplain Strategy	Assist municipalities with updating floodplain requirements and ordinance language to comply with new FEMA floodplain maps.
	Encourage 100 percent protection of floodplains delineated by FEMA or detailed hydrological studies performed by registered engineers qualified to prepare such studies, where no FEMA mapping is available.
	Support municipal regulations and land use tools that prevent development in and remove existing structure from floodplains to reduce risks to life and property.
	Support the buy-out or elevation of flood prone properties and the return of these areas to a natural state.
Principle 4: Protect Water Resources and Reduce Waste	
Water Resources Strategy	Cooperate with state, county, and municipal government officials to help implement appropriate recommendations of the Pennsylvania State Water Plan (Act 220).
	Establish wellhead protection areas/overlay zones, source water protection areas, stream corridor protection areas, and conservation management districts.

Strategy	Action
	Monitor the progress of the State Water Plan and its implications regarding critical water planning areas in Bucks County.
	Prohibit incompatible uses near surface water and preserve and manage groundwater recharge areas to ensure a sustainable water supply.
	Protect water resources, natural resources, and riparian areas.
	Review and update, as necessary, municipal ordinance language related to water resource protection.
Water Service Strategy	Protect water resources to meet peak and emergency demands.
	Promote interconnection of water supply systems to foster emergency preparedness.
	Encourage the provision of water service that is consistent with growth management.
	Use municipal comprehensive plans, zoning, and well regulations to coordinate land use goals with water resource considerations.
Water Supply Planning	Assist municipalities on integrating water resource protection standards with land use regulations, wastewater facilities, stormwater management, natural resources, and open space planning.
	Coordinate with the Delaware River Basin Commission and PaDEP on water supply planning and drought emergency management.
	Encourage integrated water resources planning through use of land development, water supply, stormwater, and wastewater techniques that maintain natural functions of the hydrologic cycle.
	Encourage municipalities and water suppliers to coordinate efforts in developing source water protection and wellhead delineation plans to protect water sources from over-withdrawal and potential sources of contamination.
	Encourage the coordination of efforts of agencies (government, private and nonprofit) responsible for the planning and management of water resources quality and quantity.
	Participate in PaDEP's source water protection grant program.
	Use aquifer yield potential to help assure that development in groundwater-dependent areas does not exceed the capability of underlying aquifers. Plan development location and intensities with consideration of available water resources.
Principle 5: Mitigate Hazards to Life and Property	
Preparedness to Reduce Potential Damage Strategy	Identify by municipality and evaluate protection of existing critical facilities with the highest relative vulnerability in the 1 percent annual chance floodplain.
	Identify and evaluate strategies for repetitive-loss properties.
	Provide public outreach/education regarding strategies (e.g., flood proofing) for property owners in the 1 percent annual chance floodplain.
	Address identified data limitations regarding lack of detailed information about individual structures located in the 1 percent annual chance floodplain.
	Identify and evaluate protection for hazardous material storage in floodplain.
	Obtain detailed flood studies and FIRMs (including 0.2 percent annual chance flood) for areas with the greatest potential damage and threat to residents.
	Identify the most vulnerable and critical existing structures and infrastructure due to the effects of severe weather.
	Utilize available county level datasets with characteristics of individual structures for improved hazard planning and outreach.
	Identify and prioritize funding for transportation infrastructure projects that will reduce impact of hazards.
Disaster-Resistant Future Development Strategy	Encourage and facilitate the development or revision of zoning/land-use ordinances to limit development in high-hazard areas.
	Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
Hazard Mitigation as a Public Value Strategy	Provide public education to increase awareness of hazards and opportunities for mitigation.
	Promote partnerships between the municipalities and the county to continue to develop a countywide approach to identifying and implementing mitigation actions.
Response and Recovery Capabilities Strategy	Increase awareness by residents (i.e., through public outreach/education) of actions to take during an emergency.
	Enhance response capability of county and municipal fire, police, and emergency medical services personnel to special populations.
	Continue and increase coordination between critical facilities and emergency responders.

The Bucks2040 Vision Plan more recently identified the seven most important issues and priorities to the county, which are:

- Make Housing Affordable Again
- Promote Economic Opportunity
- Expand Travel Options
- Act on Climate Change
- Improve Our Infrastructure
- Enhance Our Parks and Trails
- Protect Our Farmland and Natural Resources

These issues all relate to hazard mitigation, either through the development of housing resources, the development of infrastructure, and protection of natural resources, or directly addressing the impacts of climate change on the county. Any goals, actions, and implementation strategies identified in additional plan documents for the Bucks2040 Plan should incorporate hazard mitigation principles to address both current and future risk.

Strategies and actions from the 2011 Comprehensive Plan have been incorporated into the Hazard Mitigation Plan Update, and information from both the 2011 plan and the 2040 Vision Plan are incorporated in Section 4.4.4 Future Development and Vulnerability. Hazard mitigation principles from the 2026 Hazard Mitigation Plan Update will be integrated into the full Bucks 2040 Comprehensive Plan update, which will guide development in Bucks County. The HMSC currently actively monitors high growth and high-risk areas for development projects in relation to hazard vulnerability.

Bucks County Watersheds ACT 167 Plans

There are nine Act 167 Plans for Bucks County that address stormwater management by providing prioritized recommendations to mitigate and reduce the impacts from development and improve condition of local water bodies. The ACT 167 Plans that pertain to Bucks County include:

- Delaware River (North)
- Delaware River (South)
- East Branch Perkiomen
- Neshaminy and Little Neshaminy Creeks
- Pennypack Creek
- Perkiomen Creek
- Poquessing Creek
- Saucon Creek
- Tohickon Creek

These plans include goals, objectives, and actions developed in relation to developing criteria and standards for future development and redevelopment in the watersheds that minimize hydrologic and water quality impacts. These actions are directly related to hazard mitigation planning because these criteria often involve mechanisms to control stormwater volume and recharge.

Bucks County Open Space and Greenway Plan

In 2011 Bucks County developed the Bucks County Open Space and Greenways Plan to provide a decision making, implementation, and management tool designed to protect and create linkages between the County's vast natural resources, open space and farmland, recreational facilities, and historic and cultural resources (BCPC, 2011b). The preservation of open space and greenways can be relevant to hazard mitigation goals as the space may be able to manage stormwater, mitigating the effects of flooding.

Emergency Debris Management Plan

In 2017, the County published their Emergency Debris Management Plan, which is focused on helping the county to respond to a natural or manmade debris-generating event (BCEMA, 2017). The plan helps identify agencies and activities that are involved in debris operations in order to help coordinate response in the case of an event. Initiatives in this plan help address debris that may be caused by hazard events, including tornadoes, floods, winter storms, earthquakes and civil disturbance. Elements that were incorporated from the previous hazard mitigation plan into the Debris Management Plan were the different types of disaster events that the County is vulnerable to, the likelihood of each disaster occurring, the different impacts each disaster can have on the County, and post-disaster debris management practices which intertwine with future mitigation projects.

Municipal Integration

Bucks County's municipalities carry out their daily operations and provide community services according to local needs and limitations. Some of these municipalities have formed cooperative agreements and work jointly with neighboring municipalities to provide such services as police protection, fire and emergency response, solid waste disposal, recreational opportunities, wastewater treatment, infrastructure maintenance, and water supply management. Other municipalities handle these services within their own jurisdictions. These municipalities vary in staff size, resource availability, fiscal status, service provision, municipal population, geography, and vulnerability to hazards profiled within this plan. As such, it is easy to see why the county's capacity to deal with hazards are a reflection of local municipalities and individual capabilities.

Generally speaking, the municipalities in Bucks County that tend to have fewer residents usually have less staff, and, by default, a more limited supply of available resources than those municipalities in the more urbanized parts of the County. This is not to say, however, that hazard mitigation is not an important factor in less populated areas of the County. It simply may require a more unified or coordinated approach and/or more efficient utilization of a limited supply of available resources (e.g., financial, technical, and human).

The self-assessment portion of the Capability Assessment survey provided each municipality an opportunity to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. Several municipalities noted on the Capability Assessment Surveys that they have limited to moderate financial capability resources which may limit the development of some planning tools. The Self-Assessment portion of the survey provided each municipality an opportunity to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, County and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either "limited," "moderate," or "high." Table 5.8-3 summarizes the results of the self-assessment survey. With available resources being limited and stretched into the foreseeable future, plan integration is extremely relevant and will help leverage existing resources to the maximum extent possible.

Table 5.8-3 Summary of Self-Assessment Capability Responses

Capability Type	Limited	Moderate	High
Planning & Regulatory	15%	65%	20%
Administrative & Technical	25%	50%	25%
Fiscal	58%	26%	16%
Education & Outreach	35%	55%	10%

Table 5.8-4 Municipal Responses to Capability Questionnaire

Municipality	Planning & Regulatory	Administrative & Technical	Fiscal	Education & Outreach
Bedminster Township				
Bensalem Township				
Bridgeton Township				
Bristol Borough				
Bristol Township				
Buckingham Township	Moderate	Moderate	Moderate	Moderate
Chalfont Borough				
Doylestown Borough				
Doylestown Township	Moderate	Limited	Limited	Moderate
Dublin Borough				
Durham Township				
East Rockhill Township	Limited	Limited	Limited	Moderate
Falls Township				
Haycock Township	Moderate	Moderate	Limited	Limited
Hilltown Township				
Hulmeville Borough				
Ivyland Borough				
Langhorne Borough	Moderate	Moderate	Moderate	Moderate
Langhorne Manor Borough				
Lower Makefield Township	Moderate	Moderate	Limited	Limited
Lower Southampton Township	Moderate	Moderate	Moderate	Moderate
Middletown Township				
Milford Township				
Morrisville Borough				
New Britain Borough	Moderate	Moderate	Limited	Moderate
New Britain Township				
New Hope Borough	Limited	Limited	High	Limited
Newtown Borough				
Newtown Township	High	High	High	High
Nockamixon Township				
Northampton Township				
Penndel Borough				
Perkasie Borough				
Plumstead Township				
Quakertown Borough				

Municipality	Planning & Regulatory	Administrative & Technical	Fiscal	Education & Outreach
Richland Township	Limited	Limited	Limited	Limited
Richlandtown Borough				
Riegelsville Borough	Moderate	High	Limited	Moderate
Sellersville Borough				
Silverdale Borough				
Solebury Township	High	High	Moderate	High
Springfield Township	Moderate	Limited	Limited	Limited
Telford Borough				
Tinicum Township				
Trumbauersville Borough				
Tullytown Borough	Moderate	Moderate	Limited	Moderate
Upper Makefield Township	Moderate	Moderate	-	Moderate
Upper Southampton Township				
Warminster Township	Moderate	Moderate	Limited	Moderate
Warrington Township				
Warwick Township	Moderate	High	High	Moderate
West Rockhill Township				
Wrightstown Township	High	High	Moderate	Limited
Yardley Borough	High	Moderate	Limited	Limited

6.0 MITIGATION STRATEGY

6.1 Update Process

6.1.1 Overview

The mitigation strategy serves as the long-term road map to reduce the potential losses, vulnerabilities, and shortcomings identified in the Hazard Identification and Risk Assessment section. 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 participants have determined will be necessary to move closer to attaining each goal. Actions are the tasks that are proposed for realizing each objective. Each of the previous plan updates have included goals and objectives,

6.1.2 Changes from 2021

The 2021 Goals, Objectives, and Actions were reviewed and revised for this plan update. The steering committee reviewed the Goals and Objectives after project kick-off and identified opportunities to be more clear and concise in the organization and language used in the goals and objectives. The intentions of the goals and objectives remains unchanged. The 2021 strategy, and the previous plan updates, documented the county's unwavering commitment to risk reduction. The 2026 strategy reaffirms that commitment using slightly different words and prioritization.

Table 6.1-1 Review of 2021 Mitigation Strategy Goals and Objectives.

Goal/Objective #	Goal/Objective	2026 Revision
GOAL 1	**Reduce possibility of injury/death to County residents and reduce potential damage to existing community assets (including residential properties, critical facilities, and infrastructure) due to natural and human-made hazards.**	**Revised language to "Reduce potential injury, death, and damage due to natural and human-made hazards.".**
Objective 1.A	Implement projects that protect properties, critical facilities, and infrastructure from hazards focusing on the 1% annual chance floodplain.	Changed language to remove exclusive focus on 1% floodplain in recognition of future risks.
Objective 1.B	Provide public outreach/education regarding strategies (e.g., floodproofing) for property owners in the 1% annual chance floodplain.	Moved under new Goal 2. Changed language to remove exclusive focus on 1% floodplain in recognition of future risks.
Objective 1.C	Address identified data limitations regarding lack of detailed information about individual structures located in the 1% annual chance floodplain.	Combined Objective 1.C with 1.G. Changed language to remove exclusive focus on 1% floodplain in recognition of future risks.
Objective 1.D	Identify and evaluate protection for hazardous material storage in floodplain.	Combined Objective 1.D with Objective 1.H.
Objective 1.E	Identify the most-vulnerable and critical existing structures and infrastructure due to the effects of severe weather.	Removed, as intent of objective is now covered under modified Objective 1.A.
Objective 1.F	Evaluate and prioritize communities that require warning systems and storm shelters.	Moved under Goal 5, which was modified to focus on HHPD,
Objective 1.G:	Utilize available County level datasets with characteristics of individual structures for improved hazard planning and outreach.	Combined Objective 1.C with 1.G. Changed language to remove exclusive focus on 1% floodplain in recognition of future risks.
Objective 1.H:	Identify and prioritize funding for transportation infrastructure projects that will reduce impact of hazards.	Combined Objective 1.D with Objective 1.H.
GOAL 2	**Promote disaster-resistant future development**	**This was combined into Goal 1 as it focuses on damage to property. This change allows for the objectives to be streamlined.**
Objective 2.A	Encourage and facilitate the development or revision of comprehensive plans and zoning/land-use ordinances to limit development in high-hazard areas.	Combined Objective 2.A and 2.B. Moved under Goal 1.

Goal/Objective #	Goal/Objective	2026 Revision
Objective 2.B	Encourage and facilitate the adoption of building codes that provide protection for new construction and substantial renovations from the effects of identified hazards.	Combined Objective 2.A and 2.B. Moved under Goal 1.
Objective 2.C	Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.	Included in 2026 HMP under new Goal 3.
Objective 2.D	Implement hazard mitigation measures identified in other planning mechanisms and address hazard mitigation as appropriate in other planning mechanisms.	Moved under new Goal 3. Changed language to focus more on targeted integration.
GOAL 3	**Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.**	**Continued to 2026 HMP as Goal 2.**
Objective 3.A	Provide public education to increase awareness of hazards, opportunities for mitigation and to reduce the impact of disasters on all community members.	Included in 2026 HMP under new Goal 2. Changed language to be more concise.
Objective 3.B	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.	Included in 2026 HMP under new Goal 3.
Objective 3.C	Continue the promotion of disaster resistance in the business community via the hazard mitigation planning initiative	Included in 2026 HMP under new Goal 2. Changed language to focus more on the opportunity to partner with the business community.
GOAL 4	**Protect natural resources within hazard areas and use them to reduce risk and losses.**	**Continued to 2026 HMP.**
Objective 4.A	Implement natural resource planning and projects that assist in hazard mitigation.	Expanded into three more detailed objectives.
GOAL 5	**Implement structural projects to reduce the impacts of hazards.**	**Modified language to reflect focus of goal on HHPD.**
Objective 5.A	Address the risks posed by the potential failure of High Hazard Potential Dams within the county.	Continued to 2026 HMP.

Mitigation actions have been carried over and developed for the county as well as for each participating jurisdiction. While some actions may be more general in nature and could apply to more than one jurisdiction, most actions are specific to individual jurisdictions. The mitigation actions that were developed were based on the following: issues identified in the hazard identification and risk assessment, gaps identified in the mitigation capability analysis, input from the HMPT, and feedback from the Annual Plan Review Meeting held November 7, 2025. These mitigation actions may be implemented through a variety of local tools such as changes in ordinances and policies, inclusion into capital improvements budgets, and grant funding.

County and municipal actions in the 2021 Plan were distributed for the November 7 meeting 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.
- "Deferred" – Actions that had not been initiated since the adoption of the 2021 Plan.
- "On-Going" – Actions that are performed on a regular and continuous basis by the department.

The majority of existing mitigation actions have been carried over into the 2026 Hazard Mitigation Plan Update as they are continuous actions or actions that were not completed. A list of these 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 notes from the Mitigation Action Workshop.

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
All Municipalities that Participate in the NFIP	Flood, Hurricane, Tropical Storm, Nor'easter	Proceed with grant applications to suitably protect repetitive-loss properties 1% annual chance floodplain (for owners interested in FEMA mitigation funding).			X 1	X
Bensalem Township, Bristol Borough, Bristol Township, Doylestown Borough, Lower Makefield Township, Lower Southampton Township, Milford Township, Morrisville Borough, New Britain Borough, Northampton Township, Quakertown Borough, Riegelsville Borough, Sellersville Borough, Tinicum Township, West Rockhill Township	Dam Failure, Flood, Hurricane, Tropical Storm, Nor'easter, Structure Collapse	Continue identifying protection measures to operate critical facilities. Proceed with grant applications to suitably protect and continue operations of critical facilities in the 1% annual chance floodplain and at risk to utilities interruption from flooding and other hazards.				X
East Rockhill Township, Morrisville Borough, Upper Southampton Township, Yardley Borough	Dam Failure, Flood, Hurricane, Tropical Storm, Nor'easter	Continue identifying protection measures to operate businesses and protect residences. Proceed with grant applications for infrastructure that protects community from 1% annual chance floodplain.				X
All Municipalities	Flood, Hurricane, Tropical Storm, Nor'easter	Evaluate, implement, and perform mitigation projects identified in this and other planning mechanisms, including acquisition, elevation, mitigation reconstruction, foundation and building stabilization, securing access to generator power and other mitigation methods.	X 2			X
Haycock Township	Flood, Transportation Incidents	Township will replace 5 existing culverts on Top Rock Trail to mitigate flooding impacts of existing substandard drainage conditions in this area of the Township. This is part of an on-going effort to improve roadside drainage throughout the Township.				X
Trumbauersville Borough	Flood	Clean out all street drains, repair and/or replace culverts and drain grates.				X
Springfield Township	Flood, Transportation Incidents	Install storm sewer along a section of Peppermint Road to address an ongoing flooding issue that impacts neighboring downstream properties.				X
Upper Makefield Township	Flood	Elevate existing homes in the floodplain to limit damage during future flood events				X
West Rockhill Township	Flood	Repair culvert and swales on Lonely Road.				X
Nockamixon Township	Flood	Replace culvert on Tabor Road				X
Trumbauersville Borough	Flood	Repair/improve Modla/Park drainage swale.				X
Yardley Borough	Flood	Improving stormwater management in floodplain by jet cleaning storm drains and installing backflow preventers. Secondly, Yardley Borough				X

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
		will pursue the installation of additional storm drains and pipes to an area without.				
Yardley Borough	Flood	Continue elevating flood prone structures.				X
Yardley Borough	Flood	Increasing open space cache in floodplain.				X
Bedminster Township, Haycock Township, Hulmeville Borough, Lower Makefield Township, New Britain Borough, New Britain Township, New Hope Borough, Newtown Borough, Newtown Township, Quakertown Borough, Sellersville Borough, Silverdale Borough, Tinicum Township, Trumbauersville Borough, Tullytown Borough, Warrington Township, West Rockhill Township	Flood, Hurricane, Tropical Storm, Nor'easter	Work with township/borough officials to increase awareness of model floodplain ordinance and with property owners, including informational mailings to property owners in the 1% annual chance floodplain, and sponsoring a series of workshops about costs and benefits of: Acquiring and minimizing the cost of flood insurance coverage, and Property acquisition, relocation, elevation, dry floodproofing, and wet floodproofing.				X
Chalfont Borough, Lower Makefield Township, Newtown Township, Tinicum Township, Yardley Borough	Flood, Hurricane, Tropical Storm, Nor'easter	Evaluate and/or pursue Community Rating System (CRS) participation for insurance premium reduction (and flood damage reduction).	X 3			X
East Rockhill Township, New Britain Township, Nockamixon Township, Plumstead Township, Upper Southampton Township	Flood, Hurricane, Tropical Storm, Nor'easter	Obtain information for structures in the areas with the highest relative vulnerability to determine the best property protection methods. Information to be obtained includes: Lowest-floor elevation, Number of stories, Presence of a basement, and Market and/or replacement value.	X 4			X
All Municipalities that Participate in the NFIP	Flood, Hurricane, Tropical Storm, Nor'easter	Obtain information for all remaining structures in the 1% annual chance floodplain to determine the best property protection methods to promote with individual property owners. Techniques for gathering information over time should include developing and implementing a program for integrated information "capture" at key points in normal township administrative procedures, including applications for building permits at township/borough offices.	X 5			X
Tinicum Township	Flood	Provide a comprehensive update to the database that records floodplain properties and elevation certificates.				X
Yardley Borough	Flood	Pre-populating FEMA's Substantial Damage Estimator Tool.				X
Sellersville Borough, Solebury Township, Tinicum Township, West Rockhill Township	Flood, Hurricane, Tropical Storm, Nor'easter, Environmental Hazards, Urban Fire and Explosion	Identify all storage of hazardous materials in floodplains (including non-addressable structures, such as propane tanks).				X

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
West Rockhill Township	Flood, Hurricane, Tropical Storm, Nor'easter, Environmental Hazards, Urban Fire and Explosion	Evaluate alternative methods to minimize risk from existing storage areas.				X
West Rockhill Township	Flood, Hurricane, Tropical Storm, Nor'easter, Environmental Hazards, Urban Fire and Explosion	Assess means to prevent future storage in floodplain.				X
Doylestown Borough, West Rockhill Township	Dam Failure Drought, Extreme Temperature, Flood, Hailstorm, Hurricane, Tropical Storm, Nor'easter, Lightning Strike, Structure Collapse, Tornado, Wind Storm, Utility Interruption, Winter Storm	Identify critical facilities with the highest vulnerability to the effects of power outage (i.e., hospitals, nursing homes, fire, police, rescue, and emergency management).				X
Doylestown Borough, West Rockhill Township	Dam Failure Drought, Extreme Temperature, Flood, Hailstorm, Hurricane, Tropical Storm, Nor'easter, Lightning Strike, Structure Collapse, Tornado, Wind Storm, Utility Interruption, Winter Storm	Develop action plan for reducing potential damage and loss of function at identified critical facilities and infrastructure.				X
Doylestown Borough	Urban Fire and Explosion	Add additional water main on North Main Street to provide additional water service for residents and especially for fire fighting activity.				X
Plumstead Township	Utility Interruption	Complete interconnection of an existing public water system with facilities owned by North Wales Water Authority to ensure redundancy of supply in the Township's water system				X
East Rockhill Township	Utility Interruption	Replace aging sewage pump station to reduce outages and prevent storm damage.				X
West Rockhill Township	Dam Failure, Extreme Temperature, Flood, Hailstorm, Hurricane, Tropical Storm, Nor'easter, Lightning Strike, Tornado, Wind Storm, Utility Interruption, Winter Storm	Conduct qualitative evaluation process for managing stranded rural residents and travelers (e.g., temporary shelters).				X
Solebury Township, Trumbauersville Borough, West Rockhill Township	Dam Failure, Extreme Temperature, Flood, Hailstorm,	If warranted, implement additional storm shelters and warning systems near vulnerable communities, including: Identify structures				X

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
	Hurricane, Tropical Storm, Nor'easter, Lightning Strike, Tornado, Wind Storm, Utility Interruption, Winter Storm	that can be used as tornado safe rooms (some may require structure modifications), or NOAA weather radios for vulnerable populace.				
Tinicum Township	Dam Failure, Earthquake, Environmental Hazards, Extreme Temperature, Flood, Flash Flood, Ice Jam, Hailstorm, Hurricane, Tropical Storm, Nor'easter, Landslide, Lightning Strike, Pandemic, Radon, Structure Collapse, Subsidence, Sinkhole, Terrorism, Tornado, Wind Storm, Urban Fire and Explosion, Utility Interruption, Wildfire, Winter Storm	Utilize available county GIS Resources for municipal hazard related planning and outreach.				X
Bucks County	All Hazards	Review and update countywide datasets and coordinate with municipalities during this update. Identify method for distributing updated data.				X
Bensalem Township, Bristol Borough, Bristol Township, Langhorne Borough, Langhorne Manor Borough, Lower Southampton Township, Middletown Township, Milford Township, Penndel Borough, Solebury Township, Yardley Borough	Structure Collapse, Transportation Incidents	Review prevalence of transportation accidents and known infrastructure deficiencies and advocate for projects and funding that will increase safety.	X 4			X
Hilltown Township	Structure Collapse, Transportation Incidents	Replace the deck of an existing bridge on Schultz Road that is structurally deficient to ensure that the transportation system of the Township is not adversely impacted if the bridge must be closed to traffic.				X
Richland Township	Transportation Incidents	Implement signal improvements at intersections that frequently experience traffic accidents.				X
Silverdale Borough	Transportation Incidents	Traffic calming on Main Street and Barringer Avenue.				X
Tinicum Township	Transportation Incidents	Bridge replacement or rehab on Headquarters Rd spanning the Tinicum Creek due to structural failure.				X

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
New Britain Township	All Hazards	Distribute and promote the inclusion of vulnerability analysis information as part of periodic plan review and revisions at the township/borough level.				X
Doylestown Borough, East Rockhill Township, New Britain Township, Plumstead Township, Silverdale Borough	Winter Storm	Integrate evaluation of snow-removal and emergency access logistics with new development planning.				X
Buckingham Township	All Hazards	Update local zoning ordinances				X
Springfield Township, Riegelsville Borough	Subsidence, Gas and Liquid Pipelines	Consider extra permitting requirements for mines and pipelines in areas with carbonate rock.				X
Haycock Township, New Britain Township, Plumstead Township, Silverdale Borough, Springfield Township, Upper Southampton Township	Dam Failure, Earthquake, Environmental Hazards, Extreme Temperature, Flood, Flash Flood, Ice Jam, Hailstorm, Hurricane, Tropical Storm, Nor'easter, Landslide, Lightning Strike, Structure Collapse, Subsidence, Sinkhole, Tornado, Wind Storm, Urban Fire and Explosion, Utility Interruption, Wildfire, Winter Storm	Evaluate adequacy of township/borough building code implementation.				X
Haycock Township, New Britain Township, Silverdale Borough, Upper Southampton Township	Hurricane, Tropical Storm, Nor'easter, Tornado, Wind Storm, Winter Storm	Encourage increasing design wind and/or snow load for future development.				X
Chalfont Borough, Doylestown Borough, East Rockhill Township, New Britain Township, Plumstead Township, Silverdale Borough, Upper Southampton Township, West Rockhill Township	Dam Failure, Earthquake, Environmental Hazards, Extreme Temperature, Flood, Flash Flood, Ice Jam, Hailstorm, Hurricane, Tropical Storm, Nor'easter, Landslide, Lightning Strike, Structure Collapse, Subsidence, Sinkhole, Tornado, Wind Storm, Urban Fire and Explosion, Utility Interruption, Wildfire, Winter Storm	Train the municipal building inspectors to consistently enforce the building code.				X

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
Bucks County	All Hazards	Reach out to municipalities annually and ask them to advise on any changes in their local ordinances.				X
Involved with Acquisition, Elevation, Ordinances and Stormwater Management: Bristol Township, Bensalem Township, Buckingham Township, Hulmeville Borough, Middletown Township, Newtown Township, Lower Southampton Township, Northampton Township, Warwick Township, Wrightstown Township Involved with Ordinances and Stormwater Management: Buckingham Township, Doylestown Borough, New Britain Borough, New Britain Township, Warminster Township, Warrington Township, Warwick Township"	Flood, Hurricane, Tropical Storm, Nor'easter	Continue non-structural measures for mitigation of flood hazard per the December 2001 "Neshaminy Creek Supplemental Watershed Work Plan No. 5." The plan includes the following major components: Flood warning system, Voluntary property acquisition, Voluntary building elevation and floodproofing, and Continuation/ enhancement of floodplain ordinances, flood insurance, and stormwater management.				X
Doylestown Township, Plumstead Township	All Hazards	Develop Disaster Recovery plan that examines impact and plans outreach and continuity of operations for disaster events. Implements steps from planning process that could mitigate impacts and speed recovery for on residents, businesses, and government.				X
Doylestown Borough, Richlandtown Borough, Tullytown Borough	Environmental Hazards	Continue coordination and planning to mitigate, prepare, and respond to local hazardous materials facilities.				X
Delaware Valley College, Holy Family University - Bucks County, Philadelphia Biblical University, Doylestown Township, Langhorne Borough, New Britain Borough, Newtown Township	All Hazards	Continue coordination and planning with local colleges and universities to be partners to mitigate, prepare, and respond to hazards.				X
Bensalem Township, Bristol Borough, Doylestown Township, Haycock Township, Richland Township, Solebury Township, Springfield Township, Tinicum Township, Upper Makefield Township, and Yardley Borough	All Hazards	Inventory the historic properties vulnerable to the identified hazards, assess vulnerability of these assets, and establish preservation priorities by determining which assets are most valuable to the community.				X
Tinicum Township	Dam Failure	Work with Township Public Works, Police, and local Fire Police to evaluate and develop evacuation plan/routes.				X
New Britain Township, Silverdale Borough, Warrington Township, West Rockhill Township	All Hazards	Identify and publicize success stories from Bucks County and from other locations that provide a good example for Bucks County as part of an overall public education program.				X

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
East Rockhill Township, Hulmeville Borough, Langhorne Borough, Lower Southampton Township, New Britain Borough, New Britain Township, New Hope Borough, Plumstead Township, Richlandtown Borough, Sellersville Borough, Silverdale Borough, Tinicum Township, Trumbauersville Borough, Warrington Township	All Hazards	Increase awareness by residents of actions to take before, during and after an emergency. Methods include public outreach and education by website, mailings, workshops, media coverage, newsletter, Twitter and Facebook.				X
New Hope Borough, Tinicum Township	Flood, Hurricane, Tropical Storm, Nor'easter	Secure flood specific signage that warns travelers that barricades are present to prevent them from traveling into floodwater.	X 6			X
Bedminster Township, Bristol Township, Durham Township, East Rockhill Township, Falls Township, Haycock Township, Hilltown Township, Milford Township, Nockamixon Township, Plumstead Township, Richland Township, Solebury Township, Springfield Township, Tinicum Township, West Rockhill Township	Wildfire	Evaluate and consider implementing activities to secure "Firewise" designation.				X
Solebury Township, Tinicum Township, Trumbauersville Borough, West Rockhill Township	Dam Failure, Extreme Temperature, Flood, Hailstorm, Hurricane, Tropical Storm, Nor'easter, Lightning Strike, Tornado, Wind Storm, Utility Interruption, Winter Storm	Maintain information and continue outreach to residents with the highest relative vulnerability to the effects of hazards.				X
Bensalem Township, Bristol Borough, Doylestown Township, Haycock Township, Richland Township, Solebury Township, Springfield Township, Tinicum Township, Upper Makefield Township, and Yardley Borough	All Hazards	Engage the community on the vulnerability of the historic properties to hazards in the community and identify community members interested in becoming core planning team members to continue the historic property hazard mitigation planning process.				X
Chalfont Borough	Radon Exposure	Provide staff and public education on radon dangers and mitigation requirements.				X
Bucks County, All Municipalities	All Hazards	Convene regular meetings of a restructured HMPT to discuss issues and progress related to the implementation of the plan.				X
Bensalem Township, Bucks County	All Hazards	Link available technical assistance top communities that have residents interested in HMA grants yet need additional capacity to pursue complicated application and management process.				X

***Table 6.1-2* Status of 2021 Mitigation Actions**

Community	Addressed Hazard(S)	Mitigation Action	Status			
			Completed	Cancelled	Deferred	Ongoing
Bucks County	Transportation Incidents	Train emergency personnel in a basic understanding of railroads and their dangers.				X
New Britain Township, Silverdale Borough, Upper Southampton Township	All Hazards	Renew and expand commitments to hazard mitigation planning among partner organizations.				X
Hilltown Township	Pandemic	Evaluate effectiveness of the pandemic protocol implementation and restocking of pandemic response kits.				X
Bucks County, All Municipalities	All Hazards	Work to provide access to the internet across the County and make sure there are enough cell towers to service the entire County.	X 3			X
All Municipalities	Pandemic	Create telework plans.	X [3]			X
Bedminster Township	Pandemic	Implement increased communications and accessibility for residents to the local government.				X
East Rockhill Township, Yardley Borough	Flood, Hurricane, Tropical Storm, Nor'easter	Evaluate and implement projects to protect and improve natural environment along waterways with projects including preservation, conversation easements, and bank restoration.				X
East Rockhill Township, Lower Southampton Riegelsville	Flood, Hurricane, Tropical Storm, Nor'easter	Evaluate and implement projects to manage stormwater effectively.				X
Doylestown Borough, Penndel Borough, Tinicum Township, Warrington Township, Yardley Borough	Flood, Hurricane, Tropical Storm, Nor'easter	Build on existing Stormwater Management Planning and encourage implantation of small stormwater mitigation projects on private property (i.e. rain gardens, rain barrels, natural basins).				X
Upper Makefield Township	Flood	Restore native plants and wetlands to the watershed to address flooding issues.				X

[1]Buckingham Township, Warwick Township
[2]Buckingham Township, Perkasie Borough
[3]Doylestown Township, Warwick Township
[4]Lower Makefield Township
[5]Warwick Township
[6]Yardley Borough

6.1.3 Mitigation Successes

A great deal of mitigation progress has been made on hazard mitigation projects and actions in the last five years. Details on numerous actions marked as "Completed" since the 2021 plan update are summarized below:

Structure and Infrastructure

- Perkasie Borough has worked of home and business owners located in the floodplain who were interested in selling their properties to FEMA through their buy-back program. No properties have been bought out yet, but the coordination and collaboration has allowed those at risk to weigh their options.
- Doylestown Township reviews all development applications for flood risk using GIS.
- Lower Makefield Township has obtained information for structures with the highest relative vulnerability to determine the best property protection methods.

Local Plans and Regulations

- Perkasie Borough completed a flood study to evaluate the condition of the waterways and identify mitigation strategies.
- Perkasie Borough is participating in the Perkiomen Watershed study of the entire waterway, and is supporting mitigation efforts there.
- Doylestown Township has achieved CRS participation. They are Class 3.
- Doylestown Township has updated their emergency management plan to list agencies that can provide support post-disaster.
- Warwick Township has achieved CRS participation.

Natural Systems Protection

- None identified

Education and Awareness

- Bucks County held annual reviews with local officials and stakeholders to continue ongoing efforts to work towards achieving the county's hazard mitigation planning goals.
- The Bucks County Planning Commission created a Hazard Mitigation Project Tracker, which is a tool to track hazard mitigation projects and funding throughout the county.
- Yardley Borough has secured flood specific signage that warns travelers that barricades are present to prevent them from traveling into floodwater.

6.2 Goals and Objectives

Based on results of the review of the 2021 HMP mitigation goals and objectives established, several goals and objectives were improved in 2026. Table 6.2-1 lists the mitigation goals and objectives established for the 2026 plan.

Table 6.2-1 Bucks County 2026 HMP Goals and Objectives

Goal/Objective #	Goal/Objective
GOAL 1	**Reduce potential injury, death, and damage due to natural and human-made hazards.**
Objective 1.1	Implement mitigation activities to reduce risk to existing properties, community lifelines, infrastructure, and other public facilities.
Objective 1.2	Leverage data and science to consider future conditions in land use planning, infrastructure management, and mitigation projects.
Objective 1.3	Prioritize high-risk assets such as transportation systems, high-hazard dams, and areas vulnerable to hazardous material releases or repetitive flooding.
Objective 1.4	Evaluate and prioritize communities that require warning systems and storm shelters.
GOAL 2	**Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.**
Objective 2.1	Increase awareness of hazards and opportunities for mitigation through public education campaigns.
Objective 2.2	Increase public outreach/education for property owners and tenants regarding hazard risks and potential mitigation opportunities.
Objective 2.3	Partner with leaders in the business community to increase disaster awareness and resilience.
Objective 2.4	Encourage and support employers, employees, and residents to increase remote work capabilities.
Objective 2.5	Partner with other agencies and organizations to understand and address socially vulnerable and underserved communities within the county.
GOAL 3	**Enhance county mitigation program and support efforts to increase municipal and authority mitigation capabilities and planning.**
Objective 3.1	Leverage and expand GIS data and capabilities for improved hazard planning and outreach.
Objective 3.2	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.
Objective 3.3	Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
Objective 3.4	Integrate hazard mitigation planning and risk considerations into other long-term and county planning initiatives such as the county's comprehensive plan, sustainability plan, and Act 167 Stormwater Management Plan.
Objective 3.5	Work across state, federal, and local agencies to identify and pursue mitigation funding opportunities.
GOAL 4	**Protect natural resources within hazard areas and use them to reduce risk and losses.**
Objective 4.1	Identify natural resource areas providing risk reduction benefits that remain vulnerable to future development.
Objective 4.2	Partner with organizations to restore natural resource areas that could provide increased risk reduction benefits.
Objective 4.3	Identify opportunities to use green infrastructure and nature-based solutions for stormwater management and flood attenuation. Create buffers between flood prone areas and development.
GOAL 5	**Protect people and assets from the potential impacts of high hazard potential dams.**
Objective 5.1	Coordinate with High Hazard Potential Dam owners and affected officials on dam rehabilitation and funding.
Objective 5.2	Address the risks posed by the potential failure of High Hazard Potential Dams within the county.

6.3 Identification and Analysis of Mitigation Techniques

The mitigation strategy in the updated Hazard Vulnerability Assessment and Mitigation Plan Update should include analysis of a comprehensive range of specific techniques or actions. FEMA, through Local Mitigation Handbook, and PEMA, through the 2025 SOG, identify four categories of hazard mitigation techniques.

- **Local plans and regulations:** Government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include, but are not limited to, 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, but are not limited to, 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, but are not limited to, 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, but are not limited to, radio or television spots, websites with maps and information, provide information and training, NFIP outreach, StormReady, and Firewise Communities.

The HMPT reviewed the four types of mitigation techniques and examples of actions at the Risk Assessment and Mitigation Solutions Workshop. Table 6.3-1 provides a matrix identifying the mitigation techniques used for each hazard in the county. The specific actions associated with these techniques are included in Table 6.4-1.

Table 6.3-1 Mitigation Techniques for All Hazards in Bucks County.

Hazard	Mitigation Technique			
	Local Plans and Regulations	Education and Awareness Programs	Natural Systems Protection	Structural and Infrastructure Projects
Flood, Flash Flood, Ice Jam	X	X	X	X
Winter Storm	X	X		X
Extreme Temperatures	X	X		X
Hurricane, Tropical Storm, Nor'easter	X	X	X	X
Environmental Hazards – Hazardous Materials Release	X	X		X
Wildfire	X	X		X
Pandemic And Infectious Disease	X	X		X
Utility Interruption	X	X		X
Transportation Incidents	X	X		X
Environmental Hazards – Gas and Liquid Pipelines	X	X		X
Drought	X	X		X
Tornado, Windstorm	X	X		X
Dam Failure	X	X		X
Urban Fire and Explosion	X	X		X

Hazard	Mitigation Technique			
	Local Plans and Regulations	Education and Awareness Programs	Natural Systems Protection	Structural and Infrastructure Projects
Terrorism	X	X		X
Lightning Strike	X	X		X
Landslide	X	X		X
Structural Collapse	X	X		X
Cyber Terrorism	X	X		X
Earthquake	X	X		X
Radon Exposure	X	X		X
Subsidence, Sinkholes	X	X		X
Hailstorm	X	X		X

Table 6.3-2 provides a matrix identifying which municipalities have mitigation actions for each of hazards identified in the risk assessment. Each municipality has one action for all high-risk hazards, and for all medium and low risk hazards that they have identified as impacting them. This is identified in table 4.4-3. Table 4.4-3 shows the different municipalities in Bucks County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the county as a whole. Each municipality has a mitigation action for any hazards identified as greater than or equal to the risk factor of the county. All municipalities have an action for high-risk hazards. The specific actions associated with these techniques are included in Table 6.4-1 in the next section.

Table 6.3-2 Mitigation Actions Per Hazard for Each Municipality

Municipality	Flood, Flash Flood, Ice Jam	Winter Storm	Extreme Temperatures	Hurricane, Tropical Storm, Nor'easter	Environmental Hazards – Hazardous Materials Release	Wildfire	Pandemic and Infectious Disease	Utility Interruption	Transportation Incidents	Gas And Liquid Pipelines	Drought	Tornado, Windstorm	Dam Failure	Urban Fire and Explosion	Terrorism	Lightning Strike	Landslide	Structural Collapse	Cyber Terrorism	Earthquake	Radon Exposure	Subsidence, Sinkholes	Hailstorm
Bedminster Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Bensalem Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Bridgeton Township	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X		X
Bristol Borough	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X			X
Bristol Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X			X
Buckingham Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chalfont Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Doylestown Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Doylestown Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Dublin Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X
Durham Township	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X	X	X
East Rockhill Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Falls Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Haycock Township	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X		X
Hilltown Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Hulmeville Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Ivyland Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X
Langhorne Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X
Langhorne Manor Borough	X	X	X	X	X	X	X	X	X			X	X	X	X	X		X	X	X	X		X
Lower Makefield Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Lower Southampton Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Middletown Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Milford Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Morrisville Borough	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X		X
New Britain Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
New Britain Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
New Hope Borough	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X

Table 6.3-2 Mitigation Actions Per Hazard for Each Municipality

Municipality	Flood, Flash Flood, Ice Jam	Winter Storm	Extreme Temperatures	Hurricane, Tropical Storm, Nor'easter	Environmental Hazards – Hazardous Materials Release	Wildfire	Pandemic and Infectious Disease	Utility Interruption	Transportation Incidents	Gas And Liquid Pipelines	Drought	Tornado, Windstorm	Dam Failure	Urban Fire and Explosion	Terrorism	Lightning Strike	Landslide	Structural Collapse	Cyber Terrorism	Earthquake	Radon Exposure	Subsidence, Sinkholes	Hailstorm
Newtown Borough	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X		X
Newtown Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Nockamixon Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Northampton Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Penndel Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Perkasie Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Plumstead Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Quakertown Borough	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X
Richland Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Richlandtown Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Riegelsville Borough	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	X	X	X	X
Sellersville Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Silverdale Borough	X	X	X	X	X	X	X	X	X		X	X		X	X	X		X	X	X	X		X
Solebury Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Springfield Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Telford Borough	X	X	X	X	X	X	X	X	X			X		X	X	X		X	X	X	X		X
Tinicum Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Trumbauersville Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X
Tullytown Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Upper Makefield Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Upper Southampton Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Warminster Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Warrington Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Warwick Township	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X
West Rockhill Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Wrightstown Township	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X
Yardley Borough	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X		X

6.4 Mitigation Action Plan

The final list of 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.

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
GOAL 1 – Reduce potential injury, death, and damage due to natural and human-made hazards.							
1.1	Proceed with grant applications to suitably protect repetitive-loss properties 1% annual chance floodplain (for owners interested in FEMA mitigation funding).	All Municipalities	Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities, Bucks County Planning Commission	Within 2 years	Staff time; PEMA Technical Support
1.2	Continue identifying protection measures to operate critical facilities. Proceed with grant applications to suitably protect and continue operations of critical facilities in the 1% annual chance floodplain and at risk to utilities interruption from flooding and other hazards.	Bensalem Township, Bristol Borough, Bristol Township, Doylestown Borough, Lower Makefield Township, Lower Southampton Township, Milford Township, Morrisville Borough, New Britain Borough, Northampton Township, Quakertown Borough, Riegelsville Borough, Sellersville Borough, Tinicum Township, West Rockhill Township	Structure and Infrastructure	Dam Failure; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Structural Collapse	Municipalities	Within 2 years	Staff time; PEMA Technical Support; Non-Disaster Funding
1.3	Continue identifying protection measures to operate businesses and protect residences. Proceed with grant applications for infrastructure that protects community from 1% annual chance floodplain.	East Rockhill Township, Morrisville Borough, Upper Southampton Township, Yardley Borough	Structure and Infrastructure	Dam Failure; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities	Within 2 years	Staff time; PEMA Technical Support; Non-Disaster Funding
1.4	Evaluate, implement, and perform mitigation projects identified in this and other planning mechanisms, including acquisition, elevation, mitigation reconstruction,	All Municipalities (minus Buckingham Township and Perkasie Borough who	Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities, Bucks County Planning Commission	Continuously for next 5 years.	Non-Disaster Funding; USDA-NRCS

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	foundation and building stabilization, securing access to generator power and other mitigation methods.	completed this action as of the 2026 update)					
1.5	Township will replace 5 existing culverts on Top Rock Trail to mitigate flooding impacts of existing substandard drainage conditions in this area of the Township. This is part of an on-going effort to improve roadside drainage throughout the Township.	Haycock Township	Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Transportation Incidents	Public Works Department	years	General Township Budget - Estimated $10k
1.6	Clean out all street drains, repair and/or replace culverts and drain grates.	Trumbauersville Borough	Natural Systems Protection	Flood, Flash Flood, Ice Jam	Borough President and Secretary	0-1 years	Borough funds - Estimated $15K
1.7	Install storm sewer along a section of Peppermint Road to address an ongoing flooding issue that impacts neighboring downstream properties.	Springfield Township	Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Transportation Incidents	Public Works Department	2-3 years	Public Works Budget - Estimated $100K
1.8	Elevate existing homes in the floodplain to limit damage during future flood events	Upper Makefield Township	Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Township Board of Supervisors and Township Staff	2-3 years	FMA grants, BRIC, local match - $150K per home
1.9	Repair culvert and swales on Lonely Road.	West Rockhill Township	Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Township Engineer	0-1 Years	Loca, PA Liquid Fuels - Estimated $50K
1.10	Replace culvert on Tabor Road	Nockamixon Township	Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Township Manager	0-1 Years	Local - Estimated $50K
1.11	Repair/improve Modla/Park drainage swale.	Trumbauersville Borough	Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Borough Engineer	2-3 Years	Local - Estimated $50K
1.12	Improving stormwater management in floodplain by jet cleaning storm drains and installing backflow preventers. Secondly, Yardley Borough will pursue the	Yardley Borough	Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Borough Council, Borough Engineer	2-3 Years	American Rescue Plan Act Funds

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	installation of additional storm drains and pipes to an area without.						
1.13	Continue elevating flood prone structures.	Yardley Borough	Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Borough Council	2-3 Years	Non-Disaster Funding
1.14	Evaluate and/or pursue Community Rating System (CRS) participation for insurance premium reduction (and flood damage reduction).	Chalfont Borough, Lower Makefield Township, Newtown Township, Tinicum Township, Yardley Borough	Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities	Within 2 years	Staff time; FEMA Technical Support
1.15	Obtain information for structures in the areas with the highest relative vulnerability to determine the best property protection methods. Information to be obtained includes: Lowest-floor elevation, Number of stories, Presence of a basement, and Market and/or replacement value.	East Rockhill Township, New Britain Township, Nockamixon Township, Plumstead Township, Upper Southampton Township	Local Plans and Regulations; Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities	Within 5 years	Staff time; DCED and PEMA Technical Support
1.16	Obtain information for all remaining structures in the 1% annual chance floodplain to determine the best property protection methods to promote with individual property owners. Techniques for gathering information over time should include developing and implementing a program for integrated information "capture" at key points in normal township administrative procedures, including applications for building permits at township/borough offices.	All Municipalities	Local Plans and Regulations; Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities	Within 5 years	Staff time; DCED and PEMA Technical Support

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
1.17	Provide a comprehensive update to the database that records floodplain properties and elevation certificates.	Tinicum Township	Local Plans and Regulations; Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Township Manager & Administrative Services	2-3 years	Local General Tax - $1.5K for database upgrades
1.18	Identify all storage of hazardous materials in floodplains (including non-addressable structures, such as propane tanks).	Sellersville Borough, Solebury Township, Tinicum Township, West Rockhill Township	Local Plans and Regulations	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Hazardous Materials Release; Urban Fire and Explosion	Municipalities, Bucks County Emergency Management Agency	Within 3 years	Staff time
1.19	Evaluate alternative methods to minimize risk from existing storage areas.	West Rockhill Township	Local Plans and Regulations	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Hazardous Materials Release; Urban Fire and Explosion	Municipalities	Within 3 years	Staff time
1.20	Assess means to prevent future storage in floodplain.	West Rockhill Township	Local Plans and Regulations	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Hazardous Materials Release; Urban Fire and Explosion	Municipalities	Within 3 years	Staff time; DCED Technical Support for Model Ordinance that addresses hazardous materials in floodplain
1.21	Identify critical facilities with the highest vulnerability to the effects of power outage (i.e., hospitals, nursing homes, fire, police, rescue, and emergency management).	Doylestown Borough, West Rockhill Township	Education and Awareness	Dam Failure; Drought; Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Lightning Strike; Structure Collapse; Tornado, Wind Storm; Utility Interruption; Winter Storm	Municipalities, Bucks County Emergency Management Agency	Within 3 years	Staff Time; NOAA Storm Ready

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
1.22	Develop action plan for reducing potential damage and loss of function at identified critical facilities and infrastructure.	Doylestown Borough, West Rockhill Township	Structure and Infrastructure; Education and Awareness	Dam Failure; Drought; Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Lightning Strike; Structural Collapse; Tornado, Wind Storm; Utility Interruption; Winter Storm	Municipalities, Bucks County Emergency Management Agency	Within 5 years	Staff Time; DHS; NOAA Storm Ready; Private Funding from Critical Facilities and Infrastructure
1.23	Add additional water main on North Main Street to provide additional water service for residents and especially for fire fighting activity.	Doylestown Borough	Structure and Infrastructure	Urban Fire and Explosion	Public Works Director/ Deputy Manager	years	DHS grants, local budget - Estimated $400K
1.24	Complete interconnection of an existing public water system with facilities owned by North Wales Water Authority to ensure redundancy of supply in the Township's water system	Plumstead Township	Structure and Infrastructure	Utility Interruption	Water Department/Township Manager	2-3 years	Water Budget/General Fund Budget - Estimated $1.5M
1.25	Replace aging sewage pump station to reduce outages and prevent storm damage.	East Rockhill Township	Structure and Infrastructure	Utility Interruption	Township Manager	Years	Local - Estimated $1M
1.26	Conduct qualitative evaluation process for managing stranded rural residents and travelers (e.g., temporary shelters).	West Rockhill Township	Local Plans and Regulations	Dam Failure; Drought; Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Lightning Strike; Structure Collapse; Tornado, Wind Storm; Utility Interruption; Winter Storm	Municipalities, Bucks County Emergency Management Agency	Within 5 years	Staff Time; DHS; NOAA Storm Ready
1.27	If warranted, implement additional storm shelters and warning systems near vulnerable communities, including: Identify structures that can be used as	Solebury Township, Trumbauersville Borough, West Rockhill Township	Education and Awareness; Local Plans and Regulations	Dam Failure; Drought; Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter;	Municipalities, Bucks County Emergency Management Agency	Within 5 years	Staff Time; DHS; NOAA Storm Ready

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	tornado safe rooms (some may require structure modifications), or NOAA weather radios for vulnerable populace.			Lightning Strike; Structure Collapse; Tornado, Wind Storm; Utility Interruption; Winter Storm			
1.28	Review prevalence of transportation accidents and known infrastructure deficiencies and advocate for projects and funding that will increase safety.	Bensalem Township, Bristol Borough, Bristol Township, Langhorne Borough, Langhorne Manor Borough, Lower Southampton Township, Middletown Township, Milford Township, Penndel Borough, Solebury Township, Yardley Borough	Structure and Infrastructure	Structural Collapse; Transportation Incidents	Municipalities, Bucks County Planning Commission, Bucks County General Services Division	Within 5 years	PennDOT
1.29	Replace the deck of an existing bridge on Schultz Road that is structurally deficient to ensure that the transportation system of the Township is not adversely impacted if the bridge must be closed to traffic.	Hilltown Township	Structure and Infrastructure	Structural Collapse; Transportation Incidents	Township Public Works	0-1 years	Township Public Works Budget - Estimated $250K
1.30	Implement signal improvements at intersections that frequently experience traffic accidents.	Richland Township	Structure and Infrastructure	Transportation Incidents	Municipality	Within 5 years	PennDOT
1.31	Traffic calming on Main Street and Barringer Avenue.	Silverdale Borough	Structure and Infrastructure	Transportation Incidents	Borough Engineer	2-3 Years	Local, Grant - Estimated $125K
1.32	Bridge replacement or rehab on Headquarters Rd spanning the Tinicum Creek due to structural failure.	Tinicum Township	Structure and Infrastructure	Transportation Incidents	PennDOT	Within 5 years	PennDOT

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
1.33	Inventory the historic properties vulnerable to the identified hazards, assess vulnerability of these assets, and establish preservation priorities by determining which assets are most valuable to the community.	Bensalem Township, Bristol Borough, Doylestown Township, Haycock Township, Richland Township, Solebury Township, Springfield Township, Tinicum Township, Upper Makefield Township, and Yardley Borough	Local Plans and Regulations	All Hazards	Municipalities	Continuously for next 5 years.	Staff time; PHMC
1.34	Evaluate and implement projects to manage stormwater effectively.	East Rockhill Township, Lower Southampton Riegelsville	Natural Systems Protection	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipal Environmental Advisory Councils, Watershed Associations, Private property owners	Continuously for next 5 years.	CIP, DEP
1.35	Routinely clean and repair stormwater drains.	Buckingham Township, Warrington Township, Wrightstown Township, Yardley Borough	Plans and Regulations	Flood, Flash Flood, Ice Jam	Public Works Department	Ongoing	Staff Time
1.36	Implement traffic calming measures at key community intersections.	All Municipalities	Structure and Infrastructure	Transportation Incidents	Local Emergency Services, Local Planning Agencies	Ongoing	Local Planning Funding, PennDOT
1.37	Partner with local emergency management, critical facilities (e.g., hospitals) and other organizations to explore opportunities with the StormReady program.	Doylestown Borough	Education and Awareness	Lightning Strike	Emergency Management	1 Year	Staff Time
1.38	Plan for and maintain adequate road and debris clearing capabilities	Doylestown Borough, Yardley Borough	Plans and Regulations	Winter Storm	Public Works Department	Ongoing	Staff Time

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
1.39	Replace the Weiss Road bridge.	Milford Township	Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Transportation Incidents	Township	3-5 years	PennDOT Retro Reimbursement Fund
1.40	Repair two bridges at Allentown Road and Route 663.	Milford Township	Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Transportation Incidents	Township	3-5 years	PennDOT
1.41	Install lightning and surge protection devices and methods, such as lightning rods and grounding, on communications infrastructure, critical electronic equipment, and other critical facilities.	Wrightstown Township	Structure and Infrastructure	Lightning Strike	Public Works Department	5 Years	Non-Disaster Funding
1.42	Conduct a verification study of FEMA's repetitive loss inventory and developing an associated tracking database to prioritize and share information.	Yardley Borough	Plans and Regulations	Flood, Flash Flood, Ice Jam	Planning and Development	1-2 Years	Staff Time
1.43	Identify structures at risk to collapse and create a strategy for mitigation.	All Municipalities	Plans and Regulations	Structural Collapse	Local Planner	2-3 Years	Staff Time
GOAL 2 – Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.							
2.1	Work with township/borough officials to increase awareness of model floodplain ordinance and with property owners, including informational mailings to property owners in the 1% annual chance floodplain, and sponsoring a series of workshops about costs and benefits of: Acquiring and minimizing the cost of flood insurance coverage, and Property acquisition, relocation, elevation, dry floodproofing, and wet floodproofing.	Bedminster Township, Haycock Township, Hulmeville Borough, Lower Makefield Township, New Britain Borough, New Britain Township, New Hope Borough, Newtown Borough, Newtown Township, Quakertown Borough, Sellersville Borough, Silverdale Borough, Tinicum Township,	Education and Awareness	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities, Bucks County Planning Commission	Continuously for next 5 years.	Staff time; DCED and PEMA Technical Support

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
		Trumbauersville Borough, Tullytown Borough, Warrington Township, West Rockhill Township					
2.2	Identify and publicize success stories from Bucks County and from other locations that provide a good example for Bucks County as part of an overall public education program.	New Britain Township, Silverdale Borough, Warrington Township, West Rockhill Township	Education and Awareness	All Hazards	Municipalities, Bucks County Planning Commission, Bucks County Emergency Management Agency	Continuously for next 5 years.	Staff time
2.3	Increase awareness by residents of actions to take before, during and after an emergency. Methods include public outreach and education by website, mailings, workshops, media coverage, newsletter, Twitter and Facebook.	East Rockhill Township, Hulmeville Borough, Langhorne Borough, Lower Southampton Township, New Britain Borough, New Britain Township, New Hope Borough, Plumstead Township, Richlandtown Borough, Sellersville Borough, Silverdale Borough, Tinicum Township, Trumbauersville Borough, Warrington Township	Education and Awareness	All Hazards	Municipalities, American Red Cross	Continuously for next 5 years.	Staff time
2.4	Secure flood specific signage that warns travelers that barricades are present to prevent them from traveling into floodwater.	New Hope Borough, Tinicum Township	Education and Awareness	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities, Bucks County Emergency Management Agency	Within 2 years	Municipal and County Capital Budgets; Non-Disaster Funding
2.5	Maintain information and continue outreach to residents with the	Solebury Township, Tinicum Township, Trumbauersville	Education and Awareness	Dam Failure; Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane,	Municipalities, Bucks County Emergency Management Agency	Within 5 years	Staff Time; DHS; NOAA Storm Ready

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	highest relative vulnerability to the effects of hazards.	Borough, West Rockhill Township		Tropical Storm, Nor'easter; Lightning Strike; Tornado, Wind Storm; Utility Interruption; Winter Storm			
2.6	Engage the community on the vulnerability of the historic properties to hazards in the community and identify community members interested in becoming core planning team members to continue the historic property hazard mitigation planning process.	Bensalem Township, Bristol Borough, Doylestown Township, Haycock Township, Richland Township, Solebury Township, Springfield Township, Tinicum Township, Upper Makefield Township, and Yardley Borough	Education and Awareness; Local Plans and Regulations	All Hazards	Municipalities	Continuously for next 5 years.	Staff time; PHMC
2.7	Provide staff and public education on radon dangers and mitigation requirements.	All Municipalities	Education and Awareness	Radon Exposure	Building Code Official	0-1 Years	General Fund - $500
2.8	Work to provide access to the internet across the County and make sure there are enough cell towers to service the entire County.	Bucks County, All Municipalities (minus Doylestown Township and Warwick Township who completed this action as of the 2026 update)	Structure and Infrastructure	All Hazards	Bucks County	Continuously for the next 5 years	TBD
2.9	Create telework plans.	All Municipalities (minus Doylestown Township and Warwick Township who completed this action as of the 2026 update)	Plans and Regulations	Pandemic and Infectious Disease	Bucks County	0-1 years	TBD
2.10	Implement increased communications and accessibility for residents to the local government.	Bedminster Township	Education and Awareness	Pandemic and Infectious Disease	Township Manager	4-5 Years	General Fund, Local Government - Under $10K

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
2.11	Include messaging about water monitoring and conservation in water bills. For example: Regularly checking for leaks to minimize water supply losses or installing low-flow water saving showerheads and toilets.	Buckingham Township, Doylestown Borough	Education and Awareness	Drought	Planning and Development	Ongoing	Staff Time
2.12	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.	All Municipalities	Education and Awareness	Extreme Temperatures	Emergency Management	3 Years	Staff Time
2.13	Post warning signage at local parks, county fairs and outdoor venues about the risk of lightning strike and hailstorms.	All Municipalities	Education and Awareness	Lightning Strike; Hailstorm	Emergency Management	2 Years	Staff Time
2.14	Produce and distribute family and traveler emergency preparedness information about severe winter weather hazards. Distribute information through various medias (i.e., radio, local television networks, news sources, social medias) and conduct direct engagement with unhoused communities. Consider providing the outreach materials in multiple languages that are spoken within the planning area.	All Municipalities	Education and Awareness	Winter Storm	Emergency Management	5 Years	Staff Time
2.15	Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages, including populations that are often in critical	Buckingham Township	Plans and Regulations	All Hazards	Emergency Management	3 Years	Staff Time

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	facilities, such as nursing homes, schools, hospitals, and prisons.						
2.16	Establish a relationship with local National Weather Service Forecast Office through the FHWA Department of Transportation Pathfinder Program for general awareness of upcoming seasons and event-specific information to share out with residents and visitors of the planning area.	Buckingham Township, Doylestown Borough, Wrightstown Township	Education and Awareness	Winter Storm	Emergency Management	2 Years	Staff Time
2.17	Develop a program that organizes outreach to vulnerable populations, including establishing and promoting accessible heating or cooling centers in the community and community check-ins for vulnerable populations during periods of extreme temperatures.	Doylestown Borough	Education and Awareness	Extreme Temperatures	Emergency Management	2 Years	Staff Time
2.18	Develop targeted outreach to unhoused populations on their hazard risks. Leverage existing working relationships with unhoused communities and/or connect with regional advisors in the U.S. Interagency Council on Homelessness.	Doylestown Borough	Education and Awareness	Lightning Strike	Planning and Development	2 Years	Staff Time
2.19	Produce and distribute family and traveler emergency preparedness information about severe winter weather hazards. Distribute information through various medias (i.e., radio, local television networks, news sources, social medias) and conduct direct engagement with unhoused	Doylestown Borough	Education and Awareness	Winter Storm	Emergency Management	5 Years	Staff Time

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	communities. Consider providing the outreach materials in multiple languages that are spoken within the planning area.						
2.20	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.	Doylestown Borough, Middletown Township	Education and Awareness	Winter Storm, Transpiration Incidents	Emergency Management	3 Years	Staff Time
2.21	Conduct tornado drills in schools and public buildings.	All Municipalities	Education and Awareness	Tornado, Windstorm	Emergency Management	Ongoing	Staff Time
2.22	Organize a local fire department tour to show local elected officials and planners the most vulnerable areas of the community's wildland-urban interface and increase their understanding of risks.	Middletown Township, Yardley Borough	Education and Awareness	Wildfire	Emergency Management	1 Year	Staff Time
2.23	Work with local fire departments to conduct education programs in schools.	All Municipalities	Education and Awareness	Wildfire	Emergency Management	2 Years	Staff Time
2.24	Improve coordination to reduce risk from hazardous material incidents and conduct information sessions and trainings to educate and prepare local officials and first responders.	All Municipalities	Education and Awareness	Hazardous Materials Release	Emergency Management	Ongoing	Staff Time
2.25	Advise the public about the local flood hazard, flood insurance, and flood protection measures. Make sure to provide outreach materials in relevant languages and to create an equitable outreach process that can reach the most vulnerable and disadvantaged members of your community.	Yardley Borough	Education and Awareness	Flood, Flash Flood, Ice Jam	Planning and Development	5 Years	Staff Time

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
2.26	Educate homeowners and renters on how to protect their pipes, including how to insulate outdoor water pipes and disconnecting hoses and turning off water to sprinklers.	Yardley Borough	Education and Awareness	Extreme Temperatures	Emergency Management	2 Years	Staff Time
2.27	Make FEMA B-526, "Earthquake Safety Checklist" available to homeowners and renters to use to retrofit vulnerable homes and increase preparedness.	All Municipalities	Education and Awareness	Earthquake	Local Emergency Services	1 Year	Staff Time
GOAL 3 – Enhance county mitigation program and support efforts to increase municipal and authority mitigation capabilities and planning.							
3.1	Pre-populating FEMA's Substantial Damage Estimator Tool.	Yardley Borough	Local Plans and Regulations; Structure and Infrastructure	Flood, Flash Flood, Ice Jam	EMC	0-1 Years	General Budget
3.2	Utilize available county GIS Resources for municipal hazard related planning and outreach.	Tinicum Township	Education and Awareness; Local Plans and Regulations	Dam Failure; Earthquake; Hazardous Materials Release, Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Landslide; Lightning Strike; Pandemic and Infectious Disease; Radon Exposure; Structure Collapse; Subsidence, Sinkhole; Terrorism; Tornado, Wind Storm; Urban Fire and Explosion; Utility Interruption; Wildfire; Winter Storm	Municipalities, Bucks County Planning Commission, Bucks County Emergency Management Agency	Within 5 years	Staff time; Non-Disaster Funding
3.3	Review and update countywide datasets and coordinate with municipalities during this update.	Bucks County	Education and Awareness; Local Plans and Regulations	All Hazards	Bucks County Planning Commission and Bucks County GIS	Within 5 years	Staff Time, Local Funding

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	Identify method for distributing updated data.						
3.4	Distribute and promote the inclusion of vulnerability analysis information as part of periodic plan review and revisions at the township/borough level.	New Britain Township	Education and Awareness; Local Plans and Regulations	All Hazards	Municipalities, Bucks County Planning Commission	Continuously for next 5 years.	Staff Time; HMGP; PDM
3.5	Integrate evaluation of snow-removal and emergency access logistics with new development planning.	Doylestown Borough, East Rockhill Township, New Britain Township, Plumstead Township, Silverdale Borough	Local Plans and Regulations	Winter Storm	Municipalities, Bucks County Planning Commission	Continuously for next 5 years.	Staff Time
3.6	Update local zoning ordinances	Buckingham Township	Local Plans and Regulations	All Hazards	Township Manager	0-1 years	Operating budget - Estimated $5K
3.7	Consider extra permitting requirements for mines and pipelines in areas with carbonate rock.	Bedminster Township, Buckingham Township, Doylestown Township, Durham Township, East Rockhill Township, Lower Makefield Township, Lower Southampton Township, Milford Township, New Hope Borough, Newtown Borough, Newtown Township, Nockamixon Township, Northampton Township, Plumstead Township, Quakertown Borough, Riegelsville Borough, Solebury	Local Plans and Regulations	Subsidence, Sinkholes; Gas and Liquid Pipelines	Local Government	Continuously for next 5 years	Staff Time

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
		Township, Springfield Township, Tinicum Township, Upper Makefield Township, Upper Southampton Township, Warminster Township, Warrington Township, Warwick Township					
3.8	Evaluate adequacy of township/borough building code implementation.	Haycock Township, New Britain Township, Plumstead Township, Silverdale Borough, Springfield Township, Upper Southampton Township	Local Plans and Regulations	Dam Failure; Earthquake; Hazardous Materials Release; Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Landslide; Lightning Strike; Structural Collapse; Subsidence, Sinkhole; Tornado, Wind Storm; Urban Fire and Explosion; Utility Interruption; Wildfire; Winter Storm	Municipalities	Continuously for next 5 years.	Staff Time
3.9	Encourage increasing design wind and/or snow load for future development.	Haycock Township, New Britain Township, Silverdale Borough, Upper Southampton Township	Local Plans and Regulations	Hurricane, Tropical Storm, Nor'easter; Tornado, Wind Storm; Winter Storm	Municipalities	Continuously for next 5 years.	Staff Time
3.10	Train the municipal building inspectors to consistently enforce the building code.	Chalfont Borough, Doylestown Borough, East Rockhill Township, New Britain Township, Plumstead Township, Silverdale Borough, Upper Southampton Township, West Rockhill Township	Local Plans and Regulations; Structure and Infrastructure	Dam Failure; Earthquake; Hazardous Materials Release; Extreme Temperature; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Landslide; Lightning Strike; Structural Collapse; Subsidence, Sinkhole; Tornado, Wind Storm;	Municipalities, Bucks County Emergency Management Agency	Continuously for next 5 years.	Staff time; DCED and PEMA Technical Support

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
				Urban Fire and Explosion; Utility Interruption; Wildfire; Winter Storm			
3.11	Reach out to municipalities annually and ask them to advise on any changes in their local ordinances.	Bucks County	Local Plans and Regulations	All Hazards	Bucks County	Ongoing	Staff Time
3.12	Continue non-structural measures for mitigation of flood hazard per the December 2001 "Neshaminy Creek Supplemental Watershed Work Plan No. 5." The plan includes the following major components: Flood warning system, Voluntary property acquisition, Voluntary building elevation and floodproofing, and Continuation/ enhancement of floodplain ordinances, flood insurance, and stormwater management.	Involved with Acquisition, Elevation, Ordinances and Stormwater Management: Bristol Township, Bensalem Township, Buckingham Township, Hulmeville Borough, Middletown Township, Newtown Township, Lower Southampton Township, Northampton Township, Warwick Township, Wrightstown Township Involved with Ordinances and Stormwater Management: Buckingham Township, Doylestown Borough, New Britain Borough, New Britain Township, Warminster Township, Warrington	Local Plans and Regulations; Structure and Infrastructure	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipalities, Bucks County	Continue implementing plan over next 5 years.	USDA- NRCS

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
		Township, Warwick Township					
3.13	Develop Disaster Recovery plan that examines impact and plans outreach and continuity of operations for disaster events. Implements steps from planning process that could mitigate impacts and speed recovery for on residents, businesses, and government.	Doylestown Township, Plumstead Township	Local Plans and Regulations	All Hazards	Municipalities	Continuously for next 5 years.	Staff time; DHS
3.14	Continue coordination and planning to mitigate, prepare, and respond to local hazardous materials facilities.	Doylestown Borough, Richlandtown Borough, Tullytown Borough	Local Plans and Regulations	Hazardous Materials Release	Municipalities, Hazardous Materials Facilities	Continuously for next 5 years.	Staff time; DHS
3.15	Continue coordination and planning with local colleges and universities to be partners to mitigate, prepare, and respond to hazards.	Delaware Valley College, Holy Family University - Bucks County, Philadelphia Biblical University, Doylestown Township, Langhorne Borough, New Britain Borough, Newtown Township	Local Plans and Regulations	All Hazards	Municipalities, Delaware Valley College, Holy Family University - Bucks County, Philadelphia Biblical University	Continuously for next 5 years.	Staff time; DHS
3.16	Evaluate and consider implementing activities to secure “Firewise” designation.	Bedminster Township, Bristol Township, Durham Township, East Rockhill Township, Falls Township, Haycock Township, Hilltown Township, Milford Township, Nockamixon Township, Plumstead Township, Richland Township, Solebury	Education and Awareness; Local Plans and Regulations	Wildfire	Municipalities, DCNR Management Agency	Continuously for next 5 years.	Staff time, National Fire Protection Agency, DCNR Bureau of Forestry

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
		Township, Springfield Township, Tinicum Township, West Rockhill Township					
3.17	Convene regular meetings of a restructured HMPT to discuss issues and progress related to the implementation of the plan.	Bucks County, All Municipalities	Local Plans and Regulations	All Hazards	Bucks County Planning Commission, Bucks County Emergency Management Agency	Continuously for next 5 years.	Staff time
3.18	Link available technical assistance to communities that have residents interested in HMA grants yet need additional capacity to pursue complicated application and management process.	Bensalem Township, Bucks County	Local Plans and Regulations	All Hazards	Bucks County Planning Commission, Bucks County Emergency Management Agency	Continuously for next 5 years.	Staff time
3.19	Train emergency personnel in a basic understanding of railroads and their dangers.	Bucks County	Education and Awareness; Local Plans and Regulations	Transportation Incidents	SEPTA Chief Engineer	Continuously for next 5 years.	Staff time, $65 per person
3.20	Renew and expand commitments to hazard mitigation planning among partner organizations.	New Britain Township, Silverdale Borough, Upper Southampton Township	Local Plans and Regulations	All Hazards	Municipalities, Bucks County Planning Commission, Bucks County Emergency Management Agency	Continuously for next 5 years.	Staff time
3.21	Evaluate effectiveness of the pandemic protocol implementation and restocking of pandemic response kits.	All Municipalities	Local Plans and Regulations	Pandemic and Infectious Disease	Township manager and Emergency Management Coordinator	0-1 years	5000
3.22	Develop a floodplain management plan and update it regularly	Buckingham Township, Yardley Borough	Plans and Regulations	Flood, Flash Flood, Ice Jam	Planning and Development	5 years	Staff Time
3.23	Develop a drought emergency plan.	Buckingham Township, Doylestown Borough	Plans and Regulations	Drought	Planning and Development	5 Years	Staff Time
3.24	Develop a drought communication plan and early warning system to	All Municipalities	Plans and Regulations;	Drought	Emergency Management	5 Years	Staff Time

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	facilitate timely communication of relevant information to officials, decision makers, emergency managers, and the general public.		Education and Awareness				
3.25	Develop agreements for secondary water sources that may be used during drought conditions.	Doylestown Borough	Plans and Regulations	Drought	Emergency Management	3 Years	Staff Time
3.26	Update local ordinances require minimum and maximum temperatures in codes for housing, critical facilities, community spaces, and other congregate settings.	Doylestown Borough, Wrightstown Township	Plans and Regulations	Extreme Temperatures	Planning and Development	2 Years	Staff Time
3.27	Adopt the latest published editions of relevant consensus-based codes and standards, such as the International Building Code (IBC), International Residential Code (IRC), and International Existing Building Code (IEBC).	Yardley Borough	Plans and Regulations	All Hazards	Planning and Development	5 Years	Staff Time
3.28	Create an emergency plan for backup power during hazard events.	All Municipalities	Plans and Regulations	Utility Interruption	Local Planner	1 Year	Staff Time
3.29	Create a plan for responding to an urban fire or explosion.	All Municipalities	Plans and Regulations	Urban Fire and Explosion	Local Planner	1 Year	Staff Time
3.30	Conduct an exercise to respond to a terrorism event.	All Municipalities	Plans and Regulations	Terrorism	Local Planner	1 Year	Staff Time
3.31	Train local staff on cyber security initiatives and how to prevent an attack.	All Municipalities	Education and Awareness	Cyber Terrorism	Local Emergency Services	1 Year	Staff Time, Non-Disaster Funding
GOAL 4 – Protect natural resources within hazard areas and use them to reduce risk and losses.							
4.1	Increasing open space cache in floodplain.	Yardley Borough	Structure and Infrastructure	Flood, Flash Flood, Ice Jam	Borough Manager	0-1 Years	General Fund
4.2	Evaluate and implement projects to protect and improve natural environment along waterways with	East Rockhill Township, Yardley Borough	Natural Systems Protection	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipal Environmental Advisory Councils,	Continuously for next 5 years.	CIP, DEP

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
	projects including preservation, conversation easements, and bank restoration.				Watershed Associations, Private property owners		
4.3	Build on existing Stormwater Management Planning and encourage implantation of small stormwater mitigation projects on private property (i.e. rain gardens, rain barrels, natural basins).	Doylestown Borough, Penndel Borough, Tinicum Township, Warrington Township, Yardley Borough	Natural Systems Protection	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Municipal Environmental Advisory Councils, Watershed Associations, Private property owners	Continuously for next 5 years.	Private property owners; Watershed Assoc. Technical Support
4.4	Restore native plants and wetlands to the watershed to address flooding issues.	Upper Makefield Township	Natural Systems Protection	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Deputy Emergency Management Coordinator	4-5 years	PA Dept. of Natural Resources, BRIC, local funding
4.5	Apply soil stabilization measures, such as planting soil-stabilizing native vegetation on steep, publicly-owned slopes near roadways.	All Municipalities	Structure and Infrastructure	Landslide	Planning and Development	5 Years	Non-Disaster Funding
4.6	Create a wildfire scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop wildfire mitigation priorities.	Wrightstown Township	Education and Awareness	Wildfire	Emergency Management	3 Years	Staff Time
4.7	Establish a "green infrastructure" program to link, manage, and expand existing parks, preserves, greenways, etc.	Yardley Borough	Plans and Regulations	Flood, Flash Flood, Ice Jam	Planning and Development	5 Years	Non-Disaster Funding
GOAL 5 – Protect people and assets from the potential impacts of high hazard potential dams.							
5.1	Work with Township Public Works, Police, and local Fire Police to evaluate and develop evacuation plan/routes for dam failure.	All Municipalities	Local Plans and Regulations	Dam Failure	Police & Public Works	2-3 years	DHS grants and local funding - $5K for staff time

Table 6.4-1 2026 Mitigation Action Plan

#	Action Description	Community/ Organization	Category	Hazard	Lead Agency/ Department	Implementation Schedule	Funding Source and Notes Priority
5.2	Identify and make any and all repairs to existing class A-1 and B-1 dams, as well as any other dams in the County that may be applicable.	Bucks County	Structure and Infrastructure	Dam Failure	Public Works Director/ Deputy Manager	Within 5 years	HHPD
5.3	Provide notice of funding opportunity and supporting documentation from the county HMP to EMCs of municipalities with HHPDs to promote rehabilitation and safety in Bucks County. · Identify mitigation actions to reduce vulnerabilities to/from eligible HHPDs, such as proposing, enacting or delegating authority for local land use regulations, ordinances and/or construction standards to protect life and property from HHPDs. · Work with HHPD owners to integrate EAPs or a dam incident annex into emergency operations plans. · Delegate authority to local governments to adopt and enforce restrictive zoning and land use ordinances in designated inundation areas. · Acquire and/or elevate structures both up and downstream of HHPDs.	Bucks County	Structure and Infrastructure	Dam Failure	Emergency Management	Within 5 years	HHPD

At least one mitigation action was established for each hazard in Bucks County. More than one action is identified for several hazards. Every participating jurisdiction has at least one mitigation action for the hazards they are at risk to.

These mitigation actions have either been carried over from the 2021 HMP or captured during the planning process for the 2026 HMP update. During the development of this plan, there were key findings and takeaways that demonstrated further potential for future mitigation actions.

Table 6.4-1 lists the 2026 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.

Table 6.4-2 Mitigation Action Prioritization

Action Number	Mitigation Action	Multi-Objective Mitigation Action Prioritization Criteria					Total Score
		Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	
1.1	Proceed with grant applications to suitably protect repetitive-loss properties 1% annual chance floodplain (for owners interested in FEMA mitigation funding).	3	3	2	3	1	2.5
1.2	Continue identifying protection measures to operate critical facilities. Proceed with grant applications to suitably protect and continue operations of critical facilities in the 1% annual chance floodplain and at risk to utilities interruption from flooding and other hazards.	3	3	3	3	3	3.0
1.3	Continue identifying protection measures to operate businesses and protect residences. Proceed with grant applications for infrastructure that protects community from 1% annual chance floodplain.	3	3	2	3	3	2.8
1.4	Evaluate, implement, and perform mitigation projects identified in this and other planning mechanisms, including acquisition, elevation, mitigation reconstruction, foundation and building stabilization, securing access to generator power and other mitigation methods.	3	2	3	3	3	2.7
1.5	Township will replace 5 existing culverts on Top Rock Trail to mitigate flooding impacts of existing substandard drainage conditions in this area of the Township. This is part of an on-going effort to improve roadside drainage throughout the Township.	2	2	3	3	1	2.2
1.6	Clean out all street drains, repair and/or replace culverts and drain grates.	2	2	3	3	1	2.2
1.7	Install storm sewer along a section of Peppermint Road to address an ongoing flooding issue that impacts neighboring downstream properties.	1	2	2	3	3	2.1
1.8	Elevate existing homes in the floodplain to limit damage during future flood events	2	3	2	3	3	2.6
1.9	Repair culvert and swales on Lonely Road.	2	2	3	3	3	2.5
1.10	Replace culvert on Tabor Road	2	2	3	3	3	2.5
1.11	Repair/improve Modla/Park drainage swale.	1	2	2	3	3	2.1
1.12	Improving stormwater management in floodplain by jet cleaning storm drains and installing backflow preventers. Secondly, Yardley Borough will pursue the installation of additional storm drains and pipes to an area without.	3	2	2	3	3	2.5
1.13	Continue elevating flood prone structures.	1	2	2	3	3	2.1
1.14	Evaluate and/or pursue Community Rating System (CRS) participation for insurance premium reduction (and flood damage reduction).	3	2	1	3	1	2.0
1.15	Obtain information for structures in the areas with the highest relative vulnerability to determine the best property protection methods. Information to be obtained includes: Lowest-floor elevation, Number of stories, Presence of a basement, and Market and/or replacement value.	2	2	2	3	1	2.0
1.16	Obtain information for all remaining structures in the 1% annual chance floodplain to determine the best property protection methods to promote with individual property owners. Techniques for gathering information over time should include developing and	3	2	1	3	1	2.0

Table 6.4-2 Mitigation Action Prioritization

Action Number	Mitigation Action	Multi-Objective Mitigation Action Prioritization Criteria					Total Score
		Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	
	implementing a program for integrated information "capture" at key points in normal township administrative procedures, including applications for building permits at township/borough offices.						
1.17	Provide a comprehensive update to the database that records floodplain properties and elevation certificates.	3	3	2	3	3	2.8
1.18	Identify all storage of hazardous materials in floodplains (including non-addressable structures, such as propane tanks).	2	3	3	3	2	2.7
1.19	Evaluate alternative methods to minimize risk from existing storage areas.	2	3	3	3	2	2.7
1.20	Assess means to prevent future storage in floodplain.	3	2	3	3	2	2.6
1.21	Identify critical facilities with the highest vulnerability to the effects of power outage (i.e., hospitals, nursing homes, fire, police, rescue, and emergency management).	2	2	2	3	3	2.3
1.22	Develop action plan for reducing potential damage and loss of function at identified critical facilities and infrastructure.	1	2	3	3	3	2.3
1.23	Add additional water main on North Main Street to provide additional water service for residents and especially for fire fighting activity.	3	3	3	3	3	3.0
1.24	Complete interconnection of an existing public water system with facilities owned by North Wales Water Authority to ensure redundancy of supply in the Township's water system	3	2	2	3	3	2.5
1.25	Replace aging sewage pump station to reduce outages and prevent storm damage.	2	2	1	3	2	2.0
1.26	Conduct qualitative evaluation process for managing stranded rural residents and travelers (e.g., temporary shelters).	2	2	3	3	1	2.2
1.27	If warranted, implement additional storm shelters and warning systems near vulnerable communities, including: Identify structures that can be used as tornado safe rooms (some may require structure modifications), or NOAA weather radios for vulnerable populace.	3	3	3	3	1	2.7
1.28	Review prevalence of transportation accidents and known infrastructure deficiencies and advocate for projects and funding that will increase safety.	3	2	1	2	2	2.0
1.29	Replace the deck of an existing bridge on Schultz Road that is structurally deficient to ensure that the transportation system of the Township is not adversely impacted if the bridge must be closed to traffic.	3	2	1	2	2	2.0
1.30	Implement signal improvements at intersections that frequently experience traffic accidents.	3	2	1	2	1	1.9
1.31	Traffic calming on Main Street and Barringer Avenue.	1	3	1	2	3	2.1
1.32	Bridge replacement or rehab on Headquarters Rd spanning the Tinicum Creek due to structural failure.	3	3	2	2	3	2.7
1.33	Inventory the historic properties vulnerable to the identified hazards, assess vulnerability of these assets, and establish preservation priorities by determining which assets are most valuable to the community.	3	2	3	3	1	2.4
1.34	Evaluate and implement projects to manage stormwater effectively.	3	2	2	3	2	2.4
1.35	Routinely clean and repair stormwater drains.	2	3	1	3	1	2.1

Table 6.4-2 Mitigation Action Prioritization

Action Number	Mitigation Action	Multi-Objective Mitigation Action Prioritization Criteria					Total Score
		Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	
1.36	Implement traffic calming measures at key community intersections.	2	3	1	2	1	2.0
1.37	Partner with local emergency management, critical facilities (e.g., hospitals) and other organizations to explore opportunities with the StormReady program.	2	2	2	3	3	2.3
1.38	Plan for and maintain adequate road and debris clearing capabilities	2	2	1	3	2	2.0
1.39	Replace the Weiss Road bridge.	3	1	1	3	3	2.0
1.40	Repair two bridges at Allentown Road and Route 663.	3	1	1	3	3	2.0
1.41	Install lightning and surge protection devices and methods, such as lightning rods and grounding, on communications infrastructure, critical electronic equipment, and other critical facilities.	2	3	1	1	1	1.8
1.42	Conduct a verification study of FEMA's repetitive loss inventory and developing an associated tracking database to prioritize and share information.	3	3	1	3	2	2.5
1.43	Identify structures at risk to collapse and create a strategy for mitigation.	2	2	1	1	2	1.7
2.1	Work with township/borough officials to increase awareness of model floodplain ordinance and with property owners, including informational mailings to property owners in the 1% annual chance floodplain, and sponsoring a series of workshops about costs and benefits of: Acquiring and minimizing the cost of flood insurance coverage, and Property acquisition, relocation, elevation, dry floodproofing, and wet floodproofing.	3	2	1	3	1	2.0
2.2	Identify and publicize success stories from Bucks County and from other locations that provide a good example for Bucks County as part of an overall public education program.	1	1	3	3	1	1.7
2.3	Increase awareness by residents of actions to take before, during and after an emergency. Methods include public outreach and education by website, mailings, workshops, media coverage, newsletter, Twitter and Facebook.	2	1	3	3	1	1.9
2.4	Secure flood specific signage that warns travelers that barricades are present to prevent them from traveling into floodwater.	2	1	1	3	1	1.5
2.5	Maintain information and continue outreach to residents with the highest relative vulnerability to the effects of hazards.	2	2	3	3	1	2.2
2.6	Engage the community on the vulnerability of the historic properties to hazards in the community and identify community members interested in becoming core planning team members to continue the historic property hazard mitigation planning process.	3	2	3	3	1	2.4
2.7	Provide staff and public education on radon dangers and mitigation requirements.	1	2	1	1	2	1.5
2.8	Work to provide access to the internet across the County and make sure there are enough cell towers to service the entire County.	2	2	3	3	1	2.2
2.9	Create telework plans.	3	3	1	1	2	2.2
2.10	Implement increased communications and accessibility for residents to the local government.	2	2	1	2	1	1.7
2.11	Include messaging about water monitoring and conservation in water bills. For example: Regularly checking for leaks to minimize	1	3	1	2	1	1.8

Table 6.4-2 Mitigation Action Prioritization

Action Number	Mitigation Action	Multi-Objective Mitigation Action Prioritization Criteria					Total Score
		Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	
	water supply losses or installing low-flow water saving showerheads and toilets.						
2.12	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.	1	3	1	3	1	1.9
2.13	Post warning signage at local parks, county fairs and outdoor venues about the risk of lightning strike and hailstorms.	1	3	1	1	1	1.6
2.14	Produce and distribute family and traveler emergency preparedness information about severe winter weather hazards. Distribute information through various medias (i.e., radio, local television networks, news sources, social medias) and conduct direct engagement with unhoused communities. Consider providing the outreach materials in multiple languages that are spoken within the planning area.	1	3	1	2	1	1.8
2.15	Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages, including populations that are often in critical facilities, such as nursing homes, schools, hospitals, and prisons.	2	2	3	3	1	2.2
2.16	Establish a relationship with local National Weather Service Forecast Office through the FHWA Department of Transportation Pathfinder Program for general awareness of upcoming seasons and event-specific information to share out with residents and visitors of the planning area.	2	2	1	1	1	1.5
2.17	Develop a program that organizes outreach to vulnerable populations, including establishing and promoting accessible heating or cooling centers in the community and community check-ins for vulnerable populations during periods of extreme temperatures.	2	1	3	3	1	1.9
2.18	Develop targeted outreach to unhoused populations on their hazard risks. Leverage existing working relationships with unhoused communities and/or connect with regional advisors in the U.S. Interagency Council on Homelessness.	2	1	2	2	1	1.6
2.19	Produce and distribute family and traveler emergency preparedness information about severe winter weather hazards. Distribute information through various medias (i.e., radio, local television networks, news sources, social medias) and conduct direct engagement with unhoused communities. Consider providing the outreach materials in multiple languages that are spoken within the planning area.	1	3	1	2	1	1.8
2.20	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	3	1	3	1	1.9
2.21	Conduct tornado drills in schools and public buildings.	2	3	1	2	2	2.1
2.22	Organize a local fire department tour to show local elected officials and planners the most vulnerable areas of the community's wildland-urban interface and increase their understanding of risks.	1	1	2	2	1	1.4
2.23	Work with local fire departments to conduct education programs in schools.	1	1	2	2	1	1.4

Table 6.4-2 Mitigation Action Prioritization

Action Number	Mitigation Action	Multi-Objective Mitigation Action Prioritization Criteria					Total Score
		Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	
2.24	Improve coordination to reduce risk from hazardous material incidents and conduct information sessions and trainings to educate and prepare local officials and first responders.	2	2	2	2	2	2.0
2.25	Advise the public about the local flood hazard, flood insurance, and flood protection measures. Make sure to provide outreach materials in relevant languages and to create an equitable outreach process that can reach the most vulnerable and disadvantaged members of your community.	2	2	1	3	1	1.8
2.26	Educate homeowners and renters on how to protect their pipes, including how to insulate outdoor water pipes and disconnecting hoses and turning off water to sprinklers.	2	2	1	2	1	1.7
2.27	Make FEMA B-526, "Earthquake Safety Checklist" available to homeowners and renters to use to retrofit vulnerable homes and increase preparedness.	2	2	1	2	1	1.7
3.1	Pre-populating FEMA's Substantial Damage Estimator Tool.	1	2	1	3	2	1.8
3.2	Utilize available county GIS Resources for municipal hazard related planning and outreach.	2	2	3	3	2	2.4
3.3	Review and update countywide datasets and coordinate with municipalities during this update. Identify method for distributing updated data.	2	2	3	3	2	2.4
3.4	Distribute and promote the inclusion of vulnerability analysis information as part of periodic plan review and revisions at the township/borough level.	2	3	3	3	3	2.8
3.5	Integrate evaluation of snow-removal and emergency access logistics with new development planning.	2	3	2	3	3	2.6
3.6	Update local zoning ordinances	2	2	3	3	2	2.4
3.7	Consider extra permitting requirements for mines and pipelines in areas with carbonate rock.	2	2	2	2	3	2.2
3.8	Evaluate adequacy of township/borough building code implementation.	2	2	3	3	1	2.2
3.9	Encourage increasing design wind and/or snow load for future development.	2	1	3	3	1	1.9
3.10	Train the municipal building inspectors to consistently enforce the building code.	2	2	3	3	1	2.2
3.11	Reach out to municipalities annually and ask them to advise on any changes in their local ordinances.	2	2	3	3	2	2.4
3.12	Continue non-structural measures for mitigation of flood hazard per the December 2001 "Neshaminy Creek Supplemental Watershed Work Plan No. 5." The plan includes the following major components: Flood warning system, Voluntary property acquisition, Voluntary building elevation and floodproofing, and Continuation/ enhancement of floodplain ordinances, flood insurance, and stormwater management.	3	3	2	3	2	2.7
3.13	Develop Disaster Recovery plan that examines impact and plans outreach and continuity of operations for disaster events. Implements steps from planning process that could mitigate impacts and speed recovery for on residents, businesses, and government.	2	2	3	3	2	2.4

Table 6.4-2 Mitigation Action Prioritization

Action Number	Mitigation Action	Multi-Objective Mitigation Action Prioritization Criteria					Total Score
		Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	
3.14	Continue coordination and planning to mitigate, prepare, and respond to local hazardous materials facilities.	3	2	3	3	3	2.7
3.15	Continue coordination and planning with local colleges and universities to be partners to mitigate, prepare, and respond to hazards.	3	2	3	3	2	2.6
3.16	Evaluate and consider implementing activities to secure “Firewise” designation.	3	2	1	2	2	2.0
3.17	Convene regular meetings of a restructured HMPT to discuss issues and progress related to the implementation of the plan.	2	2	3	3	2	2.4
3.18	Link available technical assistance to communities that have residents interested in HMA grants yet need additional capacity to pursue complicated application and management process.	3	2	3	3	1	2.4
3.19	Train emergency personnel in a basic understanding of railroads and their dangers.	2	2	3	3	2	2.4
3.20	Renew and expand commitments to hazard mitigation planning among partner organizations.	2	2	3	3	2	2.4
3.21	Evaluate effectiveness of the pandemic protocol implementation and restocking of pandemic response kits.	3	2	1	2	2	2.0
3.22	Develop a floodplain management plan and update it regularly	2	2	1	3	2	2.0
3.24	Develop a drought emergency plan.	2	2	1	2	1	1.7
3.25	Develop a drought communication plan and early warning system to facilitate timely communication of relevant information to officials, decision makers, emergency managers, and the general public.	2	2	1	2	1	1.7
3.26	Develop agreements for secondary water sources that may be used during drought conditions.	3	1	1	2	1	1.6
3.27	Update local ordinances require minimum and maximum temperatures in codes for housing, critical facilities, community spaces, and other congregate settings.	2	2	1	3	1	1.8
3.28	Adopt the latest published editions of relevant consensus-based codes and standards, such as the International Building Code (IBC), International Residential Code (IRC), and International Existing Building Code (IEBC).	2	2	1	3	1	1.8
3.29	Create an emergency plan for backup power during hazard events.	2	2	1	2	2	1.8
3.30	Create a plan for responding to an urban fire or explosion.	2	2	1	2	1	1.7
3.31	Conduct an exercise to respond to a terrorism event.	2	2	1	1	1	1.5
3.32	Train local staff on cyber security initiatives and how to prevent an attack.	2	2	1	3	1	1.8
4.1	Increasing open space cache in floodplain.	1	2	2	3	3	2.1
4.2	Evaluate and implement projects to protect and improve natural environment along waterways with projects including preservation, conversation easements, and bank restoration.	3	2	2	3	2	2.4
4.3	Build on existing Stormwater Management Planning and encourage implantation of small stormwater mitigation projects on private property (i.e. rain gardens, rain barrels, natural basins).	3	2	2	3	2	2.4
4.4	Restore native plants and wetlands to the watershed to address flooding issues.	3	3	2	2	1	2.4

Table 6.4-2 Mitigation Action Prioritization

Action Number	Mitigation Action	Multi-Objective Mitigation Action Prioritization Criteria					Total Score
		Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Communications/ Critical Infrastructure	
4.5	Apply soil stabilization measures, such as planting soil-stabilizing native vegetation on steep, publicly-owned slopes near roadways.	1	1	1	2	1	1.2
4.6	Create a wildfire scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop wildfire mitigation priorities.	2	1	1	2	1	1.4
4.7	Establish a "green infrastructure" program to link, manage, and expand existing parks, preserves, greenways, etc.	2	2	1	2	1	1.7
5.1	Work with Township Public Works, Police, and local Fire Police to evaluate and develop evacuation plan/routes for dam failure.	2	2	1	3	2	2.0
5.2	Identify and make any and all repairs to existing class A-1 and B-1 dams, as well as any other dams in the County that may be applicable.	3	3	2	3	2	2.7
5.3	Provide notice of funding opportunity and supporting documentation from the county HMP to EMCs of municipalities with HHPDs to promote rehabilitation and safety in Bucks County. · Identify mitigation actions to reduce vulnerabilities to/from eligible HHPDs, such as proposing, enacting or delegating authority for local land use regulations, ordinances and/or construction standards to protect life and property from HHPDs. Work with HHPD owners to integrate EAPs or a dam incident annex into emergency operations plans. Delegate authority to local governments to adopt and enforce restrictive zoning and land use ordinances in designated inundation areas. Acquire and/or elevate structures both up and downstream of HHPDs.	3	3	2	3	2	2.7

7.0 PLAN MAINTENANCE

7.1 Update Process Summary

Monitoring, evaluating, and updating this plan, is critical to maintaining its value and success in Bucks County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. This HMP's plan maintenance section also defines the municipalities' role in updating and evaluating the plan, as well as how this plan may be integrated into other planning mechanisms in the County. The Plan Maintenance process was reviewed at the Final Public Meeting and reviewed in detail during the subsequent public review period. No changes were made.

7.2 Monitoring, Evaluating, and Updating the Plan

The HMSC established for the 2026 HMP is designated to administer the plan maintenance processes of monitoring, evaluation, and updating with support and representation from all 54 participating municipalities. The Bucks County Planning Commission Executive Director and the Bucks County Emergency Management Agency Director in coordination with colleagues from their respective departments will lead the HMPT in all associated plan maintenance requirements, including annual reviews. The HMSC will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from community representatives, local emergency management coordinators and planners, the general public and other important partner agencies. The HMSC will oversee the progress made on the implementation of action items identified in the 2026 HMP and modify actions, as needed, to reflect changing conditions. The HMSC will continue to meet annually to discuss specific coordination efforts that may be needed with other partner agencies. Should a significant disaster occur within the County, the HMSC will reconvene within 30 days of the disaster to review and update the HMP. Meetings will be summarized in annual reports and progress reports that will be incorporated into the next plan update.

Each municipality will designate a community representative to monitor mitigation activities and hazard events within their respective communities. The local emergency management coordinator would be suitable for this role. This individual will be asked to work with the HMSC to provide updates on applicable mitigation actions and feedback on changing hazard vulnerabilities within their community.

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. The HMSC will also support local and county officials in applying for post-disaster mitigation funds when they are available. All state and federal mitigation funding provided to the County or local municipalities will be reported in subsequent plan updates. In addition, new plans and programs being developed within the County will be evaluated as to the ability and necessity to integrate the 2026 HMP into them.

The 2026 HMP will be updated every five years, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future plan 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 the Bucks County HMP.

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- 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?

Issues that arise during monitoring and evaluation which require changes to the risk assessment, mitigation strategy and other components of the plan will be incorporated during future updates.

7.3 Continued Public Involvement

As was done during the development of the 2021 and 2026 HMP, the HMSC will involve the public during the evaluation and update of the HMP through various workshops and meetings. The public will have access to an electronic copy of the current HMP through the Bucks County Planning Commission website. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and on the County website ((http://www.buckscounty.gov). Also, several municipalities signed up for public outreach related mitigation actions. The HMSC will incorporate all relevant comments during the next update of the HMP.

8.0 PLAN ADOPTION

This section will be filled out after receiving Approvable Pending Adoption status, provided by FEMA Region 3. This plan has been reviewed by the Steering Committee, the Planning Team, the general public and the State. Once the plan is approved pending adoption by FEMA, each community that participated should adopt the plan. After the first community adopts, FEMA will issue a formal approval.

This section of the plan includes copies of the local adoption resolutions passed by Bucks County and its municipal governments; a completed Local Mitigation Plan Review Crosswalk can be found in **Appendix B**. Adoption resolution templates are provided to assist the County and municipal governments with recommended language for future adoption of the HMP.

Bucks County 2026 Hazard Mitigation Plan

County Adoption Resolution

Resolution No. _____

Bucks County, Pennsylvania

WHEREAS, the municipalities of Bucks County, Pennsylvania are most vulnerable to natural and human-made 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, Bucks 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 Bucks County 2026 Hazard Mitigation Plan has been developed by the Bucks County Emergency Management Agency and the Bucks County Planning Commission in cooperation with other county departments, local municipal officials, and the citizens of Bucks County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Bucks County 2026 Hazard Mitigation Plan, and

WHEREAS, the Bucks County 2026 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the County of Bucks that:

- The Bucks County 2026 Hazard Mitigation Plan 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 Bucks County 2026 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2026

ATTEST: **BUCKS COUNTY COMMISSIONERS**

_____ By _____

By _____

By _____

Bucks County 2026 Hazard Mitigation Plan

Municipal Adoption Resolution

Resolution No. _____

<*Borough/Township of Municipality Name*>, Bucks County, Pennsylvania

WHEREAS, the <*Borough/Township of Municipality Name*>, Bucks County, Pennsylvania is most vulnerable to natural and human-made 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 Bucks County 2026 Hazard Mitigation Plan has been developed by the Bucks County Emergency Management Agency and the Bucks County Planning Commission in cooperation with other county departments, and officials and citizens of <*Borough/Township of Municipality Name*>, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Bucks County 2026 Hazard Mitigation Plan, and

WHEREAS, the Bucks County 2026 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made 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 Bucks County 2026 Hazard Mitigation Plan 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 Bucks County 2026 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2026

ATTEST: ***<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>***

_____ By _____

By _____

Special District Adoption Resolution

Resolution No. _____

<Special District Name>, Bucks County, Pennsylvania

WHEREAS, the <*Special District Name*>, Bucks County, Pennsylvania, is most vulnerable to natural and human-made 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 <*Special District Name*> acknowledges the requirement 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 Bucks County Hazard Mitigation Plan has been developed by the Bucks County Planning and Community Development Department, in cooperation with other County departments, and leaders and citizens within and/or serviced by <*Special District Name*>, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Bucks County Hazard Mitigation Plan, and

WHEREAS, the Bucks County Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the county, its municipal governments, and its special districts,

NOW THEREFORE BE IT RESOLVED by the governing body for the <*Special District Name*>:

- The Bucks County Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the <*Special District Name*>, and
- The respective officials and agencies identified in the implementation strategy of the Bucks County Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2026

ATTEST: ***<SPECIAL DISTRICT NAME>***

_____ By _____

By _____

By _____